

N61165.AR.004925  
CNC CHARLESTON  
5090.3a

RCRA FACILITY INVESTIGATION REPORT ADDENDUM AREA OF CONCERN 638 ZONE G  
CNC CHARLESTON SC  
2/1/2002  
CH2MHILL

# RFI REPORT ADDENDUM

## Area of Concern 638, Zone G



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

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

*CH2M-Jones*

*February 2002*

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

CH2M HILL

3011 S W Williston Road  
Gainesville, FL  
32608-3928  
Mailing address  
P O Box 147009  
Gainesville, FL  
32614-7009  
Tel 352.335.7991  
Fax 352.335.2959



**CH2MHILL**

February 7, 2002

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

Re: RFI Report Addendum (Revision 1) – AOC 638, Zone G

Dear Mr. Scaturo:

Enclosed please find two sets of replacement pages which serve as Revision 1 of the RFI Report Addendum for AOC 638 in Zone G of the Charleston Naval Complex (CNC). Below is a summary of the material enclosed with this letter:

- Revision 1 text to be replaced in the Revision 0 RFI Report Addendum for AOC 638, Zone G, submitted by CH2M-Jones in September 2001.
- New Appendix F divider page and material to be inserted in the back of the original Revision 0 RFI Report Addendum 3-ring binder.
- Revision 1 covers/spines and flysheets to be replaced in the original Revision 0 RFI Report Addendum 3-ring binder.

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

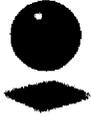
The principal author of this document is Bill Elliott. Please contact him at 352/335-5877, extension 2477, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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



**CH2MHILL**

**CH2M HILL**

3011 S.W. Williston Road

Gainesville, FL

32608-3928

Mailing address:

P.O. Box 147009

Gainesville, FL

32614-7009

Tel 352.335.7991

Fax 352.335.2959

September 20, 2001

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

Re: RFI Report Addendum (Revision 0) – AOC 638, Zone G

Dear Mr. Scaturo:

Enclosed please find four copies of the RFI Report Addendum (Revision 0) for AOC 638 in Zone G of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is David Lane. Please contact him at 352/335-5877, extension 2320, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

# RFI REPORT ADDENDUM

## Area of Concern 638, Zone G



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

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

PREPARED BY  
***CH2M-Jones***

*February 2002*

Revision 1  
Contract N62467-99-C-0960  
158814.ZG.PR.05

**Certification Page for RFI Report Addendum (Revision 1) – AOC  
638, Zone G**

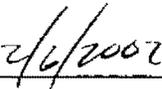
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

Permit No. 21428



Dean Williamson, P.E.



Date

# 1 Contents

---

2 Section	Page
3 Acronyms and Abbreviations.....	vi
4 1.0 Introduction .....	1-1
5     1.1 Background .....	1-1
6     1.2 Purpose of the RFI Report Addendum .....	1-2
7     1.3 RFI Report Addendum Organization.....	1-2
8 Figure 1-1 Location of AOC 638, Zone G.....	1-4
9 Figure 1-2 Aerial Photograph of AOC 638, Zone G .....	1-5
10 2.0 Summary of RFI Conclusions for AOC 638 .....	2-1
11 Figure 2-1 RFI Monitoring Well and Soil Sample Locations.....	2-3
12 3.0 Interim Measures and UST/AST Removals.....	3-1
13 4.0 Summary of Additional Investigations .....	4-1
14     4.1 Soil Sampling and Analysis .....	4-1
15         4.1.1 Surface Soil.....	4-2
16         4.1.2 Subsurface Soil.....	4-3
17     4.2 Groundwater Sampling and Analysis.....	4-4
18 Table 4-1 Inorganic Analytes Detected in Surface Soil .....	4-5
19 Table 4-2 Organic Analytes Detected in Surface Soil .....	4-9
20 Table 4-3 Inorganic Analytes Detected in Subsurface Soil.....	4-12
21 Table 4-4 Organic Analytes Detected in Subsurface Soil.....	4-16
22 Table 4-5 Inorganic Analytes Detected in Groundwater.....	4-19
23 Table 4-6 Organic Analytes Detected in Groundwater.....	4-21
24 Figure 4-1 Additional Soil Sample Locations.....	4-22
25 Figure 4-2 Location of Groundwater Monitoring Wells.....	4-23
26 5.0 COPC/COC Refinement .....	5-1
27     5.1 Soil .....	5-1
28         5.1.1 Arsenic .....	5-1
29         5.1.2 Copper .....	5-2
30         5.1.3 Selenium and Thallium .....	5-2
31         5.1.4 BEQs.....	5-2
32     5.2 Groundwater.....	5-3

1 Table 5-1 UCL<sub>95</sub> for Surface Soil Arsenic ..... 5-4

2 Figure 5-1 RFI and Additional Arsenic Results ..... 5-5

3 **6.0 Summary of Information Related to Site Closeout Issues**..... 6-1

4 6.1 RFI Status..... 6-1

5 6.2 Presence of Inorganics in Groundwater..... 6-1

6 6.3 Potential Linkage to SWMU 37, Investigated Sanitary Sewers at the CNC..... 6-1

7 6.4 Potential Linkage to AOC 699, Investigated Storm Sewers at the CNC..... 6-2

8 6.5 Potential Linkage to AOC 504, Investigated Railroad Lines at the CNC..... 6-2

9 6.6 Potential Migration Pathways to Surface Water Bodies at the CNC ..... 6-2

10 6.7 Potential Contamination in Oil/Water Separators (OWSs)..... 6-3

11 6.8 Land Use Control Management Plan ..... 6-3

12 **7.0 Recommendations**..... 7-1

13 **8.0 References**..... 8-1

14

15 **Appendices**

16 **A** Analytical Data from EnSafe RFI Investigation (1999-2000)

17 **B** Validation Reports from EnSafe RFI Investigation (1999-2000)

18 **C** SPLP Metals Test Results

19 **D** RFI Figure 2.5, *Shallow Groundwater Potentiometric Contours*

20 **E** Responses to SCDHEC Comments on the *Zone G RFI Report, Revision 0* (Ensafe, 1998)

21 **F** Responses to EPA Comments on the *RFI Report Addendum, AOC 638, Zone G, Revision*

22 *0* (CH2M-Jones, September 2001)

# 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	EBS	environmental baseline survey
13	EnSafe	Ensafe Inc.
14	EPA	U.S. Environmental Protection Agency
15	µg/kg	micrograms per kilogram
16	µg/L	micrograms per liter
17	mg/kg	milligrams per kilogram
18	MCL	maximum contaminant level
19	NAVBASE	Naval Base
20	NFA	no further action
21	NFI	no further investigation
22	OWS	oil/water separator
23	PAH	polycyclic aromatic hydrocarbon
24	PCB	polychlorinated biphenyl
25	RBC	risk-based concentration
26	RCRA	Resource Conservation and Recovery Act
27	RFI	RCRA Facility Investigation
28	SCDHEC	South Carolina Department of Health and Environmental Control
29	SPLP	synthetic precipitation leaching procedure
30	SSL	soil screening level

- |   |      |                               |
|---|------|-------------------------------|
| 1 | SWMU | solid waste management unit   |
| 2 | SVOC | semivolatile organic compound |
| 3 | THI  | target hazard index           |
| 4 | UST  | underground storage tank      |
| 5 | VOC  | volatile organic compound     |



# 1.0 Introduction

---

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

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

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to complete the RCRA Facility Investigation (RFI) for Area of Concern (AOC) 638 in Zone G of the Naval Complex. The site is recommended for No Further Action (NFA). Figure 1-1 illustrates the location of the site and of Zone G within the CNC.

## 1.1 Background

AOC 638 consists of the former torpedo workshop, Building 132, which was used from 1944 to 1991. From 1991 to 1995, the building was used by the Public Works Department to store equipment, parts, and flammable materials. The building, which is constructed of concrete block with a sheet metal roof, is now vacant. A boiler was once associated with the facility, and a 1986 underground storage tank (UST) report indicated that a 500-gallon fuel oil tank was located near the building's southernmost driveway. However, personnel interviewed during the environmental baseline survey (EBS) indicated they had no knowledge of the tank. The tank is not listed on the tank inventory spreadsheet maintained by the Navy.

AOC 638 is adjacent to the northern portion of Solid Waste Management Units (SWMUs) 8 and 9, however it was investigated independently of these areas. Figure 1-2 is an aerial photograph of the AOC 638 area. The RCRA Facility Investigation (RFA) identified potential waste characteristics associated with torpedoes as explosives (volatile organic compounds [VOCs], corrosives) and heavy metals. Visual inspection of the floor during the RFA revealed no cracking or deterioration, and there were no spill reports, inspection reports, employee interviews, or visual observations indicating a release. The RFA

1 recommended a confirmatory sampling investigation (CSI) due to the hazardous nature of  
2 military explosives and propellants, and the potential for releases from the unit to have  
3 occurred in the past.

4 The site is zoned M-1 for marine industrial use.

## 5 **1.2 Purpose of the RFI Report Addendum**

6 This RFI Report Addendum provides information about AOC 638 that documents the  
7 conclusions from the *Zone G RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1998), provides the  
8 results of limited additional sampling performed after the RFI, and recommends the site for  
9 NFA.

10 Prior to changing the status of any site to NFA under the CNC RCRA CA permit, the BRAC  
11 Cleanup Team (BCT) agreed that the following issues should be considered:

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

20 Information regarding these issues is provided in this report to expedite evaluation of  
21 closure of the site.

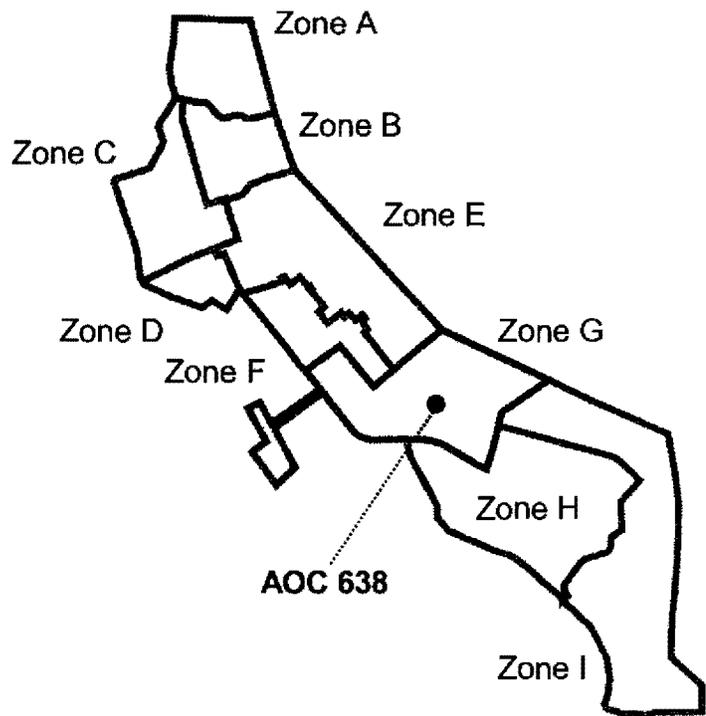
22 Provided that the information presented in this report is adequate to address these site  
23 closeout items, it is expected that the BCT will concur that NFA is appropriate for the site.

24 At that time, a Statement of Basis will be prepared that will be made available for public  
25 comment in accordance with SCDHEC policy. This will allow for public participation in the  
26 final remedy selection.

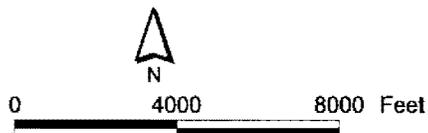
## 27 **1.3 RFI Report Addendum Organization**

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

- 1 **1.0 Introduction** — Presents the purpose of and background information relating to the RFI  
2 Report Addendum.
- 3 **2.0 Summary of RFI Conclusions for AOC 638** — Summarizes the conclusions from the RFI  
4 investigations and risk evaluations for AOC 638.
- 5 **3.0 Interim Measures and UST/AST Removals** – Provides information regarding any  
6 interim measures (IMs) or tank removal activities performed at the site.
- 7 **4.0 Summary of Additional Investigations**—Presents data collected after the RFI report.
- 8 **5.0 COPC/COC Refinement**-- Provides further evaluation of chemicals of potential concern  
9 (COPCs) based on RFI and additional data to assess them as chemicals of concern (COCs).
- 10 **6.0 Summary of Information Related to Site Closeout Issues** —Discusses the various site  
11 closeout issues that the BCT agreed to evaluate prior to site closeout.
- 12 **7.0 Recommendations**—Provides recommendations for proceeding with site closure.
- 13 **8.0 References** — Lists the references used in this document.
- 14 **Appendix A** contains analytical data from sampling performed subsequent to the RFI  
15 report.
- 16 **Appendix B** contains validation reports on the data derived from sampling performed  
17 subsequent to the RFI report.
- 18 **Appendix C** contains results of the synthetic precipitation leaching procedure (SPLP) metals  
19 tests.
- 20 **Appendix D** contains RFI Figure 2.5, *Shallow Groundwater Low-Tide Potentiometric Map*.
- 21 **Appendix E** contains responses to SCDHEC comments on the *Zone G RFI Report, Revision 0*  
22 (*EnSafe, 1998*).
- 23 **Appendix F** contains responses to EPA comments on the *RFI Report Addendum, AOC 638,*  
24 *Zone G, Revision 0* (*CH2M-Jones, September 2001*).
- 25 All tables and figures appear at the end of their respective sections.



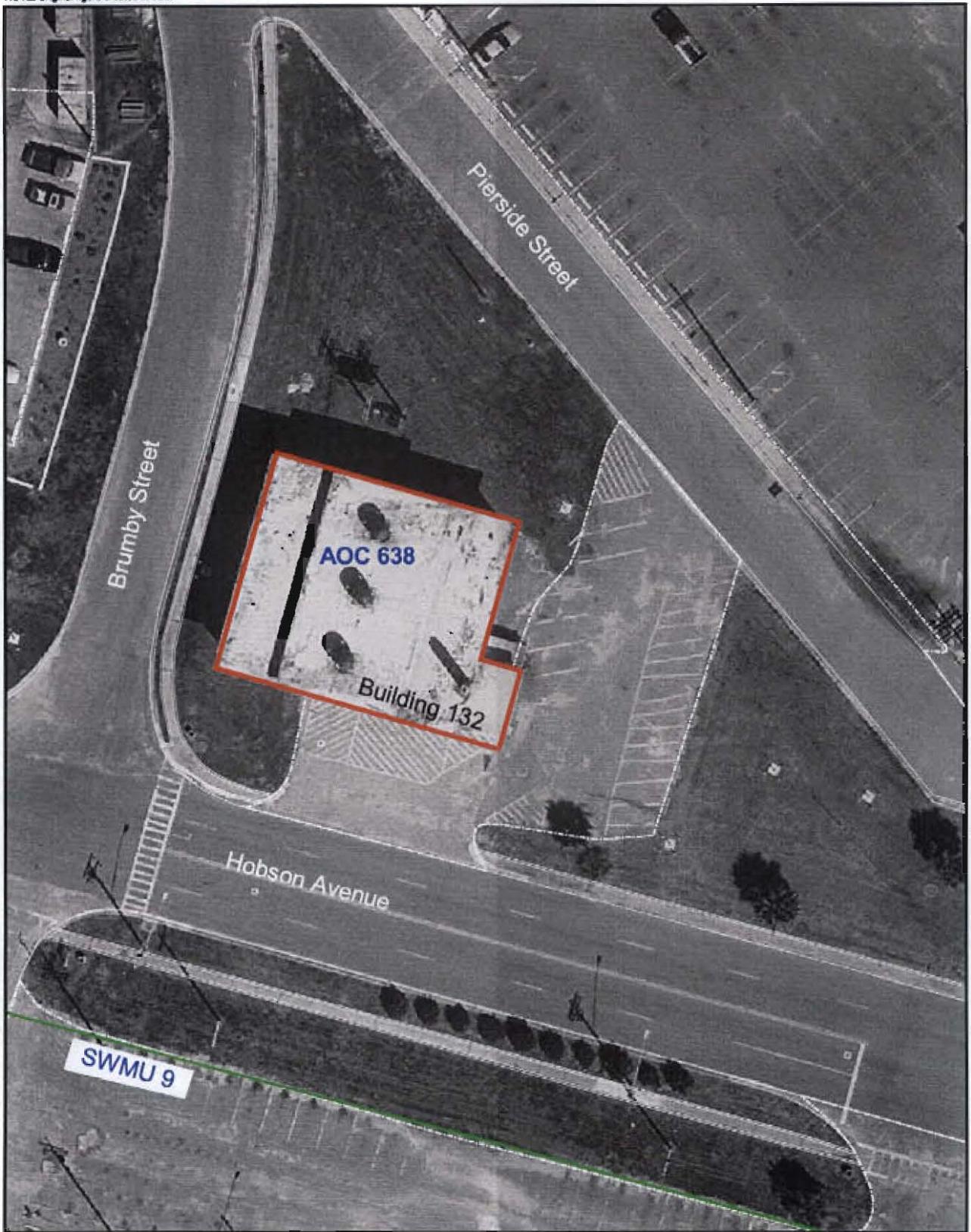
 Zone Boundary  
 Zone G



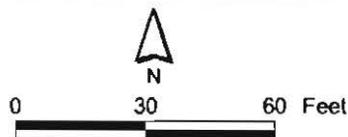
**Figure 1-1**  
Location of AOC 638, Zone G  
Zone Map  
Charleston Naval Complex

**CH2MHILL**

NOTE: Aerial Photo Date is 1997  
NOTE: Original figure created in color



-  AOC Boundary
-  SWMU Boundary
-  Roads
-  Sidewalk
-  Pavement



**Figure 1-2**  
Aerial Photograph of AOC 638  
Zone G  
Charleston Naval Complex

**CH2MHILL**

## 2.0 Summary of RFI Conclusions for AOC 638

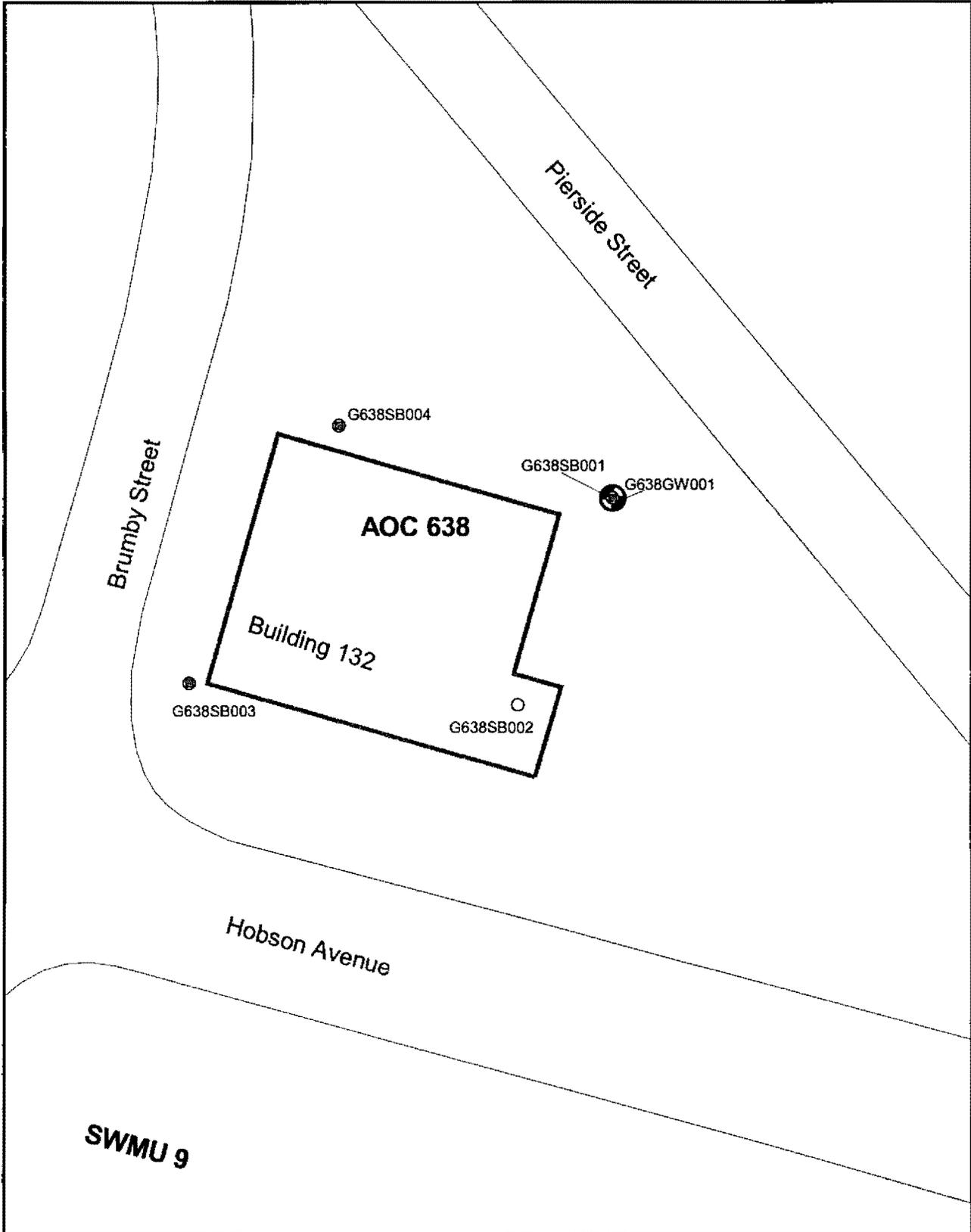
---

This section summarizes the results and conclusions from the soil and groundwater investigations conducted in the area of Building 132, which were reported in the *Zone G RFI Report, Revision 0* (EnSafe, 1998).

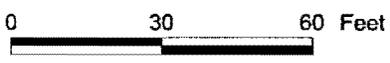
As part of the Zone G RFI, soil and groundwater investigations were conducted in the area of Building 132, the former torpedo workshop. Figure 2-1 presents the site and RFI sampling locations within this area. In September 1996, soil borings were made for collection and analysis of four surface soil and three subsurface soil samples to determine if there was any impact from the workshop to surrounding soil. Samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and metals. Surface soil sample G638SB001 was also analyzed for cyanide. One AOC-specific groundwater well was installed in September 1996 and sampled in November 1996 for VOCs, SVOCs, pesticides/PCBs, cyanide, and analyzed for metals. Two additional sampling events were conducted in May 1997 and September 1997. The samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. According to the sections 10.4.3 and 10.4.4 of the *Zone G RFI Report, Revision 0*, the following was concluded:

- No VOCs were detected in surface soil samples. No SVOCs in surface soil were detected above the direct exposure-based (residential) risk-based concentrations (RBCs), except benzo(a)pyrene in one sample. Benzo(a)pyrene exceeded the residential RBC (88 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ] for HI = 0.1) in surface soil sample G638SB001 (=120  $\mu\text{g}/\text{kg}$ ). This sample was collected next to an asphalt-paved area. No SVOCs exceeded soil screening levels (SSLs), and no other organics exceeded either residential RBCs or SSLs in surface soil.
- No organic chemicals exceeded SSLs in subsurface soil.
- No inorganic chemicals in surface or subsurface soil were detected above the greater of their respective RBCs/SSLs or BRCs. Page 10.4.23 of the RFI report notes that iron was detected above its RBC, but was considered an essential nutrient and not a COPC.
- No organic chemicals were detected in groundwater.
- No inorganic chemicals were detected in groundwater above the greater of their respective maximum contaminant levels (MCLs) or Zone G BRCs.

- 1 The fate and transport section (10.4.5) of the *Zone G RFI Report, Revision 0* concluded no
- 2 organics or inorganics were detected in site soil above applicable SSLs. Thus, the soil-to-
- 3 groundwater pathway is invalid.
- 4 The human health risk assessment (HHRA) section of the RFI report (10.4.6) identified
- 5 BEQs as a COPC in surface soil (applicable to a residential scenario only).
- 6 No COPCs were identified in groundwater.
- 7 A corrective measures study (CMS) was recommended for AOC 638 in Section 10.4.7 of the
- 8 RFI report due to the one BEQ exceedance (based on the RFI report's BRC for BEQs of 88
- 9 µg/kg in surface soil).
- 10 In summary, BEQs were identified as residential COPCs in surface soil only. No COPCs
- 11 were identified in the RFI report for subsurface soil or groundwater.



- Subsurface Soil Samples
- Surface Soil Samples
- Groundwater Well
- Sidewalk
- Pavement
- Roads
- AOC Boundary
- SWMU Boundary



**Figure 2-1**  
 RFI Monitoring Well and Soil Sample Locations  
 AOC 638, Zone G  
 Charleston Naval Complex

**CH2MHILL**



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

---

2 This section summarizes information available concerning any IMs conducted at the site,  
3 and the status of any USTs or aboveground storage tanks (ASTs) at the site.

4 There are no records of an IM carried out at the site, nor is there any record of the existence  
5 of USTs or ASTs at AOC 638.

---

## **Section 4.0**

---

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

---

2 This section addresses samples collected after completion of the *Zone G RFI Report, Revision*  
3 *0* (EnSafe, 1998), presents these additional data results in tables for screening against criteria,  
4 and discusses the screening results.

5 A fourth groundwater sampling event was conducted in December 1997 at monitoring well  
6 G638GW001, just after the completion of the RFI report. During the latter part of 1999 and  
7 early 2000, additional field activities were conducted in soil (subsequent to the RFI report) to  
8 determine SPLP ratios for metals. Also, according to the draft *Zone G RFI Report Work Plan*  
9 *Addendum* (EnSafe, 2000), additional field activities were planned for the delineation of  
10 BEQs and copper<sup>1</sup> north and northeast of soil boring G638SB001. An additional  
11 groundwater sampling event was conducted on October 18, 1999 at monitoring well  
12 G638GW001. These planned investigations were carried out to address comments received  
13 from SCDHEC regarding the *Zone G RFI Report, Revision 0*. Finally, CH2M-Jones sampled  
14 surface soil at two locations in 2001 to delineate arsenic to the north of the site. The data  
15 from these additional investigations are summarized below; the analytical data (including  
16 results of the December 1997 sampling event), validation reports, and SPLP metals results  
17 are provided in Appendices A, B, and C, respectively.

### 18 **4.1 Soil Sampling and Analysis**

19 During the additional investigations at AOC 638, seven additional surface and subsurface  
20 soil samples (G638SB005, G638SB006, G638SB007, G638SB008, G638SB009, G638SB010, and  
21 G638SB011) were collected and evaluated for inorganic and organic analyses. Figure 4-1  
22 presents the sample locations. Soil samples were obtained from the upper interval (0 to 1  
23 feet below land surface [ft bls] for surface soil samples) and lower interval (3 to 5 ft bls for  
24 subsurface soil samples) at these locations. These sampling events occurred on December 15,  
25 and 16, 1999; and January 15, 2000.

26 On July 12, 2001, CH2M-Jones sampled two additional locations (G638SB012 and  
27 G638SB013) in the upper interval and analyzed the samples for arsenic only.

---

<sup>1</sup> The RFI report screened copper in soil against the 1997 RBC of 27,000 mg/kg (Hazard Index [HI]=0.1), and the copper concentration in G638SB001(417 mg/kg) did not exceed this RBC or the BFC of 260 mg/kg. However, due to subsequent screening against the 2000 residential RBC of 310 mg/kg at HI=0.1, this copper concentration was addressed in the RFI Work Plan Addendum as an exceedance.

1 Although arsenic was not a suspected site-related contaminant, and was not identified as a  
2 COPC or a COC during the RFI, one surface soil sample (G638SB00501) collected north of  
3 Building 132 during the *Zone G RFI Work Plan Addendum* (EnSafe, 2000) work contained  
4 arsenic at 45.1 mg/kg, which exceeded the RBC, SSL, and Zone G background range.  
5 CH2M-Jones then collected two surface soil samples for arsenic analyses to ensure that the  
6 results in sample G638SO00501 were isolated and bounded by samples which completely  
7 delineated arsenic occurrence.

8 Tables 4-1 and 4-2 present summary results of surface soil inorganic and organic analyses,  
9 respectively. Tables 4-3 and 4-4 present summary results of subsurface soil inorganic and  
10 organic analyses, respectively. These tables show all detections and compare them to  
11 appropriate screening criteria:

- 12 • The criteria for surface soil are U.S. Environmental Protection Agency [EPA] Region III  
13 RBCs, SSLs, and (for inorganics) the Zone G background concentration range.
- 14 • The criteria for subsurface soil are SSLs and (for organics) the Zone G background  
15 concentration range.

16 Polycyclic aromatic hydrocarbons (PAHs) are also screened as BEQs against the base-wide  
17 reference concentrations developed for surface soil (1,304 µg/kg) and subsurface soil (1,400  
18 µg/kg).

19 Appendix A provides the detailed analytical data.

#### 20 **4.1.1 Surface Soil**

21 Two surface soil locations (638SB005 and 638SB006) were sampled and analyzed for metals  
22 and SVOCs. Three surface soil locations (628SB007 through 628SB009) were sampled and  
23 analyzed for total metals and for SPLP metals leachate analyses to calculate site-specific  
24 SSLs. Two surface soil locations (628SB010 and 628SB011) were sampled and analyzed for  
25 SVOCs in surface soils. Two surface soil locations (628SB012 and 628SB013) were sampled  
26 and analyzed for arsenic in surface soils. The inorganic and organic results are presented in  
27 Tables 4-1 and 4-2, respectively. Soil concentrations that exceeded screening criteria are in  
28 bold and outlined in boxes within the table.

#### 29 **Arsenic**

30 Arsenic was detected in all seven surface soil samples collected during the additional  
31 investigations and analyzed for metals at AOC 638. Of these, one surface sample location  
32 (G638SB005: 45.1 mg/kg) reported an arsenic concentration above the residential RBC

1 concentration (0.43 mg/kg) and the Zone G background concentration range (3.1 to 25  
2 mg/kg). Arsenic as a COPC is discussed further in Section 5.0 of this report addendum.

### 3 **Copper**

4 The copper concentration in surface soil sample G638SB006 (521 mg/kg) exceeded the  
5 surface soil residential RBC (310 mg/kg) and background concentration range (23 to 431  
6 mg/kg). Copper as a COPC is discussed further in Section 5.0.

### 7 **Organic Parameters**

8 Organic parameters were detected in four surface soil samples. As shown in Table 4-2, the  
9 detected organic parameters were primarily PAHs. Only benzo(a)pyrene exceeded its RBC.  
10 The BEQs were calculated for all samples as shown in the table, and the resulting BEQ  
11 concentrations (G638SB005: 446.53 µg/kg, G638SB006: 373.49 µg/kg, G638SB0010: 328.51  
12 µg/kg, and G638SB011: 214.1 µg/kg) were lower than the site-wide surface soil BRC for the  
13 CNC (1,304 µg/kg). Thus, PAH in surface soil does not warrant further investigation or  
14 action at AOC 638.

### 15 **4.1.2 Subsurface Soil**

16 Two subsurface soil locations (638SB005 and 638SB006) were sampled and analyzed for  
17 metals and SVOCs. Three subsurface soil locations (628SB007, 628SB008, and 628SB009)  
18 were sampled and analyzed for total metals and for SPLP metals leachate analyses to  
19 calculate site-specific SSLs, and two subsurface soil locations (628SB010 and 628SB011) were  
20 sampled and analyzed for SVOCs in subsurface soils. The inorganic and organic results are  
21 presented in Tables 4-3 and 4-4, respectively. Subsurface soil concentrations that exceeded  
22 the screening criteria are in bold and outlined in boxes within the table.

### 23 **Selenium and Thallium**

24 Selenium (3.7 mg/kg) and thallium (1.3 mg/kg) were each detected in one subsurface soil  
25 sample location (G638SB008) above the screening concentrations (SSLs [DAF= 10]) of 2.5  
26 mg/kg for selenium and 0.35 mg/kg for thallium, and above the maximum Zone G  
27 background range of 1 mg/kg for selenium and 1 mg/kg for thallium. Selenium and  
28 thallium as COPCs are discussed further in Section 5.0.

### 29 **Organic Parameters**

30 Organic parameters were detected in three subsurface soil samples; the detected organic  
31 parameters were PAHs, as shown in Table 4-4. The BEQs for the detected parameters are  
32 also shown in the table. None of the BEQ concentrations exceeded the CNC subsurface BRC

1 of 1,400 µg/kg. Thus, PAHs in subsurface soil do not warrant further investigation or action  
2 at AOC 638.

## 3 **4.2 Groundwater Sampling and Analysis**

4 As presented above, additional groundwater samples were collected from monitoring well  
5 G638GW001 just after completion of the RFI report in December 1997 and again as part of an  
6 additional investigation on October 18, 1999. The location of G638GW001 is shown in Figure  
7 4-2.

8 Groundwater sample results from December 1997 and October 1999 were compared to  
9 applicable screening criteria (i.e., MCL for drinking water, tap water RBCs if no MCL exists,  
10 and BRCs). The inorganic and organic data are presented in Tables 4-5 and 4-6, respectively.  
11 No groundwater results collected during the additional investigation exceeded the  
12 screening criteria for inorganic or organic analytes.

13 The two other wells adjacent to this site, GFDSGW06A and GFDSGW06C, were sampled  
14 and analyzed in January 1997 for VOCs, SVOCs, pesticides, PCBs, and metals. None of these  
15 groundwater results exceeded the screening criteria for inorganics or organics, except for  
16 one isolated aluminum concentration of 2,790 µg/L in GFDSGW06C. This result exceeded  
17 the secondary MCL for aluminum of 200 µg/L, but did not exceed the RBC of 3,700 µg/L  
18 (HI=0.1).

19 The hydrogeologic investigation performed during the RFI and reported in Section 2.3 of the  
20 *Zone G RFI Report, Revision 0* discusses groundwater flow at Zone G. Groundwater  
21 potentiometric contours and flow direction are depicted in RFI Figure 2.5 and included as  
22 Appendix D.

**TABLE 4-1**  
 Inorganic Analytes Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup> (HI=0.1)	Soil-to-Groundwater SSL <sup>b</sup> [DAF = 10]	Zone G Surface Background Concentration Range <sup>9</sup>
Aluminum	G638SB005	4,110	=	7,800	NL	2,190 – 17,800
	G638SB006	4,320	=			
	G638SB007	6,500	=			
	G638SB008	15,400	=			
	G638SB009	11,100	=			
Antimony	G638SB005	1.00	J	3.1	2.5	0.79 – 5.7
	G638SB007	2.60	J			
	G638SB008	0.75	J			
	G638SB009	0.59	J			
Arsenic	G638SB005	<b>45.1</b>	=	0.43 <sup>1</sup>	14.5	3.1 – 25
	G638SB006	7.3	=			
	G638SB007	24.5	=			
	G638SB008	11.4	=			
	G638SB009	5.2	=			
	G638SB012	10	=			
	G638SB013	6	=			
Barium	G638SB005	14.2	J	550	800	11 – 129
	G638SB006	43	=			
	G638SB007	68.6	=			
	G638SB008	37.6	=			
	G638SB009	23.6	=			
Beryllium	G638SB006	0.66	=	16	31.5	0.47 – 1.1
	G638SB007	0.96	=			
	G638SB008	0.66	=			
Cadmium	G638SB005	0.34	J	3.9	4	0.12 – 1.7
	G638SB006	1.50	J			
	G638SB007	3.60	=			
Calcium	G638SB005	94,600	=	NL	NL	NL
	G638SB006	27,900	=			
	G638SB007	17,000	=			
	G638SB008	34,500	=			
	G638SB009	2,130	=			
Chromium, Total	G638SB005	26	=	23	19	7 – 39
	G638SB006	31.3	=			
	G638SB007	35.1	=			
	G638SB008	25.5	=			
	G638SB009	17.2	=			

**TABLE 4-1**  
 Inorganic Analytes Detected in Surface Soil  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup> (HI=0.1)	Soil-to-Groundwater SSL <sup>b</sup> [DAF = 10]	Zone G Surface Background Concentration Range <sup>c</sup>
Cobalt	G638SB005	1.1	J	470	994 <sup>c</sup>	1.1 – 6.2
	G638SB006	6.9	=			
	G638SB007	5.8	=			
	G638SB008	4.2	J			
	G638SB009	1.9	J			
Copper	G638SB005	71.5	J	310	5,590 <sup>c</sup>	23 – 431
	G638SB006	521	=			
	G638SB007	188	J			
	G638SB008	33.8	=			
	G638SB009	8.5	=			
Iron	G638SB005	4,090	=	2,300	2,770 <sup>c</sup>	4,300 – 32,700
	G638SB006	8,580	=			
	G638SB007	16,600	=			
	G638SB008	13,900	=			
	G638SB009	12,100	=			
Lead	G638SB005	21.2	J	400 <sup>d</sup>	135 <sup>c</sup>	3.5 – 275
	G638SB006	121	=			
	G638SB007	128	J			
	G638SB008	75.10	J			
	G638SB009	166	J			
Magnesium	G638SB005	2,170	J	NL	NL	NL
	G638SB006	929	=			
	G638SB007	1,000	J			
	G638SB008	1,920	J			
	G638SB009	745	J			
Manganese	G638SB005	75.8	J	160	1,110 <sup>c</sup>	39 – 359
	G638SB006	84.8	=			
	G638SB007	358	J			
	G638SB008	156	=			
	G638SB009	67	=			
Mercury	G638SB005	0.21	=	2.3 <sup>e</sup>	1.04 <sup>c</sup>	0.060 – 2
	G638SB006	0.23	J			
	G638SB007	0.30	=			
	G638SB008	0.15	=			
	G638SB009	0.11	=			

**TABLE 4-1**  
 Inorganic Analytes Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup> (HI=0.1)	Soil-to-Groundwater SSL <sup>b</sup> [DAF = 10]	Zone G Surface Background Concentration Range <sup>c</sup>
Nickel	G638SB005	13.1	=	160	65	20.6
	G638SB006	22.9	=			
	G638SB007	43.1	=			
	G638SB008	9.9	=			
	G638SB009	3.7	=			
Potassium	G638SB005	665	J	NL	NL	NL
	G638SB006	423	=			
	G638SB007	503	J			
	G638SB008	1,070	=			
	G638SB009	315	J			
Selenium	G638SB005	1.1	=	39	2.5	0.45 – 1.4
	G638SB007	1.8	=			
	G638SB008	1.2	=			
	G638SB009	1.4	=			
Silver	G638SB007	0.1	J	39	17	NL
Sodium	G638SB005	478	=	NL	NL	NL
	G638SB006	432	=			
	G638SB007	395	J			
	G638SB008	270	J			
	G638SB009	86	J			
Thallium	G638SB006	0.59	J	0.55	0.35	0.55 – 0.91
	G638SB008	0.45	J			
Vanadium	G638SB005	15.6	=	55	3,000	7.2 – 57
	G638SB006	17.7	=			
	G638SB007	25.3	=			
	G638SB008	34.2	=			
	G638SB009	23.1	=			
Zinc	G638SB005	64.9	J	2,300	6,000	18 – 1,650
	G638SB006	360	J			
	G638SB007	591	J			
	G638SB008	114	=			
	G638SB009	29.8	=			

Concentrations in bold and outlined in boxes exceeded the RBCs or SSLs and the Zone G background concentration range.

<sup>a</sup> Residential RBCs (HI=0.1 for noncarcinogens) were obtained from the EPA Region III RBC Table, October 5, 2000 (<http://www.epa.gov/eaphome/search.html>), unless otherwise noted.

<sup>b</sup> Generic soil-to-groundwater SSLs (DAF = 10) are from EPA Soil Screening Guidance: Technical Background Document (Table A-1), EPA/540/R-95/128, May 1996, unless otherwise noted.

**TABLE 4-1**  
 Inorganic Analytes Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup> (HI=0.1)	Soil-to- Groundwater SSL <sup>b</sup> [DAF = 10]	Zone G Surface Background Concentration Range <sup>c</sup>
-----------	----------	--------------------------	-----------	--	---	---

<sup>c</sup> Where SSLs are not available from EPA Tables, EnSafe soil-to-groundwater SSLs are used, based on EPA Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, May 1996.

<sup>d</sup> Residential RBC for lead was obtained from EPA Soil Screening Guidance: Technical Background Document, Appendix A (page A-5) EPA/540/R-95/128, May 1996.

<sup>e</sup> Residential RBC (THI=0.1) for mercury was obtained from the EPA Region III RBC Table document distributed on October 22, 1997.

<sup>f</sup> Carcinogen-residential RBC was used directly from the EPA Region III RBC Table, October 5, 2000.

<sup>g</sup> Background values for Zone G are as described in the Zone G RFI Report, Revision 0 (EnSafe, 1998) Section 5 – Data Evaluation and Background Comparison.

= Chemical detected at the concentration shown

HI Hazard index

J Chemical detected at concentration below the method detection limit, concentration not known

NL Not listed

RBC Risk-based concentration

THI Target hazard index

**TABLE 4-2**  
 Organic Analytes Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup>
2-Methylnaphthalene	G638SB011	0.04	J	160
Acenaphthene	G638SB010	0.021	J	470
Acenaphthylene	G638SB011	0.02	J	NL
Anthracene	G638SB010	0.046	J	2,300
	G638SB011	0.03	J	
Benzo(a)anthracene	G638SB005	0.16	J	0.87 <sup>c</sup>
	G638SB006	0.17	J	
	G638SB010	0.14	J	
	G638SB011	0.11	J	
Benzo(a)pyrene	G638SB005	0.2	J	0.087 <sup>c</sup>
	G638SB006	0.13	J	
	G638SB010	0.088	J	
	G638SB011	0.12	J	
Benzo(b)fluoranthene	G638SB005	0.31	J	0.87 <sup>c</sup>
	G638SB006	0.16	J	
	G638SB010	0.1	J	
	G638SB011	0.19	J	
Benzo(g,h,i)perylene	G638SB005	0.13	J	NL
	G638SB010	0.065	J	
	G638SB011	0.14	J	
Benzo(k)fluoranthene	G638SB005	0.23	J	8.7 <sup>c</sup>
	G638SB006	0.13	J	
	G638SB010	0.088	J	
	G638SB011	0.095	J	
Benzoic Acid	G638SB010	0.11	J	31,000
	G638SB011	0.05	J	
Bis(2-ethylhexyl) phthalate	G638SB006	0.12	J	4.6 <sup>c</sup>
Chrysene	G638SB005	0.23	J	87 <sup>c</sup>
	G638SB006	0.19	J	
	G638SB010	0.13	J	
	G638SB011	0.15	J	
Dibenz(a,h)anthracene	G638SB011	0.051	J	0.087 <sup>c</sup>
Di-n-butyl phthalate	G638SB010	0.032	J	780
	G638SB011	0.038	J	

**TABLE 4-2**  
 Organic Analytes Detected in Surface Soil  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup>
Fluoranthene	G638SB005	0.27	J	310
	G638SB006	0.28	J	
	G638SB010	0.49	=	
	G638SB011	0.19	J	
Fluorene	G638SB010	0.026	J	310
Indeno(1,2,3-C,D)pyrene	G638SB005	0.12	J	0.87 <sup>c</sup>
	G638SB010	0.055	J	
	G638SB011	0.12	J	
Phenanthrene	G638SB006	0.14	J	NL
	G638SB010	0.13	J	
	G638SB011	0.079	J	
Pyrene	G638SB005	0.31	J	230
	G638SB006	0.29	J	
	G638SB010	0.59	=	
	G638SB011	0.19	J	

Parameter	Location	Concentration	Units	Background Concentration
				CNC
BEQ	G638SB005	446.53	µg/kg	1,304 <sup>b</sup>
	G638SB006	373.49		
	G638SB010	328.51		
	G638SB011	214.1		

Concentrations in bold and outlined boxes exceed the applicable RBC or background screening concentration.

<sup>a</sup> Non-carcinogen-residential RBCs (HI = 0.1) were obtained from the EPA Region III, Risk-Based Concentration Table, October 5, 2000 (<http://www.epa.gov/epahome/search.html>), unless noted otherwise.

<sup>b</sup> Background PAHs Study Report - Technical information for Development of Background BEQ Values, February 2001, CH2M-Jones.

<sup>c</sup> Carcinogen-residential RBC was used directly from the EPA Region III, Risk-Based Concentration Table, October 5, 2000.

- = Chemical detected at the concentration shown
- BEQ Benzo(a)pyrene equivalent
- DAF Dilution attenuation factor
- J Chemical detected at concentration below the method detection limit; concentration not known
- NA Not applicable/not available/not analyzed
- NL Not listed
- PAH Polycyclic aromatic hydrocarbon
- RBC Risk-based concentration
- SVOC Semivolatile organic compound
- THI Target hazard index

**TABLE 4-2**  
 Organic Analytes Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Region III Residential Soil RBC <sup>a</sup>
VOC	Volatile organic compound			

**BEQ Calculation Procedure:**

Equation 1:  $BEQ = \text{Sum} \{PAH * TEF\}$

PAH = the concentration value to the seven target parameters (TP) listed below, or if there was no detection of the TP, half the TP detection limit is used.

TEF = Toxicity equivalency factor (TEF) listed below, relative to benzo(a)pyrene.

If there were no detection of all seven TP, then the BEQ = nondetect (ND).

Target Parameters	TEF
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenz(a,h)anthracene	1
Indeno(1,2,3-c,d)pyrene	0.1

**TABLE 4-3**  
 Inorganic Analytes Detected in Subsurface Soil  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]	Zone G Subsurface Background Concentration Range <sup>c</sup>
Aluminum	G638SB005	8,130	=	NL	2,630 – 36,800
	G638SB006	8,580	=		
	G638SB007	8,200	=		
	G638SB008	36,400	=		
	G638SB009	8,880	=		
Antimony	G638SB005	1.2	J	2.5	0.22 – 19 <sup>d</sup>
	G638SB007	0.36	J		
	G638SB008	1.1	J		
	G638SB009	0.32	J		
Arsenic	G638SB005	15.5	=	14.5	1.4 – 36
	G638SB006	7.9	=		
	G638SB007	4.6	=		
	G638SB008	27.1	=		
	G638SB009	2.8	=		
Barium	G638SB005	13.4	J	800	7.7 – 63
	G638SB006	26.2	=		
	G638SB007	18.5	J		
	G638SB008	54.3	=		
	G638SB009	41.1	=		
Beryllium	G638SB006	0.34	J	31.5	0.45 – 2.4
	G638SB008	1.9	=		
Cadmium	G638SB005	0.54	J	4	0.080 – 0.52
	G638SB006	2.9	J		
Calcium	G638SB005	102,000	=	NL	NL
	G638SB006	14,400	=		
	G638SB007	3,650	=		
	G638SB008	7,370	=		
	G638SB009	2,350	=		
Chromium, Total	G638SB005	46.7	=	19	7.4 – 65
	G638SB006	14.3	=		
	G638SB007	12.6	=		
	G638SB008	58	=		
	G638SB009	11	=		
Cobalt	G638SB005	2	J	994 <sup>b</sup>	0.9 – 15
	G638SB006	1.5	J		

**TABLE 4-3**  
 Inorganic Analytes Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]	Zone G Subsurface Background Concentration Range <sup>c</sup>
Cobalt	G638SB007	1.3	J	994 <sup>b</sup>	0.9 – 15
	G638SB008	11.4	=		
	G638SB009	1.6	J		
Copper	G638SB005	26	J	5,590 <sup>b</sup>	4.5 – 46
	G638SB006	19.3	=		
	G638SB007	4.8	J		
	G638SB008	35.7	=		
	G638SB009	3.2	=		
Iron	G638SB005	6,730	=	2,770 <sup>b</sup>	3,110 – 58,100
	G638SB006	5,560	=		
	G638SB007	10,600	=		
	G638SB008	45,300	=		
	G638SB009	6,480	=		
Lead	G638SB005	11.4	J	135 <sup>b</sup>	2.4 – 76
	G638SB006	41.8	=		
	G638SB007	15.2	J		
	G638SB008	51.7	J		
	G638SB009	11.6	J		
Magnesium	G638SB005	4,490	J	NL	NL
	G638SB006	1,030	=		
	G638SB007	887	J		
	G638SB008	4,680	J		
	G638SB009	496	J		
Manganese	G638SB005	122	J	1,110 <sup>b</sup>	20 – 409
	G638SB006	51.7	=		
	G638SB007	53.7	J		
	G638SB008	605	=		
	G638SB009	49	=		
Mercury	G638SB006	0.06	J	1.04 <sup>b</sup>	0.050 – 3.7
	G638SB007	0.09	=		
	G638SB008	0.33	=		
	G638SB009	0.05	=		
Nickel	G638SB005	18.9	=	65 <sup>b</sup>	1.9 – 22
	G638SB006	5.6	=		
	G638SB007	2.7	J		
	G638SB008	17.9	=		

**TABLE 4-3**  
 Inorganic Analytes Detected in Subsurface Soil  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]	Zone G Subsurface Background Concentration Range <sup>c</sup>
Nickel	G638SB009	3.2	J	65 <sup>b</sup>	1.9 – 22
Potassium	G638SB005	1,830	J	NL	NL
	G638SB006	401	=		
	G638SB007	478	J		
	G638SB008	3,030	=		
	G638SB009	216	J		
Selenium	G638SB005	2	=	2.5	0.54 – 1
	G638SB006	0.52	J		
	G638SB007	1.3	=		
	G638SB008	<b>3.7</b>	=		
	G638SB009	0.81	J		
Sodium	G638SB005	1,260	=	NL	NL
	G638SB006	380	=		
	G638SB007	455	J		
	G638SB008	442	J		
	G638SB009	81.1	J		
Thallium	G638SB005	0.55	J	0.35	1
	G638SB006	0.4	J		
	G638SB008	<b>1.3</b>	J		
Vanadium	G638SB005	28.8	=	3,000	72.5
	G638SB006	13	=		
	G638SB007	19.2	=		
	G638SB008	93.1	=		
	G638SB009	14	=		
Zinc	G638SB005	53.3	J	6,000	20 ~ 198
	G638SB006	77	J		
	G638SB007	19.7	J		
	G638SB008	134	=		
	G638SB009	19.3	=		

Concentrations in bold and outlined in boxes exceed the SSL and the Zone G background range.

<sup>a</sup> Generic soil-to-groundwater SSLs (DAF = 10) are from EPA Soil Screening Guidance: Technical Background Document (Table A-1), EPA/540/R-95/128, May 1996, unless otherwise noted.

<sup>b</sup> Where SSLs are not available from EPA Tables, EnSafe soil-to-groundwater SSLs are used – based on EPA Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, May 1996.

<sup>c</sup> Background values for Zone G are as described in the Zone G RFI Report, Section 5 – Data Evaluation and Background Comparison, unless otherwise noted.

<sup>d</sup> Background range for antimony is not available for Zone G due to no detections; range shown is base wide.

**TABLE 4-3**  
 Inorganic Analytes Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]	Zone G Subsurface Background Concentration Range <sup>c</sup>
=	Chemical detected at the concentration shown				
DAF	Dilution attenuation factor				
J	Chemical detected at concentration below the method detection limit; concentration not known				
NA	Not applicable/not available/not analyzed				
NL	Not listed				
SSL	Soil screening level				

**TABLE 4-4**  
 Organic Analytes Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]
2-methylnaphthalene	G638SB010	0.6	=	NL
	G638SB011	0.068	J	
Acenaphthene	G638SB010	0.38	J	285
	G638SB011	0.26	J	
Anthracene	G638SB006	0.25	J	6,000
	G638SB011	0.56	=	
Benzo(a)anthracene	G638SB006	0.99	=	1
	G638SB010	0.26	J	
	G638SB011	0.84	=	
Benzo(a)pyrene	G638SB006	0.56	J	4
	G638SB010	0.18	J	
	G638SB011	0.67	=	
Benzo(b)fluoranthene	G638SB005	0.47	J	2.5
	G638SB006	1.1	J	
	G638SB010	0.26	J	
	G638SB011	0.65	=	
Benzo(g,h,i)perylene	G638SB006	0.32	J	NL
	G638SB010	0.098	J	
	G638SB011	0.48	=	
Benzo(k)fluoranthene	G638SB006	0.74	J	24.5
	G638SB010	0.16	J	
	G638SB011	0.5	=	
Benzoic acid	G638SB011	0.074	J	200
Benzyl butyl phthalate	G638SB011	0.028	J	NL
Bis(2-ethylhexyl) phthalate	G638SB005	0.11	J	1,800
	G638SB006	0.099	J	
Chrysene	G638SB006	1.1	=	80
	G638SB010	0.25	J	
	G638SB011	0.82	=	
Dibenz(a,h)anthracene	G638SB006	0.15	J	1
	G638SB010	0.038	J	
	G638SB011	0.21	J	
Dibenzofuran	G638SB011	0.16	J	NL

**TABLE 4-4**  
 Organic Analytes Detected in Subsurface Soil  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (mg/kg)	Qualifier	Soil-to-Groundwater SSL <sup>a</sup> [DAF = 10]
Di-n-butyl phthalate	G638SB005	0.24	J	1,150
	G638SB011	0.03	J	
	G638SB001	0.13	J	
Fluoranthene	G638SB006	1.8	=	2,150
	G638SB010	0.84	=	
	G638SB011	1.8	=	
Fluorene	G638SB010	0.46	J	280
	G638SB011	0.32	J	
Indeno(1,2,3-c,d)pyrene	G638SB006	0.31	J	7
	G638SB010	0.092	J	
	G638SB011	0.46	J	
Phenanthrene	G638SB006	1.2	=	NL
	G638SB010	1	=	
	G638SB011	1.8	=	
Pyrene	G638SB006	2	=	2,100
	G638SB010	0.61	=	
	G638SB011	1.5	=	

Parameter	Location	Concentration	Units	Background Concentration CNC
BEQ	G638SB005	566.585	µg/kg	1,400 <sup>b</sup>
	G638SB006	958.5		
	G638SB010	281.05		
	G638SB011	1080.82		

<sup>a</sup> Generic soil-to-groundwater SSLs (DAF = 10) are from the EPA Soil Screening Guidance: Technical Background Document (Table A-1), EPA/540/R-95/128 (May, 1996), unless otherwise noted.

<sup>b</sup> Background PAHs Study Report - Technical information for Development of Background BEQ Values, February 2001, CH2M-Jones.

J Chemical detected at concentration below the method detection limit; concentration not known

= Chemical detected at the concentration shown

BEQ Benzo(a)pyrene equivalent

DAF Dilution attenuation factor

NA Not applicable/not available/not analyzed

NL Not listed

PAH Polycyclic aromatic hydrocarbon

PEST Pesticide

**TABLE 4-4**  
Organic Analytes Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

---

RBC	Risk-based concentration
SSL	Soil screening level
SVOC	Semivolatile organic compound
THI	Target hazard index
VOC	Volatile organic compound

**TABLE 4-5**  
 Inorganic Analytes Detected in Groundwater  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (µg/L)	Qualifier	Sample Date	Drinking Water MCL <sup>a</sup>	Region III Tap Water RBC (THI = 0.1) <sup>b</sup>	Shallow Background Reference Concentration <sup>c</sup>
Barium	G638GW001	12.5	J	10/18/1999	2,000	260	31
		16.8	J	12/11/1997			
Calcium	G638GW001	89,900	=	10/18/1999	NL	NL	NL
		64,600	J	12/11/1997			
Copper	G638GW001	1.5	J	10/18/1999	1,300	150	8.33
Iron	G638GW001	3,310	=	10/18/1999	NL	1,100	30,400
		5,610	J	12/11/1997			
Magnesium	G638GW001	87,100	=	10/18/1999	NL	NL	NL
		247,000	=	12/11/1997			
Manganese	G638GW001	269	=	10/18/1999	NL	73	2,906
		99.4	J	12/11/1997			
Nickel	G638GW001	1.1	J	10/18/1999	NL	73	4.08
Potassium	G638GW001	54,000	=	10/18/1999	NL	NL	NL
		118,000	=	12/11/1997			
Sodium	G638GW001	859,000	=	10/18/1999	NL	NL	NL
		2,220,000	J	12/11/1997			
Vanadium	G638GW001	1	J	10/18/1999	NL	2.6	15.4

Concentrations in bold and outlined in boxes exceed the MCL, EPA Region III Tap Water, and the zone background screening criteria.

<sup>a</sup> MCL - From EPA Drinking Water Standards and Health Advisories, Summer 2000.

<sup>b</sup> RBCs were obtained from the EPA Region III RBC Table, 10/5/2000 (<http://www.epa.gov/epahome/search.html>).

<sup>c</sup> From EnSafe Zone G background study.

= Chemical detected at the concentration shown

**TABLE 4-5**  
 Inorganic Analytes Detected in Groundwater  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Parameter	Location	Concentration (µg/L)	Qualifier	Sample Date	Drinking Water MCL <sup>a</sup>	Region III Tap Water RBC (THI = 0.1) <sup>b</sup>	Shallow Background Reference Concentration <sup>c</sup>
J	Chemical detected at concentration below the method detection limit; concentration not known						
MCL	Maximum Contaminant Level - the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. MCLs are enforceable standards.						
NA	Not applicable/not available/not analyzed						
NL	Not listed						
SSL	Soil screening level						
SVOC	Semivolatile organic compound						
THI	Target hazard index						

**TABLE 4-6**  
 Organic Analytes Detected in Groundwater  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration (pg/L)	Qualifier	Drinking Water MCL <sup>a</sup>	Region III Tap Water RBC (THI = 0.1) <sup>b</sup>
Octachloro- dibenzo-p-dioxin	G638GW001	60.098	=	30,000	NL

Concentrations in bold and outlined in boxes exceed the MCL, and EPA Region III Tap Water criteria.

<sup>a</sup> MCL - From EPA Drinking Water Standards and Health Advisories, Summer 2000.

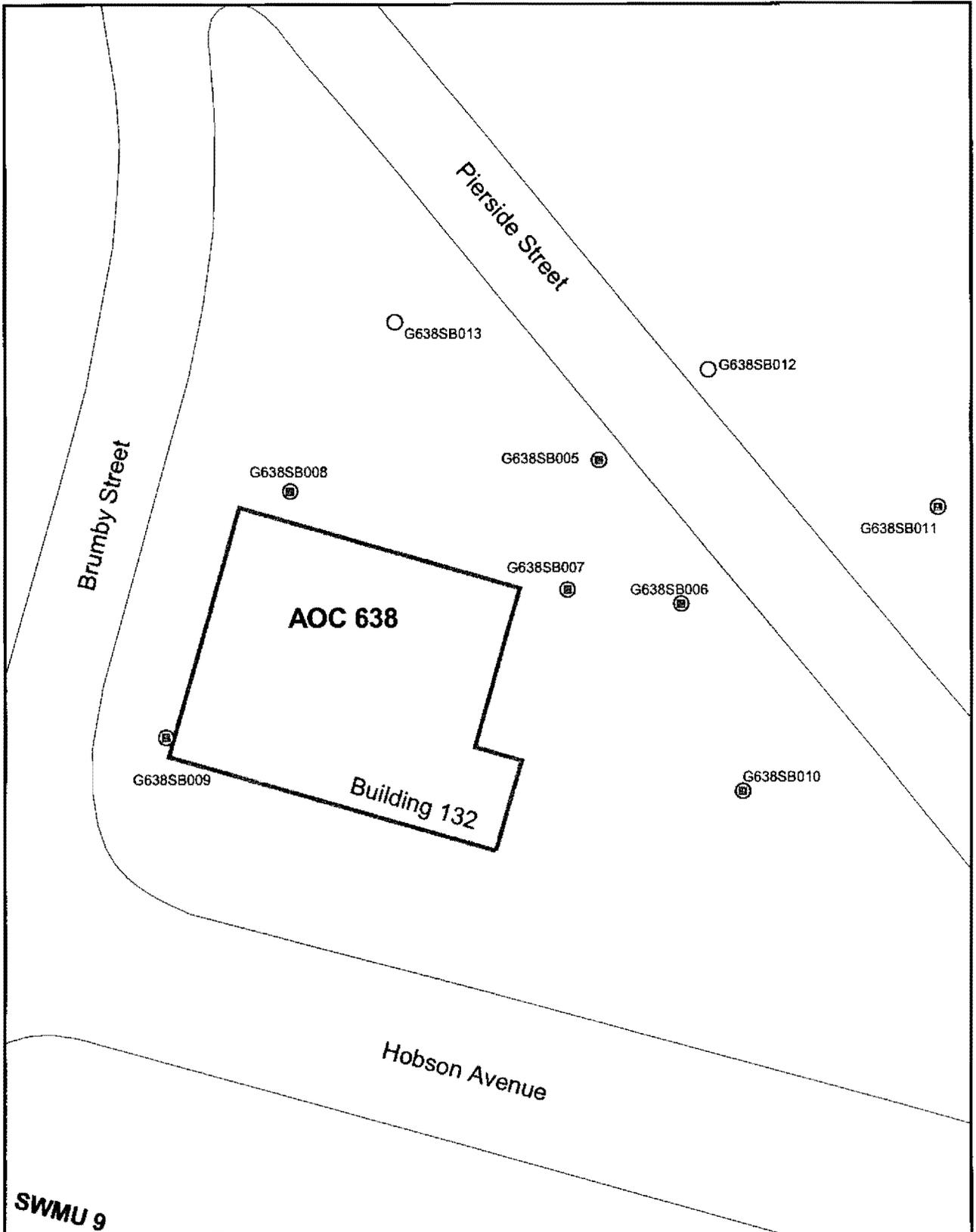
<sup>b</sup> RBCs were obtained from the EPA Region III RBC Table, (<http://www.epa.gov/epahome/search.html>), October 5, 2000.

= Chemical detected at the concentration shown

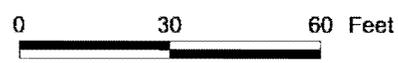
MCL Maximum Contaminant Level - the maximum permissible level of a contaminant in water which is delivered to any user of a public water system. MCLs are enforceable standards.

NL Not listed

pg/L Picograms per liter

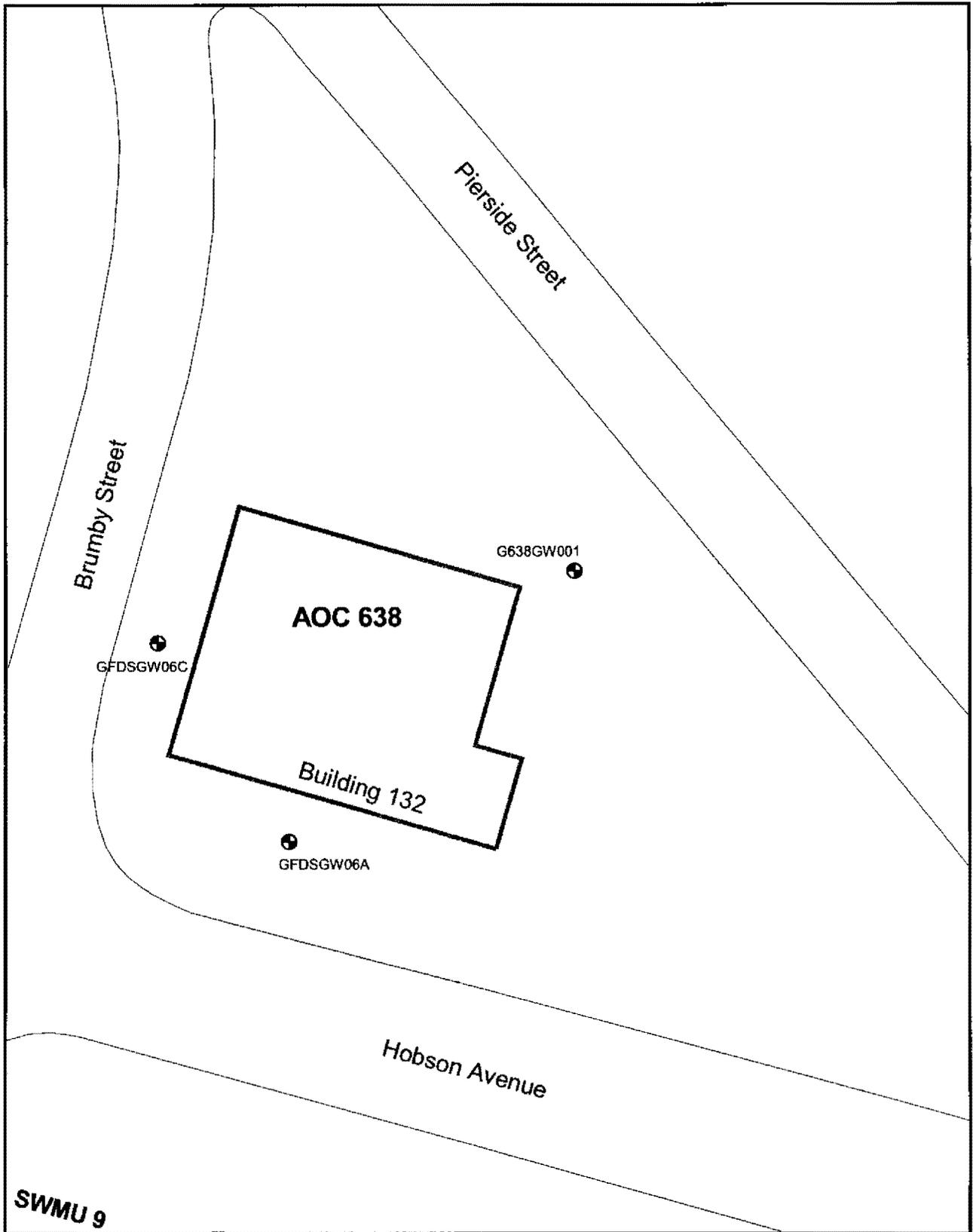


- Subsurface Soil Samples
- Surface Soil Samples
- ▭ AOC Boundary
- ▭ Buildings
- ▭ Sidewalk
- ▭ Pavement
- ▭ Roads

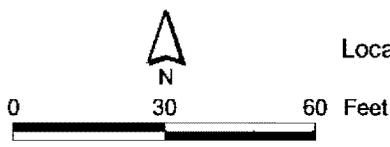


**Figure 4-1**  
 Additional Soil Sample Locations  
 AOC 638, Zone G  
 Charleston Naval Complex

**CH2MHILL**



- Groundwater Wells
- AOC Boundary
- SWMU Boundary
- Buildings
- Pavement
- Roads
- Sidewalk



**Figure 4-2**  
 Location of Groundwater Monitoring Wells  
 AOC 638, Zone G  
 Charleston Naval Complex

**CH2MHILL**

## 5.0 COPC/COC Refinement

---

In this section, the COPCs which are discussed in Section 2.0, and further developed in the screening of Section 4.0 of this report addendum, are further evaluated.

In the RFI report (see Section 2.0 of this report addendum), BEQs were identified as residential COPCs in surface soil only. No COPCs were identified for subsurface soil or groundwater. In the additional investigations (see Section 4.0 of this report addendum), arsenic, copper, and BEQs had minor exceedances in surface soil, as did selenium and thallium in subsurface soil. There were no COPCs identified from the additional groundwater data. The following presents a re-evaluation of and conclusions appropriate to the identified COPCs at AOC 638.

### 5.1 Soil

#### 5.1.1 Arsenic

Arsenic in sample G638SB005 (45.1 mg/kg) fell outside the Zone G arsenic background sample range (3.1 to 25 mg/kg). However, Zone G background is represented by only nine background samples, and therefore may not be adequate to represent variability of the background conditions. Also, the CNC is noted to have elevated arsenic levels, possibly due to the application of arsenical pesticides across the base. The more recent background samples collected from railroad lines and runoff areas around railroads indicated the presence of arsenic at elevated levels (with a maximum of 92 mg/kg), which could be due to the facility maintenance-related pesticide application. Similar observations were made in surface soils at sites in Zone G and other sites in other zones with industrial activities, suggesting that the arsenic detected at AOC 638 is not related to specific-site operations at AOC 638. The adjacent Zone F background data measured surface soil arsenic levels between 3 and 30 mg/kg. All of the background data for each zone, as well as for railroad lines, are presented in the Technical Memorandum issued by CH2M-Jones, *A Summary of Inorganic Chemical Concentrations in Background Soil and Groundwater at the CNC* (CH2M-Jones, August 2001a). Information on arsenic concentrations along the railroad lines is included in Appendix J of the *Project Team Notebook and Instructions, Revision 1A* (CH2M-Jones, December 2001b).

To further evaluate arsenic in surface soil, human health risks were estimated using the upper 95-percent confidence limits on mean concentrations (UCL<sub>95</sub>). Such a concentration

1 was estimated for the detected arsenic in both original and additional samples at AOC 638  
2 for comparison with the background range in soil at the CNC (see Table 5-1 and Figure 5-1).  
3 The surface soil arsenic UCL<sub>95</sub> (21 mg/kg) falls within the Zone G arsenic background  
4 sample range. Arsenic concentration ranges taken from the site are close to the EPA Region  
5 IV accepted residential target cleanup level of 20 mg/kg, and well below the industrial land  
6 use target cleanup level of 270 mg/kg. Site groundwater does not display elevated levels of  
7 arsenic. Therefore, it is likely that the detected arsenic is part of the area background  
8 concentration. Thus, arsenic is not considered a COC in surface soil at AOC 638, and does  
9 not warrant further investigation or action.

### 10 **5.1.2 Copper**

11 The copper concentration in G638SB006 (521 mg/kg) exceeded the surface soil residential  
12 RBC (HI = 0.1) of 310 mg/kg, but was well below the residential RBC (HI = 1.0) of 3,100  
13 mg/kg. It is also within the CNC site-wide background range (0.47 to 866 mg/kg) (CH2M-  
14 Jones, 2001). Thus, copper is not considered a COC and does not warrant further  
15 investigation or action at AOC 638.

### 16 **5.1.3 Selenium and Thallium**

17 The selenium concentration in subsurface soil (3.7 mg/kg in G638SB008) exceeded the Zone  
18 G maximum background concentration of 1.0 mg/kg, but fell within the overall CNC  
19 background selenium range of 0.34 to 3.9 mg/kg. Therefore, selenium does not represent  
20 contamination but is part of the site background. The thallium concentration in subsurface  
21 soil (1.3 mg/kg in G638SB008) exceeded the Zone G maximum background concentration of  
22 1.0 mg/kg, but fell within the overall CNC background thallium range of 0.36 to 1.9 mg/kg.  
23 Therefore, thallium does not represent contamination but is part of the site background.  
24 Thus, selenium and thallium are not considered COCs in subsurface soil and do not warrant  
25 further investigation or action at AOC 638.

### 26 **5.1.4 BEQs**

27 Although benzo(a)pyrene equivalents (BEQs) were identified in the RFI as chemicals of  
28 concern (COCs) in surface soil, BEQs exceeded the RBC for benzo(a)pyrene of 88 µg/kg in  
29 only one location (G638SB001), and the BEQ for that sample location (120 µg/kg) is well  
30 below the CNC background reference concentration for BEQs of 1,304 µg/kg. In the  
31 additional investigation, BEQs were detected at concentrations above the RBC in all four  
32 samples tested for SVOCs, but no result exceeded the CNC reference concentration. All five  
33 of the locations where BEQs were detected (G638SB001, G638SB005, G638SB006,

1 G638SB0010, and G638SB0011) are under or adjacent to pavement. Based on these  
2 considerations, BEQs are not considered a COC at this site, and do not warrant further  
3 investigation or action at AOC 638.

## 4 **5.2 Groundwater**

5 No groundwater results from the samples collected during the RFI or additional  
6 investigation exceeded the screening criteria for inorganic or organic analytes.

**TABLE 5-1**  
 UCL<sub>95</sub> for Surface Soil Arsenic  
 RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex

Location	Concentration (mg/kg)	Qualifier
G638SB001	10.6	J
G638SB002	13	J
G638SB003	6.9	=
G638SB004	6	=
G638SB005	45.1	=
G638SB006	7.3	=
G638SB007	24.5	=
G638SB008	11.4	=
G638SB009	5.2	=
G638SB012	10	=
G638SB013	6	=

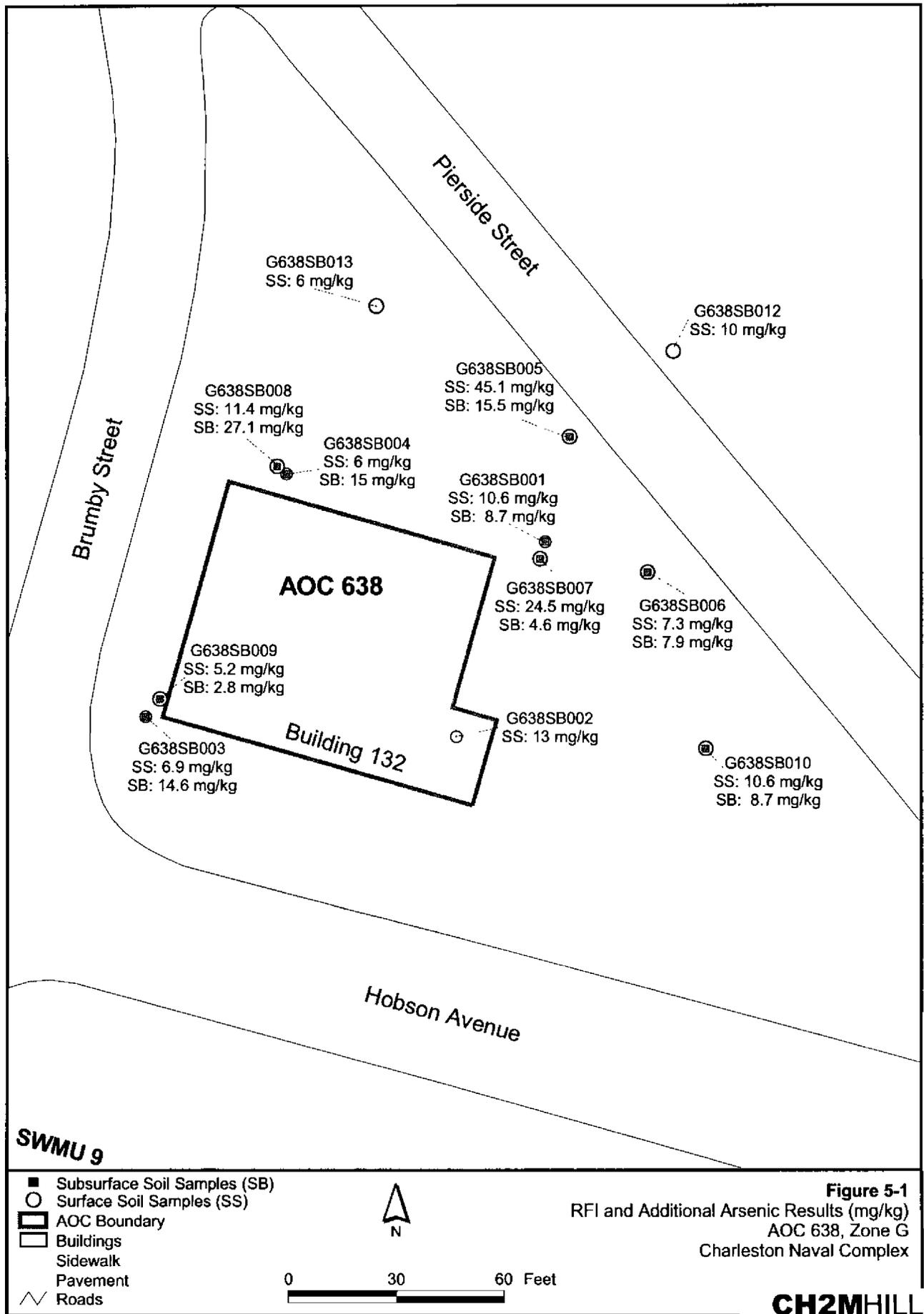
Computation Type and Value	
Standard Deviation (population)	11.9
Maximum	45.1
Minimum	5.2
Average	13.3
UCL <sub>95</sub>	21.0

J chemical detected at concentration below the method detection limit,  
 concentration not known

= chemical detected at the concentration shown

Total number of samples = 11

Total number of detects = 11



## **Section 6.0**

---

## 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 AOC 638. At the conclusion of the RFI report, the investigation was not considered to be complete for this site, and as a result the subsequent *Zone G RFI Report Work Plan Addendum* (EnSafe, 2000) proposed additional sampling. As presented and discussed in Section 4.0 of this report addendum, the results of the additional testing confirm that there are no COCs at this site, and that NFA is appropriate. Reports, comments, and responses following the *Zone G RFI Report, Revision 0* also confirm that additional soil or groundwater samples are not required. A copy of the responses to SCDHEC comments on the *Zone G RFI Report, Revision 0* and the *Zone G RFI Work Plan Addendum* for this site are provided as Appendix E to this report addendum.

### 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.

As determined in the RFI report, no soil sample inorganics were present at concentrations above their applicable SSLs; the soil-to-groundwater pathway is considered invalid at this site. RFI and additional investigations found that no inorganics in groundwater exceeded screening criteria, including MCLs.

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

AOC 638 was initially a small workshop and then a storage facility. No records indicate that wastewater or sanitary wastewater was produced at this facility, and no access to a sewer system was provided. Therefore, there is no linkage between AOC 638 and the sanitary

1 sewers, and further evaluation of this issue is not warranted. There are no COCs that could  
2 migrate from this site.

## 3 **6.4 Potential Linkage to AOC 699, Investigated Storm Sewers** 4 **at the CNC**

5 Potential linkage of a SWMU or AOC to a storm sewer refers to the possibility of a  
6 groundwater plume at a SWMU or AOC migrating into a storm sewer from which it would  
7 subsequently migrate to the water bodies around the CNC. Potential linkage also refers to  
8 the presence of a cross connection between the sanitary sewer and storm sewer, which  
9 could in turn transport pollutants directly to surface waters. Regarding the first of these  
10 potential linkages, because the most recent data suggest that there are no chemicals present  
11 above their respective MCLs in site groundwater, there is no excessively contaminated  
12 groundwater plume to migrate to a storm sewer. Therefore no potential linkage of this AOC  
13 to a storm sewer exists.

14 Regarding the second potential linkage issue, there is no data or information indicating that  
15 the former torpedo workshop was ever connected to the CNC storm sewer system.  
16 Therefore, further evaluation of a potential linkage between AOC 638 and the storm sewers  
17 is not warranted.

## 18 **6.5 Potential Linkage to AOC 504, Investigated Railroad Lines** 19 **at the CNC**

20 The nearest investigated railroad line to AOC 638 is approximately 1,200 feet to the  
21 northwest. There is no known linkage between AOC 638 and the investigated railroad lines  
22 of AOC 504. Therefore, further evaluation of this issue is not warranted.

## 23 **6.6 Potential Migration Pathways to Surface Water Bodies at** 24 **the CNC**

25 Two potential migration pathways from the site to surface water are overland flow via  
26 stormwater runoff, and subsurface flow via groundwater. There are no COCs in surface soil  
27 at AOC 638. Therefore, further evaluation of a potential pathway for contaminant migration  
28 via stormwater runoff is not warranted.

1 There were no chemicals present in groundwater at concentrations above their applicable  
2 MCLs. Therefore, further evaluation of potential migration of contaminated groundwater to  
3 a surface water body is not warranted.

## 4 **6.7 Potential Contamination in Oil/Water Separators (OWSs)**

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

7 Neither the RFA nor the RFI refer to the presence or possible presence of an OWS at AOC  
8 638. In addition, there is no visual evidence of an OWS at this site. Nor is there reference to  
9 an OWS at this facility in the base-wide OWS report prepared by the Navy in Y2000.  
10 Therefore, further evaluation of this issue at AOC 638 is not warranted.

## 11 **6.8 Land Use Control Management Plan**

12 This site is zoned M-1 for marine industrial use. The HHRA in the RFI screening did not  
13 identify any COCs in soil at AOC 638. This evaluation considered potential future  
14 residential use, which is regarded as unrestricted use. This residential use assumption is  
15 thus conservative, and no land use restrictions are needed.



## 1 **7.0 Recommendations**

---

2 AOC 638, the former torpedo workshop and materials storage building at Building 132, is  
3 currently vacant. There have been no reports or observations indicating any past spills, or  
4 that a contaminant was discharged to the environment. The single BEQ exceedance of the  
5 residential RBC was well below the CNC site-wide reference concentration for BEQ.

6 According to the evaluation of data collected during the RFI and additional investigations,  
7 the exceedances of criteria by chemicals in soil and groundwater may be attributable to the  
8 background, and are limited to a single or few minor occurrences. These occurrences do not  
9 present human exposure or leaching concerns, nor are they related to historic activities  
10 associated with AOC 638.

11 Because there are no COCs present in soil or groundwater at this site, CH2M-Jones  
12 recommends this site for NFA. Once the BCT concurs that NFA is appropriate for the site, a  
13 Statement of Basis will be prepared that will be made available for public comment in  
14 accordance with SCDHEC policy. This will allow for public participation in the final  
15 remedy selection.



## 1 **8.0 References**

---

- 2 EnSafe Inc. *Zone G RFI Report, NAVBASE Charleston*. Revision 0. February 20, 1998.
- 3 EnSafe Inc. *Zone G RFI Report Work Plan Addendum, NAVBASE Charleston*. January 17, 2000.
- 4 CH2M-Jones. *A Summary of Inorganic Chemical Concentrations in Background Soil and*  
5 *Groundwater at the CNC*. Revision 0. August 2001a.
- 6 CH2M-Jones. *CNC Project Team Notebook and Instructions*. Revision 1A. December 2001b.

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	StationID	G638GW001	
	SampleID	638GW00104	
	DateCollected	12/11/1997	
	Unit	Concentration	Qualifier
ETHYLBENZENE	UG/L	5.0	U
1,1,2,2-TETRACHLOROETHANE	UG/L	5.0	U
METHYL ETHYL KETONE (2-BUTANONE)	UG/L	5.0	U
2-HEXANONE	UG/L	5.0	U
METHYLENE CHLORIDE	UG/L	6.0	U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	5.0	U
BENZENE	UG/L	5.0	U
BROMOMETHANE	UG/L	5.0	U
2-Chloroethyl vinyl ether	UG/L	5.0	U
TOLUENE	UG/L	5.0	U
CHLOROMETHANE	UG/L	5.0	U
BROMODICHLOROMETHANE	UG/L	5.0	U
ACETONE	UG/L	7.0	U
1,2-DICHLOROETHANE	UG/L	5.0	U
1,1-DICHLOROETHANE	UG/L	5.0	U
DIBROMOCHLOROMETHANE	UG/L	5.0	U
CARBON DISULFIDE	UG/L	5.0	U
1,2-DICHLOROPROPANE	UG/L	5.0	U
1,1-DICHLOROETHENE	UG/L	5.0	U
trans-1,3-DICHLOROPROPENE	UG/L	5.0	U
cis-1,3-DICHLOROPROPENE	UG/L	5.0	U
1,2-Dichloroethene (total)	UG/L	5.0	U
CHLOROBENZENE	UG/L	5.0	U
CARBON TETRACHLORIDE	UG/L	5.0	U
STYRENE	UG/L	5.0	U
BROMOFORM	UG/L	5.0	U
XYLENES, TOTAL	UG/L	5.0	U
VINYL CHLORIDE	UG/L	5.0	U
Vinyl acetate	UG/L	5.0	U
CHLOROFORM	UG/L	5.0	U
TRICHLOROETHYLENE (TCE)	UG/L	5.0	U
1,1,2-TRICHLOROETHANE	UG/L	5.0	U
1,1,1-TRICHLOROETHANE	UG/L	5.0	U
TETRACHLOROETHYLENE(PCE)	UG/L	5.0	U

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	StationID	G638GW001	
	SampleID	638GW00104	
	DateCollected	12/11/1997	
	Unit	Concentration	Qualifier
HEXACHLOROXYCLOPENTADIENE	UG/L	10.0	U
HEXACHLOROBUTADIENE	UG/L	10.0	U
FLUORANTHENE	UG/L	10.0	U
FLUORENE	UG/L	10.0	U
DI-n-BUTYL PHTHALATE	UG/L	10.0	U
HEXACHLOROBENZENE	UG/L	10.0	U
HEXACHLOROETHANE	UG/L	10.0	U
2,4-DINITROPHENOL	UG/L	50.0	U
DI-n-OCTYLPHTHALATE	UG/L	10.0	U
4,6-DINITRO-2-METHYLPHENOL	UG/L	50.0	U
DIMETHYL PHTHALATE	UG/L	10.0	U
2,4-DIMETHYLPHENOL	UG/L	10.0	U
2,6-DINITROTOLUENE	UG/L	10.0	U
N-NITROSODI-n-PROPYLAMINE	UG/L	10.0	U
2,4-DINITROTOLUENE	UG/L	10.0	U
4-NITROANILINE	UG/L	50.0	U
3-NITROANILINE	UG/L	50.0	U
2-NITROANILINE	UG/L	50.0	U
N-NITROSODIPHENYLAMINE	UG/L	10.0	U
NITROBENZENE	UG/L	10.0	U
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10.0	U
4-NITROPHENOL	UG/L	50.0	U
2-NITROPHENOL	UG/L	10.0	U
ISOPHORONE	UG/L	10.0	U
NAPHTHALENE	UG/L	10.0	U
INDENO(1,2,3-c,d)PYRENE	UG/L	10.0	U
2-METHYLNAPHTHALENE	UG/L	10.0	U
4-METHYLPHENOL (p-CRESOL)	UG/L	10.0	U
2-METHYLPHENOL (o-CRESOL)	UG/L	10.0	U
BENZO(a)ANTHRACENE	UG/L	10.0	U
bis(2-CHLOROETHOXY) METHANE	UG/L	10.0	U
BENZO(b)FLUORANTHENE	UG/L	10.0	U
4-BROMOPHENYL PHENYL ETHER	UG/L	10.0	U
bis(2-ETHYLHEXYL) PHTHALATE	UG/L	10.0	U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10.0	U
4-CHLORO-3-METHYLPHENOL	UG/L	10.0	U
Benzoic acid	UG/L	10.0	U
BENZO(a)PYRENE	UG/L	10.0	U
Benzyl alcohol	UG/L	10.0	U
BENZO(k)FLUORANTHENE	UG/L	10.0	U
BENZO(g,h,i)PERYLENE	UG/L	10.0	U
ACENAPHTHYLENE	UG/L	10.0	U
BENZYL BUTYL PHTHALATE	UG/L	10.0	U
ANTHRACENE	UG/L	10.0	U
ACENAPHTHENE	UG/L	10.0	U
1,4-DICHLOROBENZENE	UG/L	10.0	U
1,3-DICHLOROBENZENE	UG/L	10.0	U
1,2-DICHLOROBENZENE	UG/L	10.0	U
DIBENZ(a,h)ANTHRACENE	UG/L	10.0	U
3,3'-DICHLOROBENZIDINE	UG/L	20.0	U
DIBENZOFURAN	UG/L	10.0	U

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	StationID	G638GW001	
	SampleID	638GW00104	
	DateCollected	12/11/1997	
	Unit	Concentration	Qualifier
2,4-DICHLOROPHENOL	UG/L	10.0	U
2-CHLOROPHENOL	UG/L	10.0	U
4-CHLOROANILINE	UG/L	10.0	U
CHRYSENE	UG/L	10.0	U
2-CHLORONAPHTHALENE	UG/L	10.0	U
DIETHYL PHTHALATE	UG/L	10.0	U
4-CHLOROPHENYL PHENYL ETHER	UG/L	10.0	U
2,4,6-TRICHLOROPHENOL	UG/L	10.0	U
2,4,5-TRICHLOROPHENOL	UG/L	50.0	U
1,2,4-TRICHLOROBENZENE	UG/L	10.0	U
PHENOL	UG/L	10.0	U
PHENANTHRENE	UG/L	10.0	U
PENTACHLOROPHENOL	UG/L	50.0	U
PYRENE	UG/L	10.0	U

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Unit	Concentration	Qualifier
PCB-1242 (AROCHLOR 1242)	UG/L	1.0	UJ
PCB-1232 (AROCHLOR 1232)	UG/L	1.0	UJ
PCB-1221 (AROCHLOR 1221)	UG/L	1.0	UJ
PCB-1016 (AROCHLOR 1016)	UG/L	1.0	UJ
PCB-1248 (AROCHLOR 1248)	UG/L	1.0	UJ
PCB-1260 (AROCHLOR 1260)	UG/L	2.0	UJ
PCB-1254 (AROCHLOR 1254)	UG/L	2.0	UJ
HEPTACHLOR	UG/L	0.0	UJ
HEPTACHLOR EPOXIDE	UG/L	0.0	UJ
DIELDRIN	UG/L	0.1	UJ
ENDOSULFAN SULFATE	UG/L	0.1	UJ
ENDRIN KETONE	UG/L	0.1	UJ
ENDRIN	UG/L	0.1	UJ
ENDOSULFAN II	UG/L	0.1	UJ
ENDOSULFAN I	UG/L	0.0	UJ
ENDRIN ALDEHYDE	UG/L	0.1	UJ
METHOXYCHLOR	UG/L	0.4	UJ
GAMMA BHC (LINDANE)	UG/L	0.0	UJ
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	UG/L	0.0	UJ
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	UG/L	0.0	UJ
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	UG/L	0.0	UJ
ALDRIN	UG/L	0.0	UJ
p,p'-DDT	UG/L	0.1	UJ
p,p'-DDE	UG/L	0.1	UJ
p,p'-DDD	UG/L	0.1	UJ
GAMMA-CHLORDANE	UG/L	0.0	UJ
ALPHA-CHLORDANE	UG/L	0.0	UJ
TOXAPHENE	UG/L	2.5	UJ

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Unit	Concentration	Qualifier
MERCURY	UG/L	0.2	U
IRON	UG/L	5610.0	J
NICKEL	UG/L	0.7	U
LEAD	UG/L	0.9	U
SODIUM	UG/L	2220000.0	J
POTASSIUM	UG/L	118000.0	=
MANGANESE	UG/L	99.4	J
MAGNESIUM	UG/L	247000.0	=
CADMIUM	UG/L	0.0	U
CALCIUM	UG/L	64600.0	J
BERYLLIUM	UG/L	0.2	U
BARIUM	UG/L	16.8	J
ARSENIC	UG/L	9.0	U
ALUMINUM	UG/L	9.7	U
SILVER	UG/L	1.0	U
COPPER	UG/L	1.4	U
CHROMIUM, TOTAL	UG/L	1.0	U
COBALT	UG/L	0.8	U
THALLIUM	UG/L	5.0	U
ZINC	UG/L	5.8	U
VANADIUM	UG/L	1.1	U
Tin (Sn)	UG/L	14.0	U
SELENIUM	UG/L	3.4	U
ANTIMONY	UG/L	2.8	U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB005	G638SB005	G638SB007	G638SB007	
SampleID	638SB00501 (0-1ft)	638SB00502 (3-5ft)	638SB00701 (0-1ft)	638SB00702 (3-5ft)	
DateCollected	12/15/1999	12/15/1999	12/15/1999	12/15/1999	
DateAnalyzed	01/10/2000	01/10/2000	01/10/2000	01/10/2000	
LabSampleID	9912369-09	9912369-11	9912369-15	9912369-16	
Parameter	Units				
TOTAL ORGANIC CARBON	%, DR	0.1 U	0.1 U	0.4 =	0.1 =

StationID	G638SB008	G638SB008	G638SB009	G638SB009	
SampleID	638SB00801 (0-1ft)	638SB00802 (3-5ft)	638SB00901 (0-1ft)	638SB00902 (3-5ft)	
DateCollected	12/16/1999	12/16/1999	12/16/1999	12/16/1999	
DateAnalyzed	01/11/2000	01/11/2000	01/11/2000	01/11/2000	
LabSampleID	9912406-19	9912406-20	9912406-21	9912406-22	
Parameter	Units				
TOTAL ORGANIC CARBON	%, DR	0.1 =	0.1 U	0.1 U	0.1 U

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB005		G638SB005		G638SB006		G638SB006		
SampleID	638SB005T1 (0-1ft)		638SB005T2 (3-5ft)		638SB00601a (0-1ft)		638SB00602a (3-5ft)		
DateCollected	12/15/1999		12/15/1999		01/25/2000		01/25/2000		
DateAnalyzed	01/03/2000		01/03/2000		01/31/2000		01/31/2000		
LabSampleID	9912369-09		9912369-11		41852.22		41852.23		
Parameter	Units								
ALUMINUM	MG/KG	4110	=	8130	=	4320	=	8580	=
ANTIMONY	MG/KG	1	J	1.2	J	0.39	UJ	0.3	UJ
ARSENIC	MG/KG	45.1	=	15.5	=	7.3	=	7.9	=
BARIUM	MG/KG	14.2	J	13.4	J	43	=	26.2	=
BERYLLIUM	MG/KG	0.31	U	0.67	U	0.66	=	0.34	J
CADMIUM	MG/KG	0.34	J	0.54	J	1.5	J	2.9	J
CALCIUM	MG/KG	94600	=	102000	=	27900	=	14400	=
CHROMIUM, TOTAL	MG/KG	26	=	46.7	=	31.3	=	14.3	=
COBALT	MG/KG	1.1	J	2	J	6.9	=	1.5	J
COPPER	MG/KG	71.5	J	26	J	521	=	19.3	=
IRON	MG/KG	4090	=	6730	=	8580	=	5560	=
LEAD	MG/KG	21.2	J	11.4	J	121	=	41.8	=
MAGNESIUM	MG/KG	2170	J	4490	J	929	=	1030	=
MANGANESE	MG/KG	75.8	J	122	J	84.8	=	51.7	=
MERCURY	MG/KG	0.21	=	0.06	U	0.23	J	0.06	J
NICKEL	MG/KG	13.1	=	18.9	=	22.9	=	5.6	=
POTASSIUM	MG/KG	665	J	1830	J	423	=	401	=
SELENIUM	MG/KG	1.1	=	2	=	0.38	U	0.52	J
SILVER	MG/KG	0.04	U	0.06	U	0.46	U	0.26	U
SODIUM	MG/KG	478	=	1260	=	432	=	380	=
THALLIUM	MG/KG	0.21	UJ	0.55	J	0.59	J	0.4	J
Tin (Sn)	MG/KG	3.5	U	4	U	12.5	U	5.2	U
VANADIUM	MG/KG	15.6	=	28.8	=	17.7	=	13	=
ZINC	MG/KG	64.9	J	53.3	J	360	J	77	J

Chareleston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB007	G638SB007	G638SB008	G638SB008	
SampleID	638SB007T1 (0-1ft)	638SB007T2 (3-5ft)	638SB008T1 (0-1ft)	638SB008T2 (3-5ft)	
DateCollected	12/15/1999	12/15/1999	12/16/1999	12/16/1999	
DateAnalyzed	01/03/2000	01/03/2000	12/29/1999	12/29/1999	
LabSampleID	9912369-15	9912369-16	9912406-19	9912406-20	
Parameter	Units				
ALUMINUM	MG/KG	6500 =	8200 =	15400 =	36400 =
ANTIMONY	MG/KG	2.6 J	0.36 J	0.75 J	1.1 J
ARSENIC	MG/KG	24.5 =	4.6 =	11.4 =	27.1 =
BARIUM	MG/KG	68.6 =	18.5 J	37.6 =	54.3 =
BERYLLIUM	MG/KG	0.96 =	0.49 U	0.66 =	1.9 =
CADMIUM	MG/KG	3.6 =	0.03 U	0.05 U	0.19 U
CALCIUM	MG/KG	17000 =	3650 =	34500 =	7370 =
CHROMIUM, TOTAL	MG/KG	35.1 =	12.6 =	25.5 =	58 =
COBALT	MG/KG	5.8 =	1.3 J	4.2 J	11.4 =
COPPER	MG/KG	188 J	4.8 J	33.8 =	35.7 =
IRON	MG/KG	16600 =	10600 =	13900 =	45300 =
LEAD	MG/KG	128 J	15.2 J	75.1 J	51.7 J
MAGNESIUM	MG/KG	1000 J	887 J	1920 J	4680 J
MANGANESE	MG/KG	358 J	53.7 J	156 =	605 =
MERCURY	MG/KG	0.3 =	0.09 =	0.15 =	0.33 =
NICKEL	MG/KG	43.1 =	2.7 J	9.9 =	17.9 =
POTASSIUM	MG/KG	503 J	478 J	1070 =	3030 =
SELENIUM	MG/KG	1.8 =	1.3 =	1.2 =	3.7 =
SILVER	MG/KG	0.1 J	0.06 U	0.05 U	0.06 U
SODIUM	MG/KG	395 J	455 J	270 J	442 J
THALLIUM	MG/KG	0.23 UJ	0.27 UJ	0.45 J	1.3 J
Tin (Sn)	MG/KG	10.6 U	3.1 U	3.3 U	3.1 U
VANADIUM	MG/KG	25.3 =	19.2 =	34.2 =	93.1 =
ZINC	MG/KG	591 J	19.7 J	114 =	134 =

**Charelston Naval Complex  
AOC 638, Zone G**

09/06/2001

		StationID	G638SB009		G638SB009	
		SampleID	638SB009T1 (0-1ft)		638SB009T2 (3-5ft)	
		DateCollected	12/16/1999		12/16/1999	
		DateAnalyzed	12/29/1999		12/29/1999	
		LabSampleID	9912406-21		9912406-22	
Parameter	Units					
ALUMINUM	MG/KG	11100	=		8880	=
ANTIMONY	MG/KG	0.59	J		0.32	J
ARSENIC	MG/KG	5.2	=		2.8	=
BARIUM	MG/KG	23.6	=		41.1	=
BERYLLIUM	MG/KG	0.42	U		0.4	U
CADMIUM	MG/KG	0.02	U		0.03	U
CALCIUM	MG/KG	2130	=		2350	=
CHROMIUM, TOTAL	MG/KG	17.2	=		11	=
COBALT	MG/KG	1.9	J		1.6	J
COPPER	MG/KG	8.5	=		3.2	=
IRON	MG/KG	12100	=		6480	=
LEAD	MG/KG	166	J		11.6	J
MAGNESIUM	MG/KG	745	J		496	J
MANGANESE	MG/KG	67	=		49	=
MERCURY	MG/KG	0.11	=		0.05	=
NICKEL	MG/KG	3.7	=		3.2	J
POTASSIUM	MG/KG	315	J		216	J
SELENIUM	MG/KG	1.4	=		0.81	J
SILVER	MG/KG	0.04	U		0.04	U
SODIUM	MG/KG	85.8	J		81.1	J
THALLIUM	MG/KG	0.19	UJ		0.2	UJ
Tin (Sn)	MG/KG	2.3	U		2.3	U
VANADIUM	MG/KG	23.1	=		14	=
ZINC	MG/KG	29.8	=		19.3	=

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB005	G638SB005	G638SB007	G638SB007
SampleID	638SB005S1 (0-1ft)	638SB005S2 (3-5ft)	638SB007S1 (0-1ft)	638SB007S2 (3-5ft)
DateCollected	12/15/1999	12/15/1999	12/15/1999	12/15/1999
DateAnalyzed	12/30/1999	12/30/1999	12/30/1999	12/30/1999
LabSampleID	9912369-17	9912369-19	9912369-21	9912369-22
Parameter	Units			
ALUMINUM, SPLP	UG/L	350 J	112 J	605 = 3400 =
ANTIMONY, SPLP	UG/L	3.7 J	2.9 J	5.3 J 4.1 J
ARSENIC, SPLP	UG/L	51.7 =	4.4 J	8.9 J 4.3 J
BARIUM, SPLP	UG/L	455 =	327 =	624 = 1030 =
BERYLLIUM, SPLP	UG/L	0.9 U	0.9 U	0.9 U 0.9 U
CADMIUM, SPLP	UG/L	0.4 J	0.4 J	0.5 J 0.3 U
CALCIUM, SPLP	UG/L	10900 =	18500 =	8310 = 7250 =
COBALT, SPLP	UG/L	0.5 U	0.5 U	0.5 U 0.5 U
COPPER, SPLP	UG/L	5.2 J	2 J	16.9 J 3.3 J
IRON, SPLP	UG/L	287 J	101 =	702 = 2350 =
LEAD, SPLP	UG/L	2.9 J	2.7 J	13.4 = 5 J
MAGNESIUM, SPLP	UG/L	367 J	1020 J	1130 J 2170 J
MANGANESE, SPLP	UG/L	2 J	1.1 J	10.2 J 9.8 J
MERCURY, SPLP	UG/L	0.2 U	0.2 U	0.2 U 0.2 U
NICKEL, SPLP	UG/L	1.4 J	2 J	4.9 J 2.4 J
POTASSIUM, SPLP	UG/L	146 J	262 J	692 J 4740 J
SELENIUM, SPLP	UG/L	1.7 U	1.7 U	2.5 J 2.2 J
SILVER, SPLP	UG/L	0.5 U	0.5 U	0.5 U 0.5 U
SODIUM, SPLP	UG/L	4290 J	3550 J	9640 = 25800 =
THALLIUM, SPLP	UG/L	2.4 U	2.4 U	2.4 U 2.4 U
Tin (Sn), SPLP	UG/L	2.7 U	2.7 U	2.7 U 2.7 U
VANADIUM, SPLP	UG/L	4.6 J	4.4 J	9.8 J 9.6 J
ZINC, SPLP	UG/L	26.8 =	17.9 J	89 = 45.8 =
CHROMIUM, TOTAL	UG/L	2.3 J	0.8 J	4.2 J 4.7 J

Charelston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB008	G638SB008	G638SB009	G638SB009	
SampleID	638SB008S1 (0-1ft)	638SB008S2 (3-5ft)	638SB009S1 (0-1ft)	638SB009S2 (3-5ft)	
DateCollected	12/16/1999	12/16/1999	12/16/1999	12/16/1999	
DateAnalyzed	12/30/1999	12/30/1999	12/30/1999	12/30/1999	
LabSampleID	9912406-36	9912406-37	9912406-38	9912406-13	
Parameter	Units				
ALUMINUM, SPLP	UG/L	1210 =	3690 =	2270 =	724 =
ANTIMONY, SPLP	UG/L	3.5 U	2.6 U	3 U	2.4 U
ARSENIC, SPLP	UG/L	2.1 J	5.3 J	4.2 J	4.7 J
BARIUM, SPLP	UG/L	816 J	1190 J	782 J	574 J
BERYLLIUM, SPLP	UG/L	0.9 U	0.9 U	0.9 U	0.9 U
CADMIUM, SPLP	UG/L	2.1 J	1.6 J	1.9 J	0.6 U
CALCIUM, SPLP	UG/L	12600 =	7080 =	16100 =	14400 =
COBALT, SPLP	UG/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
COPPER, SPLP	UG/L	3.6 J	6.4 J	4.1 J	1.2 J
IRON, SPLP	UG/L	948 =	4520 =	1790 =	484 =
LEAD, SPLP	UG/L	17.1 =	13.5 =	9.7 J	3.4 J
MAGNESIUM, SPLP	UG/L	668 J	1560 J	546 J	688 J
MANGANESE, SPLP	UG/L	5.2 J	44.1 =	8.3 J	2.7 U
MERCURY, SPLP	UG/L	0.2 U	0.2 U	0.2 U	0.2 U
NICKEL, SPLP	UG/L	1.1 U	2.8 J	2 J	1.2 J
POTASSIUM, SPLP	UG/L	206 J	526 J	272 J	185 J
SELENIUM, SPLP	UG/L	1.7 U	2 J	1.8 J	1.7 J
SILVER, SPLP	UG/L	0.5 U	0.5 U	0.5 U	0.5 U
SODIUM, SPLP	UG/L	5970 =	7430 =	6000 =	5570 =
THALLIUM, SPLP	UG/L	2.4 UJ	2.4 UJ	2.4 UJ	2.4 UJ
Tin (Sn), SPLP	UG/L	2.7 U	2.7 U	2.7 U	2.7 U
VANADIUM, SPLP	UG/L	3.5 J	13.5 J	6.7 J	2.5 J
ZINC, SPLP	UG/L	39.9 =	124 =	62.2 =	23.5 =
CHROMIUM, TOTAL	UG/L	2.1 J	6.4 J	4.8 J	4.7 J

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB005	G638SB005	G638SB006	G638SB006			
SampleID	638SB00501 (0-1ft)	638SB00502 (3-5ft)	638SB00601b (0-1ft)	638SB00602b (3-5ft)			
DateCollected	12/15/1999	12/15/1999	12/15/1999	12/15/1999			
DateAnalyzed	12/28/1999	12/23/1999	12/23/1999	12/23/1999			
LabSampleID	9912369-09	9912369-11	9912369-13	9912369-14			
Parameter	Units						
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/KG	370 U	470 U	380 U	430 U		R
2-METHYLNAPHTHALENE	UG/KG	370 U	470 U	380 U	430 U		R
2-METHYLPHENOL (o-CRESOL)	UG/KG	370 U	470 U	380 U	430 U		R
PHENOL	UG/KG	370 U	470 U	380 U	430 U		R
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/KG	370 U	470 U	380 U	430 U		R
2-CHLOROPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
1,3-DICHLOROBENZENE	UG/KG	370 U	470 U	380 U	430 U		R
1,4-DICHLOROBENZENE	UG/KG	370 U	470 U	380 U	430 U		R
Benzyl alcohol	UG/KG	370 U	470 U	380 U	430 U		R
1,2-DICHLOROBENZENE	UG/KG	370 U	470 U	380 U	430 U		R
N-NITROSODI-n-PROPYLAMINE	UG/KG	370 U	470 U	380 U	430 U		R
4-METHYLPHENOL (p-CRESOL)	UG/KG	370 U	470 U	380 U	430 U		R
HEXACHLOROETHANE	UG/KG	370 U	470 U	380 U	430 U		R
NITROBENZENE	UG/KG	370 U	470 U	380 U	430 U		R
ISOPHORONE	UG/KG	370 U	470 U	380 U	430 U		R
2-NITROPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
2,4-DIMETHYLPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
bis(2-CHLOROETHOXY) METHANE	UG/KG	370 U	470 U	380 U	430 U		R
Benzoic acid	UG/KG	1900 U	2300 U	1900 U	2100 U		R
2,4-DICHLOROPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
1,2,4-TRICHLOROBENZENE	UG/KG	370 U	470 U	380 U	430 U		R
4-CHLOROANILINE	UG/KG	370 U	470 U	380 U	430 U		R
HEXACHLOROBUTADIENE	UG/KG	370 U	470 U	380 U	430 U		R
4-CHLORO-3-METHYLPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
HEXACHLOROCYCLOPENTADIENE	UG/KG	370 U	470 U	380 U	430 U		R
2,4,6-TRICHLOROPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
2,4,5-TRICHLOROPHENOL	UG/KG	370 U	470 U	380 U	430 U		R
2-CHLORONAPHTHALENE	UG/KG	370 U	470 U	380 U	430 U		R
2-NITROANILINE	UG/KG	370 U	470 U	380 U	430 U		R
ACENAPHTHYLENE	UG/KG	370 U	470 U	380 U	430 U		R
2,6-DINITROTOLUENE	UG/KG	370 U	470 U	380 U	430 U		R
3-NITROANILINE	UG/KG	370 U	470 U	380 U	430 U		R
ACENAPHTHENE	UG/KG	370 U	470 U	380 U	430 U		R
2,4-DINITROPHENOL	UG/KG	740 U	940 U	760 U	850 U		R
DIBENZOFURAN	UG/KG	370 U	470 U	380 U	430 U		R

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB010	G638SB010	G638SB011	G638SB011	
SampleID	638SB01001 (0-1ft)	638SB01002 (3-5ft)	638SB01101 (0-1ft)	638SB01102 (3-5ft)	
DateCollected	01/25/2000	01/25/2000	01/25/2000	01/25/2000	
DateAnalyzed	02/02/2000	02/01/2000	02/03/2000	02/03/2000	
LabSampleID	41852.20	41852.21	41852.18	41852.19	
Parameter	Units				
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/KG	420 U	550 U	380 U	470 U
2-METHYLNAPHTHALENE	UG/KG	420 U	600 =	40 J	68 J
2-METHYLPHENOL (o-CRESOL)	UG/KG	420 U	550 U	380 U	470 U
PHENOL	UG/KG	420 U	550 U	380 U	470 U
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/KG	420 U	550 U	380 U	470 U
2-CHLOROPHENOL	UG/KG	420 U	550 U	380 U	470 U
1,3-DICHLOROBENZENE	UG/KG	420 U	550 U	380 U	470 U
1,4-DICHLOROBENZENE	UG/KG	420 U	550 U	380 U	470 U
Benzyl alcohol	UG/KG	420 U	550 U	380 U	470 U
1,2-DICHLOROBENZENE	UG/KG	420 U	550 U	380 U	470 U
N-NITROSODI-n-PROPYLAMINE	UG/KG	420 U	550 U	380 U	470 U
4-METHYLPHENOL (p-CRESOL)	UG/KG	420 U	550 U	380 U	470 U
HEXACHLOROETHANE	UG/KG	420 U	550 U	380 U	470 U
NITROBENZENE	UG/KG	420 U	550 U	380 U	470 U
ISOPHORONE	UG/KG	420 U	550 U	380 U	470 U
2-NITROPHENOL	UG/KG	420 U	550 U	380 U	470 U
2,4-DIMETHYLPHENOL	UG/KG	420 U	550 U	380 U	470 U
bis(2-CHLOROETHOXY) METHANE	UG/KG	420 U	550 U	380 U	470 U
Benzoic acid	UG/KG	110 J	550 U	50 J	74 J
2,4-DICHLOROPHENOL	UG/KG	420 U	550 U	380 U	470 U
1,2,4-TRICHLOROBENZENE	UG/KG	420 U	550 U	380 U	470 U
4-CHLOROANILINE	UG/KG	420 U	550 U	380 U	470 U
HEXACHLOROBTADIENE	UG/KG	420 U	550 U	380 U	470 U
4-CHLORO-3-METHYLPHENOL	UG/KG	420 U	550 U	380 U	470 U
HEXACHLOROCYCLOPENTADIENE	UG/KG	420 U	550 U	380 U	470 U
2,4,6-TRICHLOROPHENOL	UG/KG	420 U	550 U	380 U	470 U
2,4,5-TRICHLOROPHENOL	UG/KG	1100 U	1400 U	960 U	1200 U
2-CHLORONAPHTHALENE	UG/KG	420 U	550 U	380 U	470 U
2-NITROANILINE	UG/KG	1100 U	1400 U	960 U	1200 U
ACENAPHTHYLENE	UG/KG	420 U	550 U	20 J	470 U
2,6-DINITROTOLUENE	UG/KG	420 U	550 U	380 U	470 U
3-NITROANILINE	UG/KG	1100 U	1400 U	960 U	1200 U
ACENAPHTHENE	UG/KG	21 J	380 J	380 U	260 J
2,4-DINITROPHENOL	UG/KG	1100 U	1400 U	960 U	1200 U
DIBENZOFURAN	UG/KG	420 U	550 U	380 U	160 J

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units	G638SB005		G638SB005		G638SB006		G638SB006	
		638SB00501 (0-1ft)	638SB00502 (3-5ft)	638SB00502 (3-5ft)	638SB00601b (0-1ft)	638SB00601b (0-1ft)	638SB00602b (3-5ft)	638SB00602b (3-5ft)	
StationID	SampleID	DateCollected	DateAnalyzed	LabSampleID	DateCollected	DateAnalyzed	LabSampleID	DateCollected	DateAnalyzed
		12/15/1999	12/15/1999	9912369-09	12/15/1999	12/23/1999	9912369-13	12/15/1999	12/23/1999
		12/28/1999	12/23/1999	9912369-09	12/23/1999	12/23/1999	9912369-13	12/23/1999	12/23/1999
				9912369-09			9912369-13		9912369-14
4-NITROPHENOL	UG/KG	740	U	940	U	760	U	850	U
2,4-DINITROTOLUENE	UG/KG	370	U	470	U	380	U	430	U
FLUORENE	UG/KG	370	U	470	U	380	U	430	U
DIMETHYL PHTHALATE	UG/KG	370	U	470	U	380	U	430	U
DIETHYL PHTHALATE	UG/KG	370	U	470	U	380	U	430	U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	370	U	470	U	380	U	430	U
4-NITROANILINE	UG/KG	370	U	470	U	380	U	430	U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	740	U	940	U	760	U	850	U
N-NITROSODIPHENYLAMINE	UG/KG	370	U	470	U	380	U	430	U
4-BROMOPHENYL PHENYL ETHER	UG/KG	370	U	470	U	380	U	430	U
HEXACHLOROENZENE	UG/KG	370	U	470	U	380	U	430	U
PENTACHLOROPHENOL	UG/KG	740	U	940	U	760	U	850	U
PHENANTHRENE	UG/KG	370	U	470	U	140	J	1200	=
ANTHRACENE	UG/KG	370	U	470	U	380	U	250	J
DI-n-BUTYL PHTHALATE	UG/KG	370	U	240	J	380	U	430	U
FLUORANTHENE	UG/KG	270	J	470	U	280	J	1800	=
PYRENE	UG/KG	310	J	470	U	290	J	2000	=
BENZYL BUTYL PHTHALATE	UG/KG	370	U	470	U	380	U	430	U
BENZO(a)ANTHRACENE	UG/KG	160	J	470	U	170	J	990	=
3,3'-DICHLOROENZIDINE	UG/KG	740	U	940	U	760	U	850	U
CHRYSENE	UG/KG	230	J	470	U	190	J	1100	=
bis(2-ETHYLHEXYL) PHTHALATE	UG/KG	370	U	110	J	120	J	99	J
DI-n-OCTYLPHTHALATE	UG/KG	370	U	470	U	380	U	430	U
BENZO(b)FLUORANTHENE	UG/KG	310	J	470	J	160	J	1100	J
BENZO(k)FLUORANTHENE	UG/KG	230	J	470	U	130	J	740	J
BENZO(a)PYRENE	UG/KG	200	J	470	U	130	J	560	J
INDENO(1,2,3-c,d)PYRENE	UG/KG	120	J	470	U	380	U	310	J
DIBENZ(a,h)ANTHRACENE	UG/KG	370	U	470	U	380	U	150	J
BENZO(g,h,i)PERYLENE	UG/KG	130	J	470	U	380	U	320	J

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

StationID	G638SB010		G638SB010		G638SB011		G638SB011		
SampleID	638SB01001 (0-1ft)		638SB01002 (3-5ft)		638SB01101 (0-1ft)		638SB01102 (3-5ft)		
DateCollected	01/25/2000		01/25/2000		01/25/2000		01/25/2000		
DateAnalyzed	02/02/2000		02/01/2000		02/03/2000		02/03/2000		
LabSampleID	41852.20		41852.21		41852.18		41852.19		
Parameter	Units								
4-NITROPHENOL	UG/KG	1100	U	1400	U	960	U	1200	U
2,4-DINITROTOLUENE	UG/KG	420	U	550	U	380	U	470	U
FLUORENE	UG/KG	26	J	460	J	380	U	320	J
DIMETHYL PHTHALATE	UG/KG	420	U	550	U	380	U	470	U
DIETHYL PHTHALATE	UG/KG	420	U	550	U	380	U	470	U
4-CHLOROPHENYL PHENYL ETHER	UG/KG	420	U	550	U	380	U	470	U
4-NITROANILINE	UG/KG	1100	U	1400	U	960	U	1200	U
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1100	U	1400	U	960	U	1200	U
N-NITROSODIPHENYLAMINE	UG/KG	420	U	550	U	380	U	470	U
4-BROMOPHENYL PHENYL ETHER	UG/KG	420	U	550	U	380	U	470	U
HEXACHLOROBENZENE	UG/KG	420	U	550	U	380	U	470	U
PENTACHLOROPHENOL	UG/KG	1100	U	1400	U	960	U	1200	U
PHENANTHRENE	UG/KG	130	J	1000	=	79	J	1800	=
ANTHRACENE	UG/KG	46	J	550	U	30	J	560	=
DI-n-BUTYL PHTHALATE	UG/KG	32	J	550	U	38	J	30	J
FLUORANTHENE	UG/KG	490	=	840	=	190	J	1800	=
PYRENE	UG/KG	590	=	610	=	190	J	1500	=
BENZYL BUTYL PHTHALATE	UG/KG	420	U	550	U	380	U	28	J
BENZO(a)ANTHRACENE	UG/KG	140	J	260	J	110	J	840	=
3,3'-DICHLOROBENZIDINE	UG/KG	420	U	550	U	380	U	470	U
CHRYSENE	UG/KG	130	J	250	J	150	J	820	=
bis(2-ETHYLHEXYL) PHTHALATE	UG/KG	420	U	550	U	380	U	470	U
DI-n-OCTYLPHTHALATE	UG/KG	420	U	550	U	380	U	470	U
BENZO(b)FLUORANTHENE	UG/KG	100	J	260	J	190	J	650	=
BENZO(k)FLUORANTHENE	UG/KG	88	J	160	J	95	J	500	=
BENZO(a)PYRENE	UG/KG	88	J	180	J	120	J	670	=
INDENO(1,2,3-c,d)PYRENE	UG/KG	55	J	92	J	120	J	460	J
DIBENZ(a,h)ANTHRACENE	UG/KG	420	U	38	J	51	J	210	J
BENZO(g,h,i)PERYLENE	UG/KG	65	J	98	J	140	J	480	=

**Charleston Naval Complex  
AOC 638, Zone G**

09/06/2001

StationID	G638SB005	G638SB005	G638SB006
SampleID	638SB00501 (0-1ft)	638SB00502 (3-5ft)	638SB00601b (0-1ft)
DateCollected	12/15/1999	12/15/1999	12/15/1999
DateAnalyzed	12/28/1999	12/23/1999	12/23/1999
LabSampleID	9912369-09	9912369-11	9912369-13
Parameter	Units		
NAPHTHALENE	UG/KG	370 U	470 U 380 U

StationID	G638SB006	G638SB006	G638SB010
SampleID	638SB00602b (3-5ft)	638SB00602bDL (3-5ft)	638SB01001 (0-1ft)
DateCollected	12/15/1999	12/15/1999	01/25/2000
DateAnalyzed	12/23/1999	12/27/1999	02/02/2000
LabSampleID	9912369-14	991236914DL	41852.20
Parameter	Units		
NAPHTHALENE	UG/KG	430 U	850 R 420 U

StationID	G638SB010	G638SB011	G638SB011
SampleID	638SB01002 (3-5ft)	638SB01101 (0-1ft)	638SB01102 (3-5ft)
DateCollected	01/25/2000	01/25/2000	01/25/2000
DateAnalyzed	02/01/2000	02/03/2000	02/03/2000
LabSampleID	41852.21	41852.18	41852.19
Parameter	Units		
NAPHTHALENE	UG/KG	550 U	380 U 470 U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units	Value	Unit
	StationID	G638GW001	
	SampleID	638GW001C1	
	DateCollected	10/18/1999	
	DateAnalyzed	10/29/1999	
	LabSampleID	40774.02	
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	PG/L	7.709	U
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	PG/L	3.834	U
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	PG/L	5.399	U
1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	PG/L	13.675	U
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	PG/L	6.203	U
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	PG/L	9.207	U
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	PG/L	4.652	U
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	PG/L	10.554	U
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	PG/L	7.365	U
1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	PG/L	20.782	U
1,2,3,7,8-PENTACHLORODIBENZOFURAN	PG/L	6.69	U
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	PG/L	5.44	U
2,3,4,7,8-PENTACHLORODIBENZOFURAN	PG/L	6.764	U
2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	PG/L	6.251	U
2,3,7,8-TETRACHLORODIBENZOFURAN	PG/L	7.688	U
OCTACHLORODIBENZO-p-DIOXIN	PG/L	60.098	=
OCTACHLORODIBENZOFURAN	PG/L	6.792	U
Total Hepta-Dioxins	PG/L	7.709	U
Total Hepta-Furans	PG/L	3.834	U
Total Hexa-Dioxins	PG/L	9.207	U
Total Hexa-Furans	PG/L	4.652	U
Total Penta-Dioxins	PG/L	20.782	U
Total Penta-Furans	PG/L	6.764	U
Total Tetra-Dioxins	PG/L	6.251	U
Total Tetra-Furans	PG/L	7.688	U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

	<b>StationID</b>	G638GW001	
	<b>SampleID</b>	638GW001C1	
	<b>DateCollected</b>	10/18/1999	
	<b>DateAnalyzed</b>	11/01/1999	
	<b>LabSampleID</b>	40774.02	
<b>Parameter</b>	<b>Units</b>		
Tetryl	UG/L	0.51	U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

	<b>StationID</b>	G638GW001	
	<b>SampleID</b>	638GW001C1	
	<b>DateCollected</b>	10/18/1999	
	<b>DateAnalyzed</b>	10/21/1999	
	<b>LabSampleID</b>	40774.02	
<b>Parameter</b>	<b>Units</b>		
Hydrazine	MG/L	5	U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units		
StationID		G638GW001	
SampleID		638GW001C1	
DateCollected		10/18/1999	
DateAnalyzed		10/21/1999	
LabSampleID		40774.02	
ALUMINUM	UG/L	32.1	U
ANTIMONY	UG/L	5	U
ARSENIC	UG/L	3.3	U
BARIUM	UG/L	12.5	J
BERYLLIUM	UG/L	0.3	U
CADMIUM	UG/L	0.3	U
CALCIUM	UG/L	89900	=
CHROMIUM, TOTAL	UG/L	1.2	U
COBALT	UG/L	1.7	U
COPPER	UG/L	1.5	J
IRON	UG/L	3310	=
LEAD	UG/L	2.1	U
MAGNESIUM	UG/L	87100	=
MANGANESE	UG/L	269	=
MERCURY	UG/L	0.1	U
NICKEL	UG/L	1.1	J
POTASSIUM	UG/L	54000	=
SELENIUM	UG/L	2.9	U
SILVER	UG/L	2	U
SODIUM	UG/L	859000	=
THALLIUM	UG/L	2.3	U
Tin (Sn)	UG/L	29.5	U
VANADIUM	UG/L	1	J
ZINC	UG/L	3	U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	LabSampleID
		G638GW001	638GW001C1	10/18/1999	10/27/1999	40774.02
2,2'-OXYBIS(1-CHLORO)PROPANE	UG/L	10	U			
2-METHYLNAPHTHALENE	UG/L	10	U			
2-METHYLPHENOL (o-CRESOL)	UG/L	10	U			
PHENOL	UG/L	10	U			
bis(2-CHLOROETHYL) ETHER (2-CHLOROETHYL ETHER)	UG/L	10	U			
2-CHLOROPHENOL	UG/L	10	U			
1,3-DICHLOROBENZENE	UG/L	10	U			
1,4-DICHLOROBENZENE	UG/L	10	U			
Benzyl alcohol	UG/L	10	U			
1,2-DICHLOROBENZENE	UG/L	10	U			
N-NITROSODI-n-PROPYLAMINE	UG/L	10	U			
4-METHYLPHENOL (p-CRESOL)	UG/L	10	U			
HEXACHLOROETHANE	UG/L	10	U			
NITROBENZENE	UG/L	10	U			
ISOPHORONE	UG/L	10	U			
2-NITROPHENOL	UG/L	10	U			
2,4-DIMETHYLPHENOL	UG/L	10	U			
bis(2-CHLOROETHOXY) METHANE	UG/L	10	U			
Benzoic acid	UG/L	25	U			
2,4-DICHLOROPHENOL	UG/L	10	U			
1,2,4-TRICHLOROBENZENE	UG/L	10	U			
4-CHLOROANILINE	UG/L	10	U			
HEXACHLOROBUTADIENE	UG/L	10	U			
4-CHLORO-3-METHYLPHENOL	UG/L	10	U			
HEXACHLOROCYCLOPENTADIENE	UG/L	10	U			
2,4,6-TRICHLOROPHENOL	UG/L	10	U			
2,4,5-TRICHLOROPHENOL	UG/L	25	U			
2-CHLORONAPHTHALENE	UG/L	10	U			
2-NITROANILINE	UG/L	25	U			
ACENAPHTHYLENE	UG/L	10	U			
2,6-DINITROTOLUENE	UG/L	10	U			
3-NITROANILINE	UG/L	25	U			
ACENAPHTHENE	UG/L	10	U			
2,4-DINITROPHENOL	UG/L	25	U			
DIBENZOFURAN	UG/L	10	U			
4-NITROPHENOL	UG/L	25	U			
2,4-DINITROTOLUENE	UG/L	10	U			
FLUORENE	UG/L	10	U			
DIMETHYL PHTHALATE	UG/L	10	U			
DIETHYL PHTHALATE	UG/L	10	U			
4-CHLOROPHENYL PHENYL ETHER	UG/L	10	U			
4-NITROANILINE	UG/L	25	U			
4,6-DINITRO-2-METHYLPHENOL	UG/L	25	U			
N-NITROSODIPHENYLAMINE	UG/L	10	U			
4-BROMOPHENYL PHENYL ETHER	UG/L	10	U			
HEXACHLOROBENZENE	UG/L	10	U			

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	LabSampleID
		G638GW001	638GW001C1	10/18/1999	10/27/1999	40774.02
PENTACHLOROPHENOL	UG/L					25 U
PHENANTHRENE	UG/L					10 U
ANTHRACENE	UG/L					10 U
DI-n-BUTYL PHTHALATE	UG/L					10 U
FLUORANTHENE	UG/L					10 U
PYRENE	UG/L					10 U
BENZYL BUTYL PHTHALATE	UG/L					10 U
BENZO(a)ANTHRACENE	UG/L					10 U
3,3'-DICHLOROBENZIDINE	UG/L					10 U
CHRYSENE	UG/L					10 U
bis(2-ETHYLHEXYL) PHTHALATE	UG/L					10 U
DI-n-OCTYLPHTHALATE	UG/L					10 U
BENZO(b)FLUORANTHENE	UG/L					10 U
BENZO(k)FLUORANTHENE	UG/L					10 U
BENZO(a)PYRENE	UG/L					10 U
INDENO(1,2,3-c,d)PYRENE	UG/L					10 U
DIBENZ(a,h)ANTHRACENE	UG/L					10 U
BENZO(g,h,i)PERYLENE	UG/L					10 U

Charleston Naval Complex  
AOC 638, Zone G

09/06/2001

Parameter	Units	StationID	SampleID	DateCollected	DateAnalyzed	LabSampleID
		G638GW001	638GW001C1	10/18/1999	10/27/1999	40774.02
BENZENE	UG/L	5	U			
CHLOROMETHANE	UG/L	5	U			
TOLUENE	UG/L	5	U			
VINYL CHLORIDE	UG/L	5	U			
BROMOMETHANE	UG/L	5	U			
ETHYLBENZENE	UG/L	5	U			
CHLOROETHANE	UG/L	5	U			
1,1-DICHLOROETHENE	UG/L	5	U			
METHYLENE CHLORIDE	UG/L	5	U			
XYLENES, TOTAL	UG/L	5	U			
1,1-DICHLOROETHANE	UG/L	5	U			
NAPHTHALENE	UG/L	10	U			
CHLOROFORM	UG/L	5	U			
1,1,1-TRICHLOROETHANE	UG/L	5	U			
CARBON TETRACHLORIDE	UG/L	5	U			
1,2-DICHLOROETHANE	UG/L	5	U			
TRICHLOROETHYLENE (TCE)	UG/L	5	U			
1,2-DICHLOROPROPANE	UG/L	5	U			
BROMODICHLOROMETHANE	UG/L	5	U			
1,1,2-TRICHLOROETHANE	UG/L	5	U			
TETRACHLOROETHYLENE(PCE)	UG/L	5	U			
DIBROMOCHLOROMETHANE	UG/L	5	U			
CHLOROBENZENE	UG/L	5	U			
STYRENE	UG/L	5	U			
BROMOFORM	UG/L	5	U			
1,1,2,2-TETRACHLOROETHANE	UG/L	5	U			
ACETONE	UG/L	5	U			
CARBON DISULFIDE	UG/L	5	U			
Vinyl acetate	UG/L	5	U			
METHYL ETHYL KETONE (2-BUTANONE)	UG/L	5	U			
2-Chloroethyl vinyl ether	UG/L	5	UJ			
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	5	U			
cis-1,3-DICHLOROPROPENE	UG/L	5	U			
trans-1,3-DICHLOROPROPENE	UG/L	5	U			
2-HEXANONE	UG/L	5	U			
1,2-Dichloroethene (total)	UG/L	5	U			



## **Data Validation Report**

Ensafe  
Charleston - Zone G  
SDG#: EN033



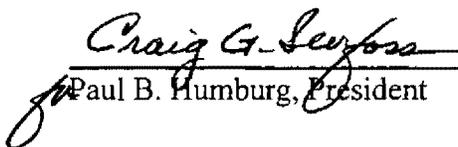
**HEARTLAND**  
ENVIRONMENTAL SERVICES, INC.

**Data Validation Report**

SDG#: EN033  
Date: January 24, 2000  
Client Name: Ensafe  
Project/Site Name: Charleston Zone G  
Date Sampled: December 15, 1999  
Number of Samples: 16 Non-Aqueous Sample(s) with 0 MS/MSD(s)  
6 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

1-31-00.  
Date

SDG# EN033

**Samples and Fractions Reviewed**

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	SVOA		MET		SPLP-MET		TOC	
024SB00501	SOIL		X		X				
024SB00502	SOIL		X		X				
024SB00601	SOIL		X		X				
024CB00601	SOIL		X		X				
024SB00602	SOIL		X		X				
024CB00602	SOIL		X		X				
024SB00701	SOIL		X		X				
024SB00702	SOIL		X		X				
638SB00501	SOIL		X		X				X
638CB00501	SOIL		X		X				X
638SB00502	SOIL		X		X				X
638CB00502	SOIL		X		X				X
638SB00601	SOIL		X						
638SB00602	SOIL		X						
638SL00701	SOIL				X				X
638SB00702	SOIL				X				X
638SB00501	WATER					X			
638CB00501	WATER					X			
638SB00502	WATER					X			
638CB00502	WATER					X			
638SB00701	WATER					X			
638SB00702	WATER					X			
Total Billable Samples (Water/Soil)		0	14	0	14	6	0	0	6

SVOA= Semivolatiles

MET= Metals

SPLP-MET= SPLP Metals

TOC= Total Organic Carbon

## DATA ASSESSMENT AND 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 SW846 Method 8270; the National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results.

#### SDG # EN033

A validation was performed on the Semivolatile Data from SDG EN033. The data was evaluated based on the following parameters.

- \* Data Completeness
- \* Holding Times
- \* GC/MS Tuning
- Calibrations
- Internal Standard Performance
- \* Blanks
- \* Surrogate Recoveries
- \* Laboratory Control Samples
- \* Matrix Spike/Matrix Spike duplicate
- Field Duplicates
- Compound Identification/Quantitation

\* - All criteria were met for this parameter

## DATA ASSESSMENT AND NARRATIVE

### SEMIVOLATILE ANALYSIS

PAGE - 2

#### Initial Calibration

The initial calibration, analyzed on 11-19-99, contained compounds with %Ds greater than 15% and less than 50%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

638SB00502	di-n-butylphthalate (23.2%)
638CB00501	benzo(b)fluoranthene (16.1%)
638SB00602	
638SB00502	
638SB00601	
638CB00501	benzo(g,h,i)perylene (16.1%)
638SB00602	

The initial calibration, analyzed on 11-08-99, contained compounds with %Ds greater than 15% and less than 50%. For the samples and non-compliant compounds listed below, qualify all positive results as estimated (J).

024CB00601	benzo(b)fluoranthene (20.0%)
024SB00701	benzo(k)fluoranthene (16.3%)
638SB00501	

#### Internal Standards

The following samples exhibited low internal standard area recoveries for perylene-d12. Qualify all associated compound results as estimated (J/UJ).

638SB00602  
024SB00702

## DATA ASSESSMENT AND NARRATIVE

### SEMIVOLATILE ANALYSIS

PAGE - 3

#### Field Duplicate

Sample 024SB00601 and duplicate sample 024CB00601 exhibited non comparable results, with RPDs greater than 50%, for the compounds listed below. Qualify all results for these compounds as estimated (J/UJ).

fluorene (200%)  
n-nitrosodiphenylamine (84%)  
phenanthrene (93%)  
anthracene (146%)  
fluoranthene (200%)  
pyrene (200%)  
benzo(a)anthracene (200%)  
chrysene (200%)  
benzo(b)fluoranthene (200%)  
benzo(k)fluoranthene (200%)  
benzo(a)pyrene (200%)

Sample 024SB00602 and duplicate sample 024CB00602 exhibited non comparable results, with RPDs greater than 50%, for the compounds listed below. Qualify all results for these compounds as estimated (J/UJ).

n-nitrosodiphenylamine (200%)  
nitrobenzene (200%)  
isophorone (200%)

#### Compound Identification/Quantitation

Do not use the E-flagged compound results for the samples listed below, in favor of the D-flagged compound results in the dilutions.

024SB00502  
024SB00602  
024CB00602  
024SB00702

Do not use sample 638SB00602DL due to unnecessary analysis.

**DATA ASSESSMENT AND NARRATIVE**

**SEMIVOLATILE ANALYSIS**

**PAGE - 4**

**System Performance and Overall Assessment**

The data as presented requires qualifications.

## **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 10X 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 10X 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 10X the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
638SB00502	di-n-butylphthalate	+	J
638CB00501 638SB00602 638SB00502 638SB00601	benzo(b)fluoranthene	+	J
638CB00501 638SB00602	benzo(g,h,i)perylene	+	J
024CB00601 024SB00701 638SB00501	benzo(b)fluoranthene benzo(k)fluoranthene	+	J
638SB00602 024SB00702	<i>All Associated compounds</i> perylene-d12	+/-	J/UJ
024SB00601 024CB00601	fluorene n-nitrosodiphenylamine phenanthrene anthracene fluoranthene pyrene benzo(a)anthracene chrysene benzo(b)fluoranthene benzo(k)fluoranthene benzo(a)pyrene	+/-	J/UJ
024SB00602 024CB00602	n-nitrosodiphenylamine nitrobenzene isophorone	+/-	J/UJ

\* 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

# SUMMARY OF DATA QUALIFICATIONS

Page 2

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
024SB00502 024SB00602 024CB00602 024SB00702	all E-flagged compounds	+	do not use
024SB00502DL 024SB00602DL 024CB00602DL 024SB00702DL	all results except D-flagged compounds	+/-	do not use
638SB00602DL	all results	+/-	do not use

\*

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 # EN033

A validation was performed on the Metals for soils and SPLP and TOC Data from SDG EN033. 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>
Barium	0.05 mg/kg	no impact
Beryllium	0.15 mg/kg	all soil samples below 0.75 mg/kg
Cadmium	0.03 mg/kg	all soil samples below 0.15 mg/kg
Calcium	13.6 mg/kg	no impact
Iron	2.92 mg/kg	no impact
Lead	0.43 mg/kg	no impact
Manganese	0.05 mg/kg	no impact

Zinc	0.31 mg/kg	no impact
Tin	3.17 mg/kg	all soil samples below 15.9 mg/kg
Zinc	2.0 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>
Aluminum	-6.10 mg/kg	no impact
Cobalt	-0.08 mg/kg	all soil samples below 0.8 mg/kg
Thallium	-0.60 mg/kg	all soil samples below 6.0 mg/kg

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 (51%) and Lead (34%) 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 recoveries for soils for Chromium (130%), Copper (129%) and Manganese (172%) were above the upper control limits (>125%). All positive results are qualified as estimated, "J".

### Matrix Duplicate results

The matrix duplicate RPD results for SPLP samples for Copper (>CRDL) was greater than one times the CRDL and the RPD gfor soils for Lead (59%) was greater than 35%.. All positive results are qualified as estimated, "J". The difference for soils for Aluminum (24%), Chromium (25%), Lead (24%) and Zinc (29%) were not greater than 35% and will not be qualified for soils.

### Field Duplicate RPD results

The RPD for field duplicate samples 638SB00501 and 638CB00501(soils only) for Lead (81%) was greater than 50%. The RPD for field duplicate samples 638SB00501 and 638CB00501 (SPLP samples only) for Aluminum (100%) and Iron (98%) were greater than 35%. All positive and non-detect results are qualified as estimated, "J" or "UJ".

## Serial Dilution recovery results

The serial dilution results for SPLP samples for Magnesium and for soils for Copper, Magnesium, Zinc and Potassium were 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 soil samples below 0.75 mg/kg	Be.	+	U
all soil samples below 0.15 mg/kg	Cd.		
all soil samples below 15.9 mg/kg	Sn.		
all soil samples below 0.8 mg/kg	Co.	+/U	J/UJ
all soil samples below 6.0 mg/kg	Tl.		
all soil samples	Sb and Pb.	+/U	J/UJ
all soil samples	Cr, Cu and Mn.	+	J
all SPLP samples	Cu.	+	J
all soil samples	Pb.		
all SPLP samples	Mg	+	J
all soil samples	Cu, Mg, Zn and K.		
638SB00501/638CB00501	Pb.	+/U	J/UJ
638SB00501/638CB00501	Al and Fe.		
all "B" results	all analytes	B	J

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912369  
SDG No. : EN033  
Date of Report: January 17, 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>
024SB00501	9912369-01	ABN/MET
024SB00502	9912369-02	ABN/MET
024SB00601	9912369-03	ABN/MET
024SB00603 CB00601 P	9912369-04	ABN/MET
024SB00602	9912369-05	ABN/MET
024SB00604 CB00602 P	9912369-06	ABN/MET
024SB00701	9912369-07	ABN/MET
024SB00702	9912369-08	ABN/MET
638SB00501	9912369-09	ABN/MET/TOC
638SB00503 CB00501 P	9912369-10	ABN/MET/TOC
638SB00502	9912369-11	ABN/MET/TOC
638SB00504 CB00502 P	9912369-12	ABN/MET/TOC
638SB00601	9912369-13	ABN
638SB00602	9912369-14	ABN
638SB00701	9912369-15	MET/TOC
638SB00702	9912369-16	MET/TOC
638SB00501 SPLP	9912369-17	SPLP
638SB00503 SPLP CB00501 P	9912369-18	SPLP
638SB00502 SPLP	9912369-19	SPLP
638SB00504 SPLP CB00502 P	9912369-20	SPLP
638SB00701 SPLP	9912369-21	SPLP
638SB00702 SPLP	9912369-22	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)

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### Sample Receipt Comments:

The metals analysis for the first 8 samples was added on 12/21/1999 as per Fred Erdmann.

### 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 sub-set 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  
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.

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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/ $\mu$ L injected respectively.

##### Sample Analyses:

Analyses of the extracts for sample 024SB00702 and 638SB00602 yielded internal standard area responses for perylene-d12 which fell below the lower control limit due to severe matrix interference. Corrective action in the form of extract dilution and reanalysis was performed. Reanalysis yielded all internal standard areas within control for the extract analysis of sample 024SB00702 and confirmed the matrix interference for extract sample 638SB00602. Data from both analyses have been submitted with this data package.

##### Quality Control Analyses:

MS/MSD analyses were performed on sample 638SB00501. 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.

##### Reporting Limits:

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

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

**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  $\mu$ L to 100 mL with 2% HNO<sub>3</sub>. The calibration curve is made by placing 0, 20, 50, 100, 200, 500 and 1000  $\mu$ L 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  $\mu$ g/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

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### ICP Metals(Soil):

The matrix spike sample percent recoveries of antimony, chromium and lead were outside of the established control limits of 75-125% for sample 024SB00501. The LCS percent recoveries for antimony, chromium and lead were within control limits. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The matrix spike sample percent recoveries of copper, lead and manganese were outside of the established control limits of 75-125% for sample 638SB00503. The LCS percent recoveries for copper, lead and manganese were within control limits. 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, chromium and lead were outside the control limits of  $\pm 20\%$  for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "" on Forms I and VI.

The duplicate sample relative percent differences of lead and zinc were outside the control limits of  $\pm 20\%$  for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "" on Forms I and VI.

The serial dilution for copper, magnesium and zinc did not agree within 10% of the original determination after correction for dilution for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

The serial dilution for magnesium and potassium did not agree within 10% of the original determination after correction for dilution for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

### Mercury(Soil):

No comments.

### Metals (SPLP):

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

The duplicate sample relative percent differences of copper was outside the control limits of  $\pm 20\%$  for sample 638SB00504. 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 638SB00504. No further corrective action was

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

**Total Organic Carbon:**

No comments.

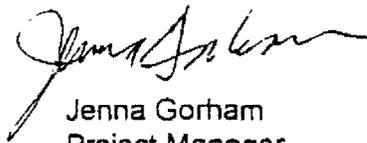
**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

RELEASE OF DATA

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature."

Respectfully submitted,

  
Jenna Gorham  
Project Manager

  
Mike Nelson  
Technical Director

17 Jan 2000  
(DATE)

17 Jan 2000  
(DATE)

**HOW TO CONTACT US:**

All Laucks Testing Laboratories staff members can be reached at the same telephone and facsimile numbers: (206) 767-5060 by phone, (206) 767-5063 by FAX.

**REQUESTS FOR DUPLICATE COPIES:**

This packet has been checked for accuracy. All pages are present and in sequential order. Please see Attachment B for a detailed record.

In the event that duplicate data copies are needed, Laucks will accommodate your request at a fee of twenty-five cents (\$0.25) per copy, plus shipping. If the data are in storage, there will also be a fee for retrieval.





# 4412364

EM 3

PAGE 1 OF 1

PROJECT/JOB NO: 29070 084240

# CHAIN OF CUSTODY RECORD

COC NO: \_\_\_\_\_

PO NO: 1840 62

REL NO: 38

LAB NAME: LANCUS

800-588-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT: Navy Clean CNC PROJECT MANAGER: T. Havens  
LOCATION: Zone G / AOC 63F TELE/FAX NO.: (843) 884-0029  
SAMPLERS: (SIGNATURE) William Bernick

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
	SVOCs	Metals	SPLP Metals	TOC	
4	✓	✓	✓	✓	
4	✓	✓	✓	✓	Dup for 01
4	✓	✓	✓	✓	
4	✓	✓	✓	✓	Dup for 02
1	✓				
1	✓				
3		✓	✓	✓	offered to 001
3		✓	✓	✓	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	SVOCs	Metals	SPLP Metals	TOC	REMARKS
					TEMP.	CHEMICAL						
NBCG/6385B00501	11/15/99	1120	S	Glass 8 oz	Ice	None	4	✓	✓	✓	✓	
NBCG/6385B00502	"	1120	S	"	"	"	4	✓	✓	✓	✓	Dup for 01
NBCG/6385B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓	
NBCG/6385B00504	"	1130	S	"	"	"	4	✓	✓	✓	✓	Dup for 02
NBCG/6385B00601	"	1205	S	"	"	"	1	✓				
NBCG/6385B00602	"	1215	S	"	"	"	1	✓				
NBCG/6385B00701	"	1500	S	"	"	"	3		✓	✓	✓	offered to 001
NBCG/6385B00702	"	1510	S	"	"	"	3		✓	✓	✓	

RELINQUISHER: <u>Fred Erdman</u>	DATE: _____	RECEIVER: <u>Mike Baxter</u>	DATE: 12/16	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: Fred Erdman	TIME: _____	PRINTED: Mike Baxter	TIME: 9:15	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: EnSafe		COMPANY: Lanch's Lab		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp.  
SHIPMENT NO. 814795922636  
SEND RESULTS TO: Charles Verney

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912369  
SDG No. : EN033  
Date of Report: January 17, 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>
024SB00501	9912369-01	ABN/MET
024SB00502	9912369-02	ABN/MET
024SB00601	9912369-03	ABN/MET
024SB00603 <i>CB00601 P</i>	9912369-04	ABN/MET
024SB00602	9912369-05	ABN/MET
024SB00604 <i>CB00602 P</i>	9912369-06	ABN/MET
024SB00701	9912369-07	ABN/MET
024SB00702	9912369-08	ABN/MET
638SB00501	9912369-09	ABN/MET/TOC
638SB00503 <i>CB00501 P</i>	9912369-10	ABN/MET/TOC
638SB00502	9912369-11	ABN/MET/TOC
638SB00504 <i>CB00502 P</i>	9912369-12	ABN/MET/TOC
638SB00601	9912369-13	ABN
638SB00602	9912369-14	ABN
638SB00701	9912369-15	MET/TOC
638SB00702	9912369-16	MET/TOC
638SB00501 SPLP	9912369-17	SPLP
638SB00503 <i>CB00501 P</i>	9912369-18	SPLP
638SB00502 SPLP	9912369-19	SPLP
638SB00504 <i>CB00502 P</i>	9912369-20	SPLP
638SB00701 SPLP	9912369-21	SPLP
638SB00702 SPLP	9912369-22	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)

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

**Sample Receipt Comments:**

The metals analysis for the first 8 samples was added on 12/21/1999 as per Fred Erdmann.

**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 sub-set 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  
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.

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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/ $\mu$ L injected respectively.

##### Sample Analyses:

Analyses of the extracts for sample 024SB00702 and 638SB00602 yielded internal standard area responses for perylene-d12 which fell below the lower control limit due to severe matrix interference. Corrective action in the form of extract dilution and reanalysis was performed. Reanalysis yielded all internal standard areas within control for the extract analysis of sample 024SB00702 and confirmed the matrix interference for extract sample 638SB00602. Data from both analyses have been submitted with this data package.

##### Quality Control Analyses:

MS/MSD analyses were performed on sample 638SB00501. 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.

##### Reporting Limits:

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

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

**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% HNO<sub>3</sub>. 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

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### ICP Metals(Soil):

The matrix spike sample percent recoveries of antimony, chromium and lead were outside of the established control limits of 75-125% for sample 024SB00501. The LCS percent recoveries for antimony, chromium and lead were within control limits. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The matrix spike sample percent recoveries of copper, lead and manganese were outside of the established control limits of 75-125% for sample 638SB00503. The LCS percent recoveries for copper, lead and manganese were within control limits. 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, chromium and lead were outside the control limits of  $\pm 20\%$  for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "\*" on Forms I and VI.

The duplicate sample relative percent differences of lead and zinc were outside the control limits of  $\pm 20\%$  for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "\*" on Forms I and VI.

The serial dilution for copper, magnesium and zinc did not agree within 10% of the original determination after correction for dilution for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

The serial dilution for magnesium and potassium did not agree within 10% of the original determination after correction for dilution for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

### Mercury(Soil):

No comments.

### Metals (SPLP):

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

The duplicate sample relative percent differences of copper was outside the control limits of  $\pm 20\%$  for sample 638SB00504. 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 638SB00504. No further corrective action was

**LAUCKS TESTING LABORATORIES**

940 S. Hamey  
Seattle, WA 98108

required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

**Total Organic Carbon:**

No comments.

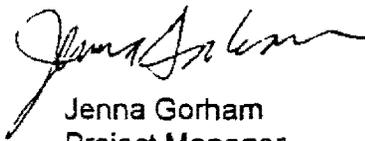
**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

RELEASE OF DATA

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature."

Respectfully submitted,



Jenna Gorham  
Project Manager



Mike Nelson  
Technical Director

17 Jan 2000  
(DATE)

17 Jan 2000  
(DATE)

*HOW TO CONTACT US:*

All Laucks Testing Laboratories staff members can be reached at the same telephone and facsimile numbers: (206) 767-5060 by phone, (206) 767-5063 by FAX.

*REQUESTS FOR DUPLICATE COPIES:*

This packet has been checked for accuracy. All pages are present and in sequential order. Please see Attachment B for a detailed record.

In the event that duplicate data copies are needed, Laucks will accommodate your request at a fee of twenty-five cents (\$0.25) per copy, plus shipping. If the data are in storage, there will also be a fee for retrieval.







# CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 29070010547001  
 COC NO: 1540  
 PG NO: 38  
 REL NO: 38  
 LAB NAME: Lancis

800-588-7982  
 MEMPHIS, TENNESSEE  
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
 RALEIGH, NC; COLOGNE, GERMANY

CLIENT: Navy Clean CNC PROJECT MANAGER: T. HAVENHIST  
 LOCATION: Zone G / AOC 646 TELE/FAX NO.: (543) 884-0029  
 SAMPLERS: (SIGNATURE) William Herrick

NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
	SVCC's	Metals	SPLP Metals	TOC	Pesticides	
1	✓					
2	✓					
3	✓					
4	✓					
5	4	✓	✓	✓	✓	offset to 002
6	4	✓	✓	✓	✓	"
7	4	✓	✓	✓	✓	offset to 001
8	4	✓	✓	✓	✓	"
9	4	✓	✓	✓	✓	offset to 004
10	4	✓	✓	✓	✓	"
11	4	✓	✓	✓	✓	offset to 003
12	4	✓	✓	✓	✓	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION											
					TEMP	CHEMICAL										
1 NBCG/646 SB00501	12/16/99	0955	S	Glass/8 oz	Ice	None	1	✓								
2 NBCG/646 SB00502	"	1000	"	"	"	"	1	✓								
3 NBCG/646 SB00601	"	1010	"	"	"	"	1	✓								
4 NBCG/646 SB00602	"	1015	"	"	"	"	1	✓								
5 NBCG/646 SB00701	"	1030	"	"	"	"	4	✓	✓	✓	✓	✓				offset to 002
6 NBCG/646 SB00702	"	1035	"	"	"	"	4	✓	✓	✓	✓	✓				"
7 NBCG/646 SB00801	"	1050	"	"	"	"	4	✓	✓	✓	✓	✓				offset to 001
8 NBCG/646 SB00802	"	1055	"	"	"	"	4	✓	✓	✓	✓	✓				"
9 NBCG/646 SB00901	"	1115	"	"	"	"	4	✓	✓	✓	✓	✓				offset to 004
10 NBCG/646 SB00902	"	1120	"	"	"	"	4	✓	✓	✓	✓	✓				"
11 NBCG/646 SB01001	"	1135	"	"	"	"	4	✓	✓	✓	✓	✓				offset to 003
12 NBCG/646 SB01002	"	1145	"	"	"	"	4	✓	✓	✓	✓	✓				

RELINQUISHER: Fred Erdmann DATE: 12/14/99 TIME: 1550 COMPANY: EnSate  
 RECEIVER: Charles Christenson DATE: 12/17/99 TIME: 0830 COMPANY: L.A.V.C.I.S.

METHOD OF SHIPMENT: Fed Exp  
 SHIPMENT NO: 814 795 922-603  
 SEND RESULTS TO: Charles Veeney

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

**ICP Metals (Soils):**

The matrix spike sample percent recoveries of antimony and lead were outside of the established control limits of 75-125% for sample 646SB00701. The LCS percent recoveries for antimony and lead were within control limits. 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, calcium and manganese were outside the control limits of  $\pm 20\%$  for sample 646SB00701. No further corrective action was required. All relevant data have been flagged with an "D" 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 646SB00701. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

**Mercury (Soils):**

No comments.

**Metals (SPLP):**

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

The serial dilution for barium did not agree within 10% of the original determination after correction for dilution for sample 646SB00902. 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.

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

**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% HNO<sub>3</sub>. 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

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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 initial calibration. The standards concentrations were 5, 10, 25, 40, 60 and 80 µg/L injected respectively.

#### Quality Control Analyses:

MS/MSD analyses were performed on sample 646SB00501. Several analyte recoveries from the MSD analysis fell below the lower control limits. Since all analyte recoveries were in control in the MS and the associated blank spike, no corrective action was taken.

#### 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.

#### Reporting Limits:

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

### Pesticides Fraction:

#### Initial Calibration Standards:

Analyses of the initial calibration standards yielded a %RSD value for alpha-BHC which exceeded 20 percent on both columns. However, since the average %RSD for all compounds was below 20 percent, the initial calibration is compliant in accordance with SW 846. Since alpha-BHC was not detected in any of the sample extracts, no further action was taken.

#### Continuing Calibration Verification Analyses:

Analyses of CCV files DC28920.d, DC28926.d and D0103023.d yielded %D values for the surrogates, decachlorobiphenyl and tetrachloro-m-xylene, and the target analytes, gamma-BHC and heptachlor epoxide which exceeded the control limit due to an increase in response. However, since the %Ds for all compounds were in control on one of the two columns and there were no target analytes detected in any of the sample extracts, no further action was taken.

#### Surrogate Recoveries:

Analysis of the extract for sample 646SB01002 yielded a recovery value for tetrachloro-m-xylene which exceeded the control limit. Corrective action was taken in the form of sample re-extraction and reanalysis. Reanalysis of the sample extract yielded all surrogate recovery values in control. Since the sample was re-extracted within holding time, only data from the re-extract were submitted.

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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  
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.

### *Pesticides:*

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.

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

646SB01002 SPLP	9912406-30	SPLP
634SB00401 SPLP	9912406-31	SPLP
634SB00402 SPLP	9912406-32	SPLP
634SB00501 SPLP	9912406-33	SPLP
634SB00502 SPLP	9912406-34	SPLP
634SB00601 SPLP	9912406-35	SPLP
638SB00801 SPLP	9912406-36	SPLP
638SB00802 SPLP	9912406-37	SPLP
638SB00901 SPLP	9912406-38	SPLP

## Analytical Request Key:

ABN =	Semi-Volatile Organics (8270C)
PEST =	Pesticides (8081A)
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 12/16/1999. One jar was received with no sample ID on the label. The correct ID of 646SB00702 was matched using the sample time and test indicated on the container. 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 sub-set 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."

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912406  
SDG No. : EN034  
Date of Report: January 14, 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>
646SB00501	9912406-01	ABN
646SB00502	9912406-02	ABN
646SB00601	9912406-03	ABN
646SB00602	9912406-04	ABN
646SB00701	9912406-05	PEST/MET/TOC
646SB00702	9912406-06	PEST/MET/TOC
646SB00801	9912406-07	PEST/MET/TOC
646SB00802	9912406-08	PEST/MET/TOC
646SB00901	9912406-09	PEST/MET/TOC
646SB00902	9912406-10	PEST/MET/TOC
646SB01001	9912406-11	PEST/MET/TOC
646SB01002	9912406-12	PEST/MET/TOC
638SB00902 SPLP	9912406-13	SPLP
634SB00401	9912406-14	MET/TOC
634SB00402	9912406-15	MET/TOC
624SB00501	9912406-16	MET/TOC
634SB00502	9912406-17	MET/TOC
634SB00601	9912406-18	MET/TOC
638SB00801	9912406-19	MET/TOC
638SB00802	9912406-20	MET/TOC
638SB00901	9912406-21	MET/TOC
638SB00902	9912406-22	MET/TOC
646SB00701 SPLP	9912406-23	SPLP
646SB00702 SPLP	9912406-24	SPLP
646SB00801 SPLP	9912406-25	SPLP
646SB00802 SPLP	9912406-26	SPLP
646SB00901 SPLP	9912406-27	SPLP
646SB00902 SPLP	9912406-28	SPLP
646SB01001 SPLP	9912406-29	SPLP



99124.0 ENK34

# CHAIN OF CUSTODY RECORD

PAGE 1 OF 1  
 PROJECT/JOB NO: 290700 842000  
 COC NO: 01  
 PO NO: 1540  
 REL NO: 38  
 LAB NAME: Lancers

800-588-7982  
 MEMPHIS, TENNESSEE  
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; NASHVILLE, TN;  
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
 RALEIGH, NC; COLOGNE, GERMANY

CLIENT Navy Clean CNC PROJECT MANAGER T. Haverkort  
 LOCATION Zone G / AOC 646 TELE/FAX NO. (543) 554-0029  
 SAMPLERS: (SIGNATURE) William Herrick

ANALYSIS REQUIRED										REMARKS
NO. OF CONTAINERS	SVCC's	Metals	SPLP Metals	TOC	Pesticides					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION															
					TEMP.	CHEMICAL														
1 NBCG/646 SB00501	12/16/99	0955	S	Glass/8 oz	Ice	None	1	✓												
2 NBCG/646 SB00502	"	1000	"	"	"	"	1	✓												
3 NBCG/646 SB00601	"	1010	"	"	"	"	1	✓												
4 NBCG/646 SB00602	"	1015	"	"	"	"	1	✓												
5 NBCG/646 SB00701	"	1030	"	"	"	"	4	✓	✓	✓	✓	✓								offset to 002
6 NBCG/646 SB00702	"	1035	"	"	"	"	4	✓	✓	✓	✓	✓								"
7 NBCG/646 SB00801	"	1050	"	"	"	"	4	✓	✓	✓	✓	✓								offset to 001
8 NBCG/646 SB00802	"	1055	"	"	"	"	4	✓	✓	✓	✓	✓								"
9 NBCG/646 SB00901	"	1115	"	"	"	"	4	✓	✓	✓	✓	✓								offset to 004
10 NBCG/646 SB00902	"	1120	"	"	"	"	4	✓	✓	✓	✓	✓								"
11 NBCG/646 SB01001	"	1135	"	"	"	"	4	✓	✓	✓	✓	✓								offset to 003
12 NBCG/646 SB01002	"	1145	"	"	"	"	4	✓	✓	✓	✓	✓								

RELINQUISHER: <u>Fred Erdmann</u> DATE: <u>12/16/99</u> TIME: <u>1550</u> COMPANY: <u>EnSate</u>	RECEIVER: <u>Charles Christensen</u> DATE: <u>12/17/99</u> TIME: <u>0830</u> COMPANY: <u>LAVICS</u>	RELINQUISHER: _____ DATE: _____ TIME: _____ COMPANY: _____	RECEIVER: _____ DATE: _____ TIME: _____ COMPANY: _____
---	--	---	---

METHOD OF SHIPMENT: Fed Ex  
 SHIPMENT NO: 814 795 922 603  
 SEND RESULTS TO: Charles Verry

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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 initial calibration. The standards concentrations were 5, 10, 25, 40, 60 and 80 µg/L injected respectively.

#### Quality Control Analyses:

MS/MSD analyses were performed on sample 646SB00501. Several analyte recoveries from the MSD analysis fell below the lower control limits. Since all analyte recoveries were in control in the MS and the associated blank spike, no corrective action was taken.

#### 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.

#### Reporting Limits:

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

### Pesticides Fraction:

#### Initial Calibration Standards:

Analyses of the initial calibration standards yielded a %RSD value for alpha-BHC which exceeded 20 percent on both columns. However, since the average %RSD for all compounds was below 20 percent, the initial calibration is compliant in accordance with SW 846. Since alpha-BHC was not detected in any of the sample extracts, no further action was taken.

#### Continuing Calibration Verification Analyses:

Analyses of CCV files DC28920.d, DC28926.d and D0103023.d yielded %D values for the surrogates, decachlorobiphenyl and tetrachloro-m-xylene, and the target analytes, gamma-BHC and heptachlor epoxide which exceeded the control limit due to an increase in response. However, since the %Ds for all compounds were in control on one of the two columns and there were no target analytes detected in any of the sample extracts, no further action was taken.

#### Surrogate Recoveries:

Analysis of the extract for sample 646SB01002 yielded a recovery value for tetrachloro-m-xylene which exceeded the control limit. Corrective action was taken in the form of sample re-extraction and reanalysis. Reanalysis of the sample extract yielded all surrogate recovery values in control. Since the sample was re-extracted within holding time, only data from the re-extract were submitted.

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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  
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 1. 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.

### *Pesticides:*

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.

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

646SB01002 SPLP	9912406-30	SPLP
634SB00401 SPLP	9912406-31	SPLP
634SB00402 SPLP	9912406-32	SPLP
634SB00501 SPLP	9912406-33	SPLP
634SB00502 SPLP	9912406-34	SPLP
634SB00601 SPLP	9912406-35	SPLP
638SB00801 SPLP	9912406-36	SPLP
638SB00802 SPLP	9912406-37	SPLP
638SB00901 SPLP	9912406-38	SPLP

## Analytical Request Key:

ABN =	Semi-Volatile Organics (8270C)
PEST =	Pesticides (8081A)
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 12/16/1999. One jar was received with no sample ID on the label. The correct ID of 646SB00702 was matched using the sample time and test indicated on the container. 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 sub-set 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."

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912406  
SDG No. : EN034  
Date of Report: January 14, 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>
646SB00501	9912406-01	ABN
646SB00502	9912406-02	ABN
646SB00601	9912406-03	ABN
646SB00602	9912406-04	ABN
646SB00701	9912406-05	PEST/MET/TOC
646SB00702	9912406-06	PEST/MET/TOC
646SB00801	9912406-07	PEST/MET/TOC
646SB00802	9912406-08	PEST/MET/TOC
646SB00901	9912406-09	PEST/MET/TOC
646SB00902	9912406-10	PEST/MET/TOC
646SB01001	9912406-11	PEST/MET/TOC
646SB01002	9912406-12	PEST/MET/TOC
638SB00902 SPLP	9912406-13	SPLP
634SB00401	9912406-14	MET/TOC
634SB00402	9912406-15	MET/TOC
624SB00501	9912406-16	MET/TOC
634SB00502	9912406-17	MET/TOC
634SB00601	9912406-18	MET/TOC
638SB00801	9912406-19	MET/TOC
638SB00802	9912406-20	MET/TOC
638SB00901	9912406-21	MET/TOC
638SB00902	9912406-22	MET/TOC
646SB00701 SPLP	9912406-23	SPLP
646SB00702 SPLP	9912406-24	SPLP
646SB00801 SPLP	9912406-25	SPLP
646SB00802 SPLP	9912406-26	SPLP
646SB00901 SPLP	9912406-27	SPLP
646SB00902 SPLP	9912406-28	SPLP
646SB01001 SPLP	9912406-29	SPLP

## SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples below 0.5 mg/kg	Be.	+	U
all soil samples below 0.25 mg/kg	Cd.		
all soil samples below 11.6 mg/kg	Sn.		
all SPLP samples below 12.0 ug/l	Sb.		
all SPLP samples below 1.5 ug/l	Cd.		
all SPLP samples below 3.0 ug/l	Mn.		
all soil samples below 0.8 mg/kg	Co.	+/U	J/UJ
all soil samples below 7.7 mg/kg	Tl.		
all SPLP samples below 8.0 ug/l	Co.		
all SPLP samples below 48.0 ug/l	Tl.		
all soil samples	Sb.	+/U	J/UJ
all soil samples	Pb.	+	J
all soil samples	Mg.	+	J
all SPLP samples	Ba.		
all "B" results	all analytes	B	J

Zinc	0.25 mg/kg	no impact
Tin	2.31 mg/kg	all soil samples below 11.6 mg/kg
Antimony	2.4 ug/l	all SPLP samples below 12.0 ug/l
Barium	0.3 ug/l	no impact
Cadmium	0.3 ug/l	all SPLP samples below 1.5 ug/l
Manganese	0.6 ug/l	all SPLP samples below 3.0 ug/l
Zinc	2.6 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>
Cobalt	-0.08 mg/kg	all soil samples below 0.8 mg/kg
Thallium	-0.77 mg/kg	all soil samples below 7.7 mg/kg
Calcium	-36.2 ug/l	no impact
Cobalt	-0.80 ug/l	all SPLP samples below 8.0 ug/l
Thallium	-4.8 ug/l	all SPLP samples below 48.0 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 recovery for soils for Antimony (47%) was 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 Lead (178%) was above the upper control limits (>125%). All positive results are qualified as estimated, "J".

### Matrix Duplicate results

The differences for soils for Aluminum (20%), Calcium (25%) and Manganese (34%) was not greater than 35% and will not be qualified for soils.

### Serial Dilution recovery results

The serial dilution results for soils for Magnesium and for SPLP samples for Barium were 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.

# 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 # EN034

A validation was performed on the Metals for soils and SPLP and TOC Data from SDG EN034. 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>
Barium	0.06 mg/kg	no impact
Beryllium	0.10 mg/kg	all soil samples below 0.5 mg/kg
Cadmium	0.05 mg/kg	all soil samples below 0.25 mg/kg
Chromium	0.18 mg/kg	no impact
Iron	2.36 mg/kg	no impact
Lead	0.35 mg/kg	no impact
Manganese	0.04 mg/kg	no impact

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
------------------	--------------------	-----------	-----------

NO QUALIFICATIONS WERE 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

## **GLOSSARY OF DATA QUALIFIERS**

### **QUALIFICATION CODES**

**U** = Not detected

**J** = Estimated value

**UJ** = Reported quantitation limit is qualified as estimated

**NJ** = Result is considered presumptively present at an estimated concentration

**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 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 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 the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

# DATA ASSESSMENT NARRATIVE

## PESTICIDES

### 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 performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081A; the National Functional Guidelines for Organic 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.

### SDG # EN034

A validation was performed on the Pesticide Data from SDG EN034. The data was evaluated based on the following parameters:

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

\* - All criteria were met for this parameter.

### System Performance and Overall Assessment

The data did not require qualifications.

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
------------------	--------------------	-----------	-----------

NO QUALIFICATIONS WERE 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

## **GLOSSARY OF DATA QUALIFIERS**

### **QUALIFICATION CODES**

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

### **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.

# 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 8270C for GC/MS Semivolatiles; the National Functional Guidelines for Organic Data Validation, 2/94, 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 # EN034

A validation was performed on the Semivolatile Data from SDG EN034. The data was evaluated based on the following parameters:

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

\* - All criteria were met for this parameter.

### System Performance and Overall Assessment

The data, as reported, did not require qualifications.

## **DATA ASSESSMENT NARRATIVES**

SDG# EN034

**Samples and Fractions Reviewed**

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	SVOA	P/P	MET	SPLP-MET	TOC					
634SB00401	SOIL			X		X					
634SB00402	SOIL			X		X					
634SB00501	SOIL			X		X					
634SB00502	SOIL			X		X					
634SB00601	SOIL			X		X					
638SB00801	SOIL			X		X					
638SB00802	SOIL			X		X					
638SB00901	SOIL			X		X					
638SB00902	SOIL			X		X					
646SB00501	SOIL	X									
646SB00502	SOIL	X									
646SB00601	SOIL	X									
646SB00602	SOIL	X									
646SB00701	SOIL		X	X		X					
646SB00702	SOIL		X	X		X					
646SB00801	SOIL		X	X		X					
646SB00802	SOIL		X	X		X					
646SB00901	SOIL		X	X		X					
646SB00902	SOIL		X	X		X					
646SB01001	SOIL		X	X		X					
646SB01002	SOIL		X	X		X					
634SB00401	WATER				X						
634SB00402	WATER				X						
634SB00501	WATER				X						
634SB00502	WATER				X						
634SB00601	WATER				X						
638SB00801	WATER				X						
638SB00802	WATER				X						
638SB00901	WATER				X						
638SB00902	WATER				X						
646SB00701	WATER				X						
646SB00702	WATER				X						
646SB00801	WATER				X						
646SB00802	WATER				X						
646SB00901	WATER				X						
646SB00902	WATER				X						
646SB01001	WATER				X						
646SB01002	WATER				X						
Total Billable Samples (Water/Soil)		0	4	0	8	0	17	17	0	0	17

SVOA= Semivolatiles  
P/P= Pesticides/PCBs  
MET= Metals  
SPLP-MET= SPLP Metals  
TOC= Total Organic Carbon



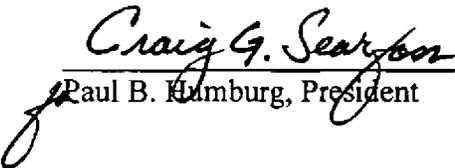
**HEARTLAND**  
ENVIRONMENTAL SERVICES, INC.

**Data Validation Report**

SDG#: EN034  
Date: January 24, 2000  
Client Name: Ensafe  
Project/Site Name: Charleston Zone G  
Date Sampled: December 16, 1999  
Number of Samples: 21 Non-Aqueous Sample(s) with 0 MS/MSD(s)  
17 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, Pesticides/PCBs, 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. Hamburg, President

1-27-00.  
\_\_\_\_\_  
Date

## **Data Validation Report**

Ensafe  
Charleston - Zone G  
SDG#: EN034



# CHAIN OF CUSTODY RECORD

PAGE 2 OF 2

PROJECT/JOB NO: 2907-001-0120-0  
COC NO: \_\_\_\_\_  
PO NO: 4  
REL NO: 139  
LAB NAME: SWL

JAN-26-2000

10:19

EN SAFE, INC.

803 856 0107

P.03/03

800-588-7167  
MEMPHIS, TENNESSEE  
LITTON, KS; CHICAGO, ILL; DALLAS, TX; JACKSON, TN; ANDREWS, TX;  
ST. LOUIS, MO; NASHVILLE, TN; NORFOLK, VA; PHOENIX, AZ; PORTLAND, ME;  
MILWAUKEE, WI; COLOGNE, GERMANY

CLIENT: Naval Base Charleston PROJECT MANAGER: Charlie Vernay  
LOCATION: Zone G TELE/FAX NO.: 843-984-0529  
SAMPLERS: (SIGNATURE) [Signature]

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS		ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL	SVOC	MCFAIS		
CG 1205B01302	01-25-00	1557	S	4oz. JARS	4°C	None	2	X		
CG 638SB01101		1626					2	X		
CG 638SB01102		1633					2	X		
CG 638SB01001		1645					2	X		
CG 638SB01002		1653					2	X		
CG 638SB00601		1713					2		X	
CG 638SB00602		1721					2		X	

ISSUED BY: <u>Rachel M. White</u>	DATE: <u>1-25-00</u>	RECEIVED BY: _____	DATE: _____
BY: <u>EnSafe</u>	TIME: <u>1755</u>	PRINTED: _____	TIME: _____
COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____

MODE OF SHIPMENT: Fed Ex  
 SHIPMENT NO.: 4849147870  
 RESULTS TO: Charlie Vernay

COMMENTS: \_\_\_\_\_



800-348-7942  
MEMPHIS, TENNESSEE

CHARLESTON, SC; CHICAGO, IL; DALLAS, TX; JACKSONVILLE, FL; KNOXVILLE, TN;  
LAVENGER, VA; NASHVILLE, TN; NORFOLK, VA; PHOENIX, AZ; PORTLAND, ME;  
RALEIGH, NC; RICHMOND, VA; WASHINGTON, DC

# CHAIN OF CUSTODY RECORD

PAGE 1 OF 2

PROJECT/JOB NO: 2907-051-09420

COC NO: \_\_\_\_\_

PO NO: 4

REL NO: 139

LAB NAME: SWL

CLIENT Naval Base Charleston

PROJECT MANAGER Charlie Vernoy

LOCATION Zone G

TELE/FAX NO. 803-994-0229

SAMPLERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED

NO. OF CONTAINERS  
Metals  
SVOC

REMARKS

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS			REMARKS
					TEMP.	CHEMICAL	Metals	SVOC		
NBCG6435B02101	11-25-03	1035	S	4 OZ. JARS	4°C	None	2	X	X	
NBCG6435B02102		1041					2	X	X	
NBCG6435B02701		1105					2	X	X	
NBCG6435B02702		1110					2	X	X	
NBCG6435B02601		1135					2	X	X	
NBCG6435B02602		1141					2	X	X	
NBCG6435B02501		1200					2	X	X	
NBCG6435B02502		1208					2	X	X	
NBCG6435B01401		1221					2	X		
VBCG1205B01601		1500					2	X		
NBCG1205B01602		1505					2	X		
NBCG1205B01501		1516					2	X		
NBCG1205B01502		1519					2	X		
NBCG1205B01401		1530					2	X		
NBCG1205B01402		1535					2	X		
NBCG1205B01301		1550					2	X		

RELINQUISHER: <u>Rachel M. White</u>	DATE: <u>1-25-03</u>	RECEIVER: _____	DATE: _____
WITNESSED: <u>Rachel M. White</u>	TIME: <u>1755</u>	PRINTED: _____	TIME: _____
ORGANIZATION: <u>EnSafe</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fed Ex

SHIPMENT NO. 4849147870

SEND RESULTS TO: Charlie Vernoy

COMMENTS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

JAN-26-2000 10:15 EN SAFE, INC. B03 B56 0107 P.02/03



# CHAIN OF CUSTODY RECORD

PAGE 2 OF 2

PROJECT/JOB NO: 2907-001-L-420-0  
COC NO: \_\_\_\_\_  
PO NO: 4  
REL NO: 139  
LAB NAME: SWL

800-388-7827  
MEMPHIS, TENNESSEE  
WILSONVILLE, OREGON; DALLAS, TX; JACKSON, TN; ANCHORAGE, AK  
ASTORIA, OR; HARTFORD, CT; NORFOLK, VA; ANDOVER, MA; PENSACOLA, FL  
MILWAUKEE, WISCONSIN; GERMANY

CLIENT: Naval Base Charleston PROJECT MANAGER: Charlie Vernay  
LOCATION: Zone G TELE/FAX NO.: 843-984-0229  
AMPLIFIERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED	
NO. OF CONTAINERS	
SVOC	
Metals	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	SVOC	Metals	REMARKS
					TEMP.	CHEMICAL				
3CG1205001302	01-25-00	1557	S	4oz. JARS	4°C	None	2	X		
1CG6385B01101		1626					2	X		
CG6385B01102		1633					2	X		
CG6385B01001		1645					2	X		
CG6385B01002		1653					2	X		
3CG6385B00601		1713					2	X		
CG6385B00602		1721					2	X		

*Rachel M. White*  
*1-25-00*

ISSUED BY: <u>Rachel M. White</u>	DATE: <u>1-25-00</u>	RECEIVER: _____	DATE: _____	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
BY: <u>EnSafe</u>	TIME: <u>1755</u>	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
MODE OF SHIPMENT: <u>Fed Ex</u>		COMMENTS: _____					
SHIPMENT NO: <u>4849147870</u>		_____					
CO RESUBS TO: <u>Charlie Vernay</u>		_____					
CO: _____		_____					

JAN-26-2000 10:19 EN SAFE, INC. 803 856 0107 P.03/03



800-588-7942  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PHOENIX, AZ; PENSACOLA, FL;  
RICHMOND, VA; WASHINGTON, DC

# CHAIN OF CUSTODY RECORD

PAGE 1 OF 2  
PROJECT/JOB NO: 2907-001-08420  
COC NO: \_\_\_\_\_  
PO NO: 4  
REL NO: 139  
LAB NAME: SWL

CLIENT Naval Base Charleston PROJECT MANAGER Charlie Vernoy  
LOCATION Zone G TELE/FAX NO. 803-994-6229  
SAMPLERS: (SIGNATURE) [Signature]

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS			ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL	Metals	SVOC			
NBCG6435B02101	1-25-00	1035	S	4oz. JARS	4°C	None	2	X	X		
VBCG6435B02102		1041					2	X	X		
NBCG6435B02701		1105					2	X	X		
NBCG6435B02702		1110					2	X	X		
VBCG6435B02601		1135					2	X	X		
VBCG6435B02602		1141					2	X	X		
NBCG6435B02501		1200					2	X	X		
NBCG6435B02502		1208					2	X	X		
VBCG6435B01401		1221					2		X		
VBCG1205B01601		1500					2		X		
VBCG1205B01602		1505					2		X		
VBCG1205B01501		1516					2		X		
VBCG1205B01502		1519					2		X		
VBCG1205B01401		1530					2		X		
VBCG1205B01402		1535					2		X		
VBCG1205B01301		1550					2		X		

RELINQUISHER: Rachel M. White DATE: 1-25-00 RECOVER: \_\_\_\_\_ DATE: \_\_\_\_\_  
 WITN: Rachel M. White TIME: 1755 PRINTED: \_\_\_\_\_ TIME: \_\_\_\_\_  
 COMPANY: EnSafe COMPANY: \_\_\_\_\_

METHOD OF SHIPMENT: Fed Ex COMMENTS: \_\_\_\_\_  
 SHIPMENT NO: 4849147870  
 SENT TO: Charlie Vernoy

EN-26-2000 10:18 EN SAFE, INC. 803 856 0107 P. 02/03

## SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples below 2.6 mg/kg	Sb.	+	U
all soil samples below 1.0 mg/kg	Cd.		
all soil samples below 2.75 mg/kg	Ag.		
all soil samples below 17.5 mg/kg	Sn.		
all soil samples below 2.2 mg/kg	As.	+/U	J/UJ
all soil samples below 0.3 mg/kg	Hg.		
all soil samples	Sb.	+/U	J/UJ
all soil samples	Zn.	+	J
all samples	all analytes	B	J

Zinc	0.99 mg/kg	no impact
Tin	3.49 mg/kg	all soil samples below 17.5 mg/kg

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	-0.22 mg/kg	all soil samples below 2.2 mg/kg
Mercury	-0.03 mg/kg	all soil samples below 0.3 mg/kg

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

### Matrix Spike Recovery results

The matrix spike recovery for soils for Antimony (72%) was below the lower control limits (>30% but <75%). All positive and non-detect results are qualified as estimated, "J" or "UJ"

### Matrix Duplicate results

The matrix duplicate RPD for soils for Iron (24%) was below 35%. No qualification is necessary.

### Serial Dilution results

The serial dilution result for soils for Zinc 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.

# DATA ASSESSMENT NARRATIVE

## METALS

### 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 SW 846 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 # 41852

A validation was performed on the Metals Data from SDG 41852. 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>
Antimony	0.52 mg/kg	all soil samples below 2.6 mg/kg
Barium	0.18 mg/kg	no impact
Cadmium	0.20 mg/kg	all soil samples below 1.0 mg/kg
Iron	6.85 mg/kg	no impact
Lead	0.22 mg/kg	no impact
Manganese	0.09 mg/kg	no impact
Silver	0.55 mg/kg	all soil samples below 2.75 mg/kg

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
643SB01102 643SB02602 120SB01302 638SB01101 643SB02102 643SB02501 643SB02601 638SB01002	bis(2-ethylhexyl)phthalate	+B	CRQL
120SB01401 643SB02501	All E flagged compounds	+E	Do not use
120SB01401DL 643SB02501DL	All except corresponding D flagged results	+/-	Do Not use

- \* 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

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
643SB02101	<i>All associated with</i> naphthalene-d8 acenaphthene-d10 phenanthrene-d10	+/-	J/UJ
120SB01401	<i>All associated with</i> perylene-d12	+/-	J/UJ
120SB01301 120SB01601 120SB01501 120SB01401 643SB02702 643SB01401 638SB01001 643SB02101 120SB01402 643SB02502 643SB02701 643SB01102 643SB02602 120SB01302 638SB01101 643SB02102	naphthalene	+B	CRQL
120SB01301 120SB01601 120SB01602 120SB01501 120SB01502 120SB01401 643SB02702 643SB01401 638SB01001 643SB02101 120SB01402 643SB02502 643SB02701	bis(2-ethylhexyl)phthalate	+B	CRQL

## GLOSSARY OF DATA QUALIFIERS

### QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

### 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.

**DATA ASSESSMENT NARRATIVE  
SEMIVOLATILE ORGANICS**

**PAGE 3**

**Blanks (continued)**

<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
643SB01401 638SB01001 643SB02101 120SB01402 643SB02502 643SB02701 643SB01102 643SB02602 120SB01302 638SB01101 643SB02102 643SB02501 643SB02601 638SB01002	bis(2-ethylhexyl)phthalate	CRQL

**Compound Quantitation**

For the following sample, the E flagged result is not used in favor of the corresponding D flagged result reported in the dilution analysis of the sample. All other results reported in the dilution analysis are not used in favor of the results reported in the lessor dilution of the sample.

120SB01401  
643SB02501

**System Performance and Overall Assessment**

The data, as reported, required qualifications.

**DATA ASSESSMENT NARRATIVE  
SEMIVOLATILE ORGANICS**

**PAGE 2**

**Blanks**

The two (2) method blanks associated with the field samples in this SDG exhibited contamination for which qualifications were required. The end user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into considerations when applying the 5X and 10X criteria to field samples.

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK1	naphthalene	18J ug/Kg	90 ug/Kg
	bis(2-ethylhexyl)phthalate	43J ug/Kg	430 ug/Kg
SBLK2	bis(2-ethylhexyl)phthalate	20J ug/Kg	200 ug/Kg

<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
120SB01301	naphthalene	CRQL
120SB01601		
120SB01501		
120SB01401		
643SB02702		
643SB01401		
638SB01001		
643SB02101		
120SB01402		
643SB02502		
643SB02701		
643SB01102		
643SB02602		
120SB01302		
638SB01101		
643SB02102		
120SB01301	bis(2-ethylhexyl)phthalate	CRQL
120SB01601		
120SB01602		
120SB01501		
120SB01502		
120SB01401		
643SB02702		

# 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 8270C for GC/MS Semivolatiles; the National Functional Guidelines for Organic Data Validation, 2/94, 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 # 41852

A validation was performed on the Semivolatile Data from SDG 41852. The data was evaluated based on the following parameters:

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

\* - All criteria were met for this parameter.

### Internal Standards

The following samples exhibited non-compliant EICP area recoveries below the QC limits for the noted internal standards. All reported positive and non-detect results are qualified as estimated, J/UJ.

643SB02101	naphthalene-d8 acenaphthene-d10 phenanthrene-d10
120SB01401	perylene-d12

## DATA ASSESSMENT NARRATIVES

SDG# 41852

**Samples and Fractions Reviewed**

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	SVOA		MET	
120SB01301	SOIL	X			
120SB01302	SOIL	X			
120SB01401	SOIL	X			
120SB01402	SOIL	X			
120SB01501	SOIL	X			
120SB01502	SOIL	X			
120SB01601	SOIL	X			
120SB01602	SOIL	X			
638SB00601	SOIL				X
638SB00602	SOIL				X
638SB01001	SOIL	X			
638SB01002	SOIL	X			
638SB01101	SOIL	X			
638SB01102	SOIL	X			
643SB01401	SOIL	X			
643SB02101	SOIL	X			X
643SB02102	SOIL	X			X
643SB02501	SOIL	X			X
643SB02502	SOIL	X			X
643SB02601	SOIL	X			X
643SB02602	SOIL	X			X
643SB02701	SOIL	X			X
643SB02702	SOIL	X			X
Total Billable Samples (Water/Soil)		0	21	0	10

SVOA= Semivolatiles  
 MET= Metals



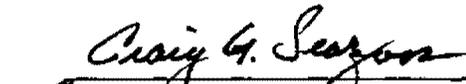
**HEARTLAND**  
ENVIRONMENTAL SERVICES, INC.

**Data Validation Report**

SDG#: 41852  
Date: February 17, 2000  
Client Name: Ensafe  
Project/Site Name: Charleston Zone G  
Date Sampled: January 25, 2000  
Number of Samples: 23 Non-Aqueous Sample(s) with 0 MS/MSD(s)  
Laboratory: Southwest Laboratory of Oklahoma  
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 and Metals

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

2-24-00.  
\_\_\_\_\_  
Date

## **Data Validation Report**

Ensafe  
Charleston Zone G  
SDG# 41852, 41892



# 9412364

EN033

PAGE 1 OF 1

### CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 2907 001 084 20 0

COC NO: \_\_\_\_\_

PO NO: 1840 03

REL NO: 38

LAB NAME: Launch

800-585-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; ANDOVER, VT;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENNSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT: Nary Clean CNC PROJECT MANAGER: T. Haverkott  
LOCATION: Zone G / AOC 63F TELE/FAX NO.: (843) 884-0029  
SAMPLERS: (SIGNATURE) William Arrick

NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
	SVOCs	Metals	SPLP Metals	TOC		

	FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION														
						TEMP.	CHEMICAL													
11	NBCG/63F5B00501	12/15/99	1120	S	Glass 8 oz	Ice	None	4	✓	✓	✓	✓								
10	NBCG/63F5B00503	"	1120	S	"	"	"	4	✓	✓	✓	✓								Dup for 01
11	NBCG/63F5B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓								
12	NBCG/63F5B00504	"	1130	S	"	"	"	4	✓	✓	✓	✓								Dup for 02
13	NBCG/63F5B00601	"	1205	S	"	"	"	1	✓											
14	NBCG/63F5B00602	"	1215	S	"	"	"	1	✓											
15	NBCG/63F5B00701	"	1500	S	"	"	"	3		✓	✓	✓								offset to 001
16	NBCG/63F5B00702	"	1510	S	"	"	"	3		✓	✓	✓								

RELINQUISHER: <u>Fred Erdmann</u>	DATE: _____	RECEIVER: <u>Mike Baxter</u>	DATE: <u>12/16</u>	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>Ensafe</u>		COMPANY: <u>Launch's Lab</u>	9:15	COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp.  
 SHIPMENT # 814795922636  
 SEND RES. TO: Charles Verhey

COMMENTS: \_\_\_\_\_



#4912364

LNO03

# CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT/JOB NO: 2907001084300

COC NO: \_\_\_\_\_

PO NO: 1840

REL NO: 38

LAB NAME: Laukus

800-586-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT Navy Clean CNC PROJECT MANAGER T. Havenkost  
LOCATION Zone G / SWM4 24 TELE/FAX NO. (843) 854-0029  
SAMPLERS: (SIGNATURE) William Hornik

ANALYSIS REQUIRED										REMARKS
NO. OF CONTAINERS	SVOCs	METALS								

	FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	SVOCs	METALS											REMARKS	
						TEMP.	CHEMICAL															
1	NBCG/0245B00501	12/15/99	0940	S	Glass 8oz	Ice	None	1	✓	✓												Petrol. Odor
2	NBCG/0245B00502	"	0945	S	"	"	"	1	✓	✓												"
3	NBCG/0245B00601	"	1005	S	Glass 8oz	"	"	1	✓	✓												"
4	NBCG/0245B00603	"	1005	S	"	"	"	1	✓	✓												Dup of 01
5	NBCG/0245B00602	"	1010	S	"	"	"	1	✓	✓												Petrol. Odor
6	NBCG/0245B00604	"	1010	S	"	"	"	1	✓	✓												Dup of 02
7	NBCG/0245B00701	"	1025	S	"	"	"	1	✓	✓												Petrol. Odor
8	NBCG/0245B00702	"	1033	S	"	"	"	1	✓	✓												"

RELINQUISHER: <u>Fred Erdmann</u>	DATE: _____	RECEIVER: <u>Mike Baxter</u>	DATE: <u>12/16</u>	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: <u>Fred Erdmann</u>	TIME: _____	PRINTED: <u>Mike Baxter</u>	TIME: <u>9:15</u>	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>Ensafe</u>		COMPANY: <u>Laukus Labs</u>		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp.  
SHIPMENT NO. 814795922636  
SEND RESULTS TO: Charles Vetry

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# 4912364

EN033

PAGE 1 OF 1

### CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 2907 001 084 20 00

COC NO: \_\_\_\_\_

PO NO: 1840

REL NO: 38

LAB NAME: Lancus

800-588-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT Navy Clean CNC PROJECT MANAGER T. Haverkust

LOCATION Zone G / AOC 63F TELE/FAX NO. (843) 884-0029

SAMPLERS: (SIGNATURE) William Bernick

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
					TEMP.	CHEMICAL		SVOCs	Metals	SPLP Metals	TOC		
NBCG/63F5B00501	12/15/99	1120	S	Glass 8 oz	Ice	None	4	✓	✓	✓	✓		
NBCG/63F5B00501	"	1120	S	"	"	"	4	✓	✓	✓	✓		Dup Fr-01
NBCG/63F5B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓		
NBCG/63F5B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓		Dup Fr-02
NBCG/63F5B00601	"	1205	S	"	"	"	1	✓					
NBCG/63F5B00602	"	1215	S	"	"	"	1	✓					
NBCG/63F5B00701	"	1500	S	"	"	"	3		✓	✓	✓		off Fr-01 to 001
NBCG/63F5B00702	"	1510	S	"	"	"	3		✓	✓	✓		

RELINQUISHER: <u>Fred Erdmann</u>	DATE: _____	RECEIVER: <u>Mike Baxter</u>	DATE: 12/16	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: Fred Erdmann	TIME: _____	PRINTED: Mike Baxter	TIME: 9:15	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: EnSafe		COMPANY: Lancus's Lab		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp.  
SHIPMENT NO. 814 795 922 636  
SEND RESULTS Charles Verhey

COMMENTS: \_\_\_\_\_



#4912364

ENOS

PAGE 1 OF 1

### CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 29070010842000

COC NO: \_\_\_\_\_

PO NO: 1840

REL NO: 38

LAB NAME: Laurus

800-588-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT Navy Clean CNC PROJECT MANAGER T. Haverkost  
LOCATION Zone G / SWHY 24 TELE/FAX NO. (843) 854-0029  
SAMPLERS: (SIGNATURE) William Herrick

ANALYSIS REQUIRED

NO. OF CONTAINERS

SVOC's

REMARKS

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	SVOC's	ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL				
NBCG/0245B00501	11/15/99	0940	S	Glass 8oz	Ice	None	1	✓		Petrol. Odor
NBCG/0245B00502	"	0945	S	"	"	"	1	✓		"
NBCG/0245B00601	"	1005	S	Glass 8oz	"	"	1	✓		"
NBCG/0245B00603	"	1005	S	"	"	"	1	✓		Dup of 01
NBCG/0245B00602	"	1010	S	"	"	"	1	✓		Petrol. Odor
NBCG/0245B00604	"	1010	S	"	"	"	1	✓		Dup of 02
NBCG/0245B00701	"	1025	S	"	"	"	1	✓		Petrol. Odor
NBCG/0245B00702	"	1033	S	"	"	"	1	✓		"

RELINQUISHER: <u>Fred Erdmann</u>	DATE: <u>12/16</u>	RECEIVER: <u>Mike Baxter</u>	DATE: _____	RECEIVER: _____
PRINTED: <u>Fred Erdmann</u>	TIME: _____	PRINTED: <u>Mike Baxter</u>	TIME: _____	PRINTED: _____
COMPANY: <u>EnSafe</u>	COMPANY: <u>Laurus Labs</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fed Exp  
 SHIPMENT NO: 814795922636  
 SEND RESULTS TO: Charles Vetry

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**LAUCKS TESTING LABORATORIES**  
940 S. Harney  
Seattle, WA 98108

**ATTACHMENT A**

Chain-of-Custody Copies

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

## INORGANIC ANALYSES:

- B The reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL). If the analyte was analyzed for but not detected, a "U" shall be entered.
- E The reported value is estimated because of the presence of interference. An explanatory note shall be included under Comments on the Cover Page (if the problem applies to all samples) or on the specific Form I-IN (if it is an isolated problem).
- M Duplicate injection precision not met.
- N Spiked sample recovery not within control limits.
- S The reported value was determined by the Method of Standard Additions (MSA)
- W Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50 % of spike absorbance.
- \* Duplicate analysis not within control limits.
- + Correlation coefficient for the MSA is less than 0.995.

Entering "S", "W" or "+" is mutually exclusive. No combination of these qualifiers can appear in the same field for an analyte.

CRDL Client Requested Detection Limit, usually the limit of detection specified at your request. Might also be referred to as Contract required Detection Limit.

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

## ABBREVIATIONS

Several abbreviations can appear in our reports. The most commonly employed abbreviations are as follows:

- U The analyte of interest was not detected to the limit of detection indicated.
- SDL Sample Detection Limit. The SDL can vary from sample to sample, depending on sample size, matrix interferences, moisture content and other sample-specific conditions.
- PQL Practical Quantitation Limit. The limit is drawn from the test method and usually represents the SDL multiplied by a matrix-specific factor.
- DB Dry Basis. The value reported has been back-calculated to normalize for the moisture content of the sample.
- AR As-Received. The value has not been normalized for moisture.

## ORGANIC ANALYSES:

- B When used in relation to organics fractions, the "B" flag indicates the analyte of interest was detected in the method blank associated with the sample, as well as in the sample itself. The "B" flag is applied without regard to the relative concentrations detected in the blank and sample.
- J The analyte of interest was detected below the routine reporting limit. This value should be regarded as an estimate.
- T The flagged values represent the SUM of two co-eluting compounds. The SUM of these two values is shown as though it were a result for each of them. The two figures should not be added together.
- E The flagged value was reported from an analysis which exceeded the linear range of the instrument. See additional comments for further discussion of the circumstances. Values so flagged should be considered estimates.
- D The value reported derives from analysis of a diluted sample of sample extract.
- P When a dual column GC technique is employed, this flag indicates that test results from the two columns differ by more than 25%. Generally, we report the higher value.
- C The flagged analyte has been confirmed by GC/MS analysis. The value reported may be derived from either the initial or confirmatory (GC/MS) analysis. See specific report comments for details.
- CRQL Client Requested Quantitation Limit, usually the limit of detection specified at your request. Might also be referred to as Contract Required Quantitation Limit.

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

RELEASE OF DATA

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature."

Respectfully submitted,

  
Jenna Gorham  
Project Manager

  
Mike Nelson  
Technical Director

17 Jan 2000  
(DATE)

17 Jan 2000  
(DATE)

*HOW TO CONTACT US:*

All Laucks Testing Laboratories staff members can be reached at the same telephone and facsimile numbers: (206) 767-5060 by phone, (206) 767-5063 by FAX.

*REQUESTS FOR DUPLICATE COPIES:*

This packet has been checked for accuracy. All pages are present and in sequential order. Please see Attachment B for a detailed record.

In the event that duplicate data copies are needed, Laucks will accommodate your request at a fee of twenty-five cents (\$0.25) per copy, plus shipping. If the data are in storage, there will also be a fee for retrieval.

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

**Total Organic Carbon:**

No comments.

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

ICP Metals(Soil):

The matrix spike sample percent recoveries of antimony, chromium and lead were outside of the established control limits of 75-125% for sample 024SB00501. The LCS percent recoveries for antimony, chromium and lead were within control limits. No further corrective action was required. All relevant data have been flagged with an "N" on Forms I and V.

The matrix spike sample percent recoveries of copper, lead and manganese were outside of the established control limits of 75-125% for sample 638SB00503. The LCS percent recoveries for copper, lead and manganese were within control limits. 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, chromium and lead were outside the control limits of  $\pm 20\%$  for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "\*" on Forms I and VI.

The duplicate sample relative percent differences of lead and zinc were outside the control limits of  $\pm 20\%$  for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "\*" on Forms I and VI.

The serial dilution for copper, magnesium and zinc did not agree within 10% of the original determination after correction for dilution for sample 024SB00501. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

The serial dilution for magnesium and potassium did not agree within 10% of the original determination after correction for dilution for sample 638SB00503. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

Mercury(Soil):

No comments.

Metals (SPLP):

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

The duplicate sample relative percent differences of copper was outside the control limits of  $\pm 20\%$  for sample 638SB00504. 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 638SB00504. No further corrective action was

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

**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% HNO<sub>3</sub>. 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

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

## 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/ $\mu$ L injected respectively.

#### Sample Analyses:

Analyses of the extracts for sample 024SB00702 and 638SB00602 yielded internal standard area responses for perylene-d12 which fell below the lower control limit due to severe matrix interference. Corrective action in the form of extract dilution and reanalysis was performed. Reanalysis yielded all internal standard areas within control for the extract analysis of sample 024SB00702 and confirmed the matrix interference for extract sample 638SB00602. Data from both analyses have been submitted with this data package.

#### Quality Control Analyses:

MS/MSD analyses were performed on sample 638SB00501. 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.

#### Reporting Limits:

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

# LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

## Sample Receipt Comments:

The metals analysis for the first 8 samples was added on 12/21/1999 as per Fred Erdmann.

## 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 sub-set 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
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.

**LAUCKS TESTING LABORATORIES**

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912369  
SDG No. : EN033  
Date of Report: January 17, 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>
024SB00501	9912369-01	ABN/MET
024SB00502	9912369-02	ABN/MET
024SB00601	9912369-03	ABN/MET
024SB00603 <i>Box 01 P</i>	9912369-04	ABN/MET
024SB00602	9912369-05	ABN/MET
024SB00604 <i>Box 02 P</i>	9912369-06	ABN/MET
024SB00701	9912369-07	ABN/MET
024SB00702	9912369-08	ABN/MET
638SB00501	9912369-09	ABN/MET/TOC
638SB00503 <i>Box 501 P</i>	9912369-10	ABN/MET/TOC
638SB00502	9912369-11	ABN/MET/TOC
638SB00504 <i>Box 502 P</i>	9912369-12	ABN/MET/TOC
638SB00601	9912369-13	ABN
638SB00602	9912369-14	ABN
638SB00701	9912369-15	MET/TOC
638SB00702	9912369-16	MET/TOC
638SB00501 SPLP	9912369-17	SPLP
638SB00503 <i>Box 501 P</i> SPLP	9912369-18	SPLP
638SB00502 SPLP	9912369-19	SPLP
638SB00504 <i>Box 502 P</i> SPLP	9912369-20	SPLP
638SB00701 SPLP	9912369-21	SPLP
638SB00702 SPLP	9912369-22	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)



# 4412364

EN055

PAGE 1 OF 1

### CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 29070 08424

COC NO: \_\_\_\_\_

PO NO: 1840 62

REL NO: 38

LAB NAME: LANCUS

800-888-7962  
MEMPHIS, TENNESSEE  
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
RALEIGH, NC; COLOGNE, GERMANY

CLIENT Navy Clean CNC PROJECT MANAGER T. Haverkost  
LOCATION Zone G / AOC 63F TELE/FAX NO. (843) 884-0029  
SAMPLERS: (SIGNATURE) William Hornick

ANALYSIS REQUIRED				
NO. OF CONTAINERS	SVOCs	Metals	SPLP Metals	TOC

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	SVOCs	Metals	SPLP Metals	TOC	REMARKS
					TEMP.	CHEMICAL						
7/11 NBCG/63F5B00501	11/17/99	1120	S	Glass 8 oz	Ice	None	4	✓	✓	✓	✓	
4/10 NBCG/63F5B00501	"	1120	S	"	"	"	4	✓	✓	✓	✓	Dup for 01
7/11 NBCG/63F5B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓	
9/12 NBCG/63F5B00502	"	1130	S	"	"	"	4	✓	✓	✓	✓	Dup for 02
13 NBCG/63F5B00601	"	1205	S	"	"	"	1	✓				
14 NBCG/63F5B00602	"	1215	S	"	"	"	1	✓				
1/15 NBCG/63F5B00701	"	1500	S	"	"	"	3		✓	✓	✓	offset to 001
2/16 NBCG/63F5B00702	"	1510	S	"	"	"	3		✓	✓	✓	

RELINQUISHER: <u>Fred Erdmann</u>	DATE: _____	RECEIVER: <u>Mike Baxter</u>	DATE: 12/16	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: _____	TIME: _____	PRINTED: _____	TIME: 9:15	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>Ensafe</u>		COMPANY: <u>LANCUS Lab</u>		COMPANY: _____		COMPANY: _____	

METHOD OF SHIPMENT: Fed Exp.  
SHIPMENT NO. 814795922636  
SEND REF TO: Charles Verney

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

To: Ensafe  
Laboratory No. : 9912406  
SDG No. : EN034  
Date of Report: January 14, 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>
646SB00501	9912406-01	ABN
646SB00502	9912406-02	ABN
646SB00601	9912406-03	ABN
646SB00602	9912406-04	ABN
646SB00701	9912406-05	PEST/MET/TOC
646SB00702	9912406-06	PEST/MET/TOC
646SB00801	9912406-07	PEST/MET/TOC
646SB00802	9912406-08	PEST/MET/TOC
646SB00901	9912406-09	PEST/MET/TOC
646SB00902	9912406-10	PEST/MET/TOC
646SB01001	9912406-11	PEST/MET/TOC
646SB01002	9912406-12	PEST/MET/TOC
638SB00902 SPLP	9912406-13	SPLP
634SB00401	9912406-14	MET/TOC
634SB00402	9912406-15	MET/TOC
624SB00501	9912406-16	MET/TOC
634SB00502	9912406-17	MET/TOC
634SB00601	9912406-18	MET/TOC
638SB00801	9912406-19	MET/TOC
638SB00802	9912406-20	MET/TOC
638SB00901	9912406-21	MET/TOC
638SB00902	9912406-22	MET/TOC
646SB00701 SPLP	9912406-23	SPLP
646SB00702 SPLP	9912406-24	SPLP
646SB00801 SPLP	9912406-25	SPLP
646SB00802 SPLP	9912406-26	SPLP
646SB00901 SPLP	9912406-27	SPLP
646SB00902 SPLP	9912406-28	SPLP
646SB01001 SPLP	9912406-29	SPLP

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

646SB01002 SPLP	9912406-30	SPLP
634SB00401 SPLP	9912406-31	SPLP
634SB00402 SPLP	9912406-32	SPLP
634SB00501 SPLP	9912406-33	SPLP
634SB00502 SPLP	9912406-34	SPLP
634SB00601 SPLP	9912406-35	SPLP
638SB00801 SPLP	9912406-36	SPLP
638SB00802 SPLP	9912406-37	SPLP
638SB00901 SPLP	9912406-38	SPLP

### Analytical Request Key:

ABN =	Semi-Volatile Organics (8270C)
PEST =	Pesticides (8081A)
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 12/16/1999. One jar was received with no sample ID on the label. The correct ID of 646SB00702 was matched using the sample time and test indicated on the container. 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 sub-set 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."

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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  
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.

### *Pesticides:*

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.

## LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

### 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/ $\mu$ L injected respectively.

#### Quality Control Analyses:

MS/MSD analyses were performed on sample 646SB00501. Several analyte recoveries from the MSD analysis fell below the lower control limits. Since all analyte recoveries were in control in the MS and the associated blank spike, no corrective action was taken.

#### 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.

#### Reporting Limits:

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

### Pesticides Fraction:

#### Initial Calibration Standards:

Analyses of the initial calibration standards yielded a %RSD value for alpha-BHC which exceeded 20 percent on both columns. However, since the average %RSD for all compounds was below 20 percent, the initial calibration is compliant in accordance with SW 846. Since alpha-BHC was not detected in any of the sample extracts, no further action was taken.

#### Continuing Calibration Verification Analyses:

Analyses of CCV files DC28920.d, DC28926.d and D0103023.d yielded %D values for the surrogates, decachlorobiphenyl and tetrachloro-m-xylene, and the target analytes, gamma-BHC and heptachlor epoxide which exceeded the control limit due to an increase in response. However, since the %Ds for all compounds were in control on one of the two columns and there were no target analytes detected in any of the sample extracts, no further action was taken.

#### Surrogate Recoveries:

Analysis of the extract for sample 646SB01002 yielded a recovery value for tetrachloro-m-xylene which exceeded the control limit. Corrective action was taken in the form of sample re-extraction and reanalysis. Reanalysis of the sample extract yielded all surrogate recovery values in control. Since the sample was re-extracted within holding time, only data from the re-extract were submitted.

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

**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% HNO<sub>3</sub>. 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

LAUCKS TESTING LABORATORIES

940 S. Harney  
Seattle, WA 98108

ICP Metals (Soils):

The matrix spike sample percent recoveries of antimony and lead were outside of the established control limits of 75-125% for sample 646SB00701. The LCS percent recoveries for antimony and lead were within control limits. 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, calcium and manganese were outside the control limits of  $\pm 20\%$  for sample 646SB00701. 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 646SB00701. No further corrective action was required. All relevant data have been flagged with an "E" on the applicable Forms I and IX.

Mercury (Soils):

No comments.

Metals (SPLP):

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

The serial dilution for barium did not agree within 10% of the original determination after correction for dilution for sample 646SB00902. 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.



800-588-7982  
 MEMPHIS, TENNESSEE  
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
 RALEIGH, NC; COLOGNE, GERMANY

9912 '95 810457  
**CHAIN OF CUSTODY RECORD**

PAGE 1 OF 1  
 PROJECT/JOB NO: 290706 54700  
 COC NO: 407  
 PO NO: 1840  
 REL NO: 39  
 LAB NAME: Laney's

CLIENT: Navy Clean CNC PROJECT MANAGER: T. Haverkamp  
 LOCATION: Zone G / AOC 646 TELE/FAX NO.: (543) 884-0029  
 SAMPLERS: (SIGNATURE) William Herrick

ANALYSIS REQUIRED										REMARKS
NO. OF CONTAINERS	SVCC	Metals	SPLP Metals	TOC	Pesticides					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION															
					TEMP.	CHEMICAL														
1 NBCG/646 SB00501	12/16/99	0755	S	Glass/802	Ice	None	1	✓												
2 NBCG/646 SB00502	"	1000	"	"	"	"	1	✓												
3 NBCG/646 SB00601	"	1010	"	"	"	"	1	✓												
4 NBCG/646 SB00602	"	1015	"	"	"	"	1	✓												
5 NBCG/646 SB00701	"	1030	"	"	"	"	4	✓	✓	✓	✓	✓								offset to 002
6 NBCG/646 SB00702	"	1035	"	"	"	"	4		✓	✓	✓	✓								"
7 NBCG/646 SB00801	"	1050	"	"	"	"	4		✓	✓	✓	✓								offset to 001
8 NBCG/646 SB00802	"	1055	"	"	"	"	4		✓	✓	✓	✓								"
9 NBCG/646 SB00901	"	1115	"	"	"	"	4		✓	✓	✓	✓								offset to 004
10 NBCG/646 SB00902	"	1120	"	"	"	"	4		✓	✓	✓	✓								"
11 NBCG/646 SB01001	"	1135	"	"	"	"	4		✓	✓	✓	✓								offset to 003
12 NBCG/646 SB01002	"	1145	"	"	"	"	4		✓	✓	✓	✓								

RELINQUISHER: <u>Fred Erdmann</u>	DATE: <u>12/16/99</u>	RECEIVER: <u>Chrl. Christ</u>	DATE: <u>12/17/99</u>	RELINQUISHER:	DATE:	RECEIVER:
PRINTED: <u>Fred Erdmann</u>	TIME: <u>1550</u>	PRINTED: <u>Charles Christenson</u>	TIME: <u>0830</u>	PRINTED:	TIME:	PRINTED:
COMPANY: <u>EnSafe</u>		COMPANY: <u>LAVICKS</u>		COMPANY:		COMPANY:

METHOD OF SHIPMENT: Fed Exp  
 SHIPMENT NO.: 814 795 922 603  
 SEND RESULTS TO: Charles Verry

COMMENTS:



800-588-7862  
 MEMPHIS, TENNESSEE  
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL  
 RALEIGH, NC; COLOGNE, GERMANY

7912406 4M034  
 CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 290700109400  
 COC NO: 1840  
 PO NO: 3P  
 REL NO:  
 LAB NAME: LAUCKS

CLIENT: Navy Clean CNC PROJECT MANAGER: T. Harkness  
 LOCATION: Zone G / AOC 634 TELE/FAX NO.: (843) 884-0029  
 SAMPLERS: (SIGNATURE) William Harkness

ANALYSIS REQUIRED

NO. OF CONTAINERS  
 METALS  
 SPLP METALS  
 TOC

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	METALS	SPLP METALS	TOC	REMARKS
					TEMP.	CHEMICAL					
NBCG/634SB00401	12/16/99	1355	S	Glass 8oz	ICE	None	3	✓	✓	✓	near 003
NBCG/634SB00402	"	1400	"	"	"	"	3	✓	✓	✓	"
NBCG/634SB00501	"	1415	"	"	"	"	3	✓	✓	✓	near 001
NBCG/634SB00502	"	1420	"	"	"	"	3	✓	✓	✓	"
NBCG/634SB00601	"	1435	"	"	"	"	3	✓	✓	✓	near 002

RELINQUISHER: Fred Erdmann DATE: 12/16/99 TIME: 1550 COMPANY: Ensate  
 RECIPIENT: Charles Christensen DATE: 12/17/99 TIME: 0830 COMPANY: LAUCKS

METHOD OF SHIPMENT: Fed Exp  
 SHIPMENT NO.: 814795922603  
 SEND RESULTS TO: Charles Veary

COMMENTS:



800-588-7862  
 MEMPHIS, TENNESSEE  
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;  
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
 RALEIGH, NC; COLOGNE, GERMANY

112406 EN434  
 CHAIN OF CUSTODY RECORD

PAGE 1 OF 1  
 PROJECT/JOB NO: 290700 OF 40  
 COC NO: 140  
 PO NO: 1840  
 REL NO: 3F  
 LAB NAME: LAUCKS

CLIENT: Navy Clean CNC  
 PROJECT MANAGER: T. Havenhaft  
 LOCATION: Zone G/AOC 63F  
 TELE/FAX NO: (843) 954-0029  
 SAMPLERS: (SIGNATURE) *William Herrick*

ANALYSIS REQUIRED				REMARKS
NO. OF CONTAINERS	Metals	SPLP Metals	TOC	

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	Metals	SPLP Metals	TOC	REMARKS
					TEMP.	CHEMICAL					
NBCG/63PSB00901	12/16/99	0900	S	Glass PC bottle	None		3	✓	✓	✓	offset to CO4
NBCG/63PSB00902	"	0905	S	"	"	"	3	✓	✓	✓	
NBCG/63PSB00901	12/16/99	0925	S	"	"	"	3	✓	✓	✓	offset to CO3
NBCG/63PSB00902	"	0930	S	"	"	"	3	✓	✓	✓	

RELEASER: <i>Fred Erdmann</i>	DATE: 12/16/99	RECEIVER: <i>Charles Christensen</i>	DATE: 12/17/99	RELEASER:	DATE:	RECEIVER:
PRINTED: Fred Erdmann	TIME: 1550	PRINTED: Charles Christensen	TIME: 0830	PRINTED:	TIME:	PRINTED:
COMPANY: EnSafe		COMPANY: LAUCKS		COMPANY:		COMPANY:

METHOD OF SHIPMENT: Fed Exp  
 SHIPMENT NO: 814 775922 603  
 SEND RESULTS TO: Charles Vernoy

COMMENTS:

## Data Validation Report

ENSAFE  
Charleston Zone *AC*  
SDG #: 40774



**HEARTLAND**  
ENVIRONMENTAL SERVICES, INC.

**Data Validation Report**

SDG#: 40774  
Date: December 2, 1999  
Client Name: Ensafe  
Project/Site Name: Charleston Zone *XG*  
Date Sampled: October 18, 1999  
Number of Samples: 4 Aqueous Sample(s) with 0 MS/MSD(s)  
Laboratory: Southwest Laboratory of Oklahoma  
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 Fraction: Volatiles, Semivolatiles, Metals, Dioxins / Furans, Hydrazine and Tetryl

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:

*Craig G. Seymour*  
\_\_\_\_\_  
Paul G. Humburg, President

*12-6-99*  
\_\_\_\_\_  
Date

SDG# 40774

### Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	VOA		SVOA		MET		DIOX		HYD		EXP	
638GW001C1	WATER	X		X		X		X		X		X	
638HW001C1	WATER	X		X		X		X		X		X	
638TW001C1	WATER	X											
FDSGW01EC1	WATER	X		X		X		X		X		X	
Total Billable Samples (Water/Soil)		4	0	3	0	3	0	3	0	3	0	3	0

VOA= Volatiles  
SVOA= Semivolatiles  
MET= Metals  
DIOX= Dioxins / Furans  
HYD= Hydrazine  
EXP= Tetryl

# DATA ASSESSMENT NARRATIVE

## VOLATILE 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 8260B for GC/MS Volatiles; the National Functional Guidelines for Organic Data Validation, 2/94, 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 # 40774

A validation was performed on the Volatile Data from SDG 40774. The data was evaluated based on the following parameters:

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

\* - All criteria were met for this parameter.

### Calibrations

The continuing calibration I53727.D exhibited one (1) compound with a %D greater than 50% but less than 90%. For the following samples and non-compliant compound, the reported positive and non-detect results are qualified as estimated, J/UJ.

FDSGW01EC1	2-chloroethyl vinyl ether (80.3%)
638GW001C1	
638HW001C1	

**DATA ASSESSMENT NARRATIVE  
VOLATILE ORGANICS**

**PAGE 2**

**System Performance and Overall Assessment**

The data, as reported, required qualifications.

## **GLOSSARY OF DATA QUALIFIERS**

### **QUALIFICATION CODES**

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

### **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

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
FDSGW01EC1 638GW001C1 638HW001C1	2-chloroethyl vinyl ether (80.3%)	+/-	I/UJ

- \* 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

### 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 8270C for GC/MS Semivolatiles; the National Functional Guidelines for Organic Data Validation, 2/94, 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 # 40774

A validation was performed on the Semivolatile Data from SDG 40774. The data was evaluated based on the following parameters:

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

\* - All criteria were met for this parameter.

#### Blanks

The method blank associated with the field samples in this SDG exhibited contamination for which qualifications were required. The end user should note that the action levels indicated for the blank analysis may not involve the same weights, volumes, dilution factors, or percent moisture as associated samples. These factors must be taken into considerations when applying the 5X and 10X criteria to field samples.

**DATA ASSESSMENT NARRATIVE  
SEMIVOLATILE ORGANICS**

**PAGE 2**

<u>Associated blank</u>	<u>Compound</u>	<u>Concentration</u>	<u>Action Level</u>
SBLK1	bis(2-ethylhexyl)phthalate	5J ug/L	50 ug/L
	<u>Samples</u>	<u>Compound</u>	<u>Qualifications</u>
	FDSGW01EC1 638GW001C1 638HW001C1	bis(2-ethylhexyl)phthalate	CRQL

**System Performance and Overall Assessment**

The data, as reported, required qualifications.

## GLOSSARY OF DATA QUALIFIERS

### QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

L = Result is estimated and biased low.

K = Result is estimated and biased high.

R = Result is rejected and unusable

D = Result value is based on dilution analysis

### 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

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
FDSGW01EC1 638GW001C1 638HW001C1	bis(2-ethylhexyl)phthalate	+B	CRQL

- \* 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

### TETRYL

#### 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, calibration data, blank analysis results, surrogate recoveries and LCS recoveries. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW-846 Method 8330; the National Functional Guidelines for Organic Data Review, February 1994, where applicable; and EPA DQO Level III requirements. Please refer the specific findings found in each category to the Summary of Data Qualifications table.

#### SDG# 40774

A validation was performed on the Tetryl data from SDG 40774. The data was evaluated based on the following parameters.

- \* • Data Completeness
- \* • Holding Times
- \* • HPLC Performance
- \* • Calibrations
- \* • Blanks
- \* • Surrogate Recoveries
- \* • LCS Recoveries
- \* • Field Duplicates
- \* • Identification/Quantitation

\* - All criteria were met for this parameter.

#### Overall Performance

The data did not require qualifications.

## **GLOSSARY OF DATA QUALIFIERS**

### **QUALIFICATION CODES**

**U** = Not detected

**J** = Estimated value

**UJ** = Reported quantitation limit is qualified as estimated

**NJ** = Result is considered presumptively present at an estimated concentration

**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 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 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 the method blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
------------------	--------------------	-----------	-----------

NO QUALIFICATIONS WERE 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

## Dioxin/Furans

### 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, matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard recoveries. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8290; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

### SDG # 40774 Level III

A validation was performed on the Dioxin/Furans Data from SDG 40774. The data was evaluated based on the following parameters.

- \* • Data Completeness
- \* • Holding Times
- \* • Mass Resolution Checks
- \* • Column Performance
- \* • Calibrations
- \* • Internal Standard Performance
- \* • Blanks
- \* • Field Duplicates
- \* • Congener Identification /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 the dilution analysis

### **METHOD BLANK QUALIFICATION CODES**

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that analyte is reported.

U = The sample result for the blank contaminant is greater than the sample CRQL and is less than 10X the method blank value. The sample result for the blank contaminant is qualified as non detected at the analyte value reported.

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

The specific findings will be noted in numerical form on the Form Is in this data validation report. These specific finding footnotes will reflect the conclusions found in the data validation process that resulted in the qualification of the data.

## SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>CONGENER ID</u>	<u>DL</u>	<u>QL</u>
------------------	--------------------	-----------	-----------

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 AND HYDRAZINE

### 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 # 40774

A validation was performed on the Metals and hydrazine Data from SDG 40774. 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, field and calibration blanks exhibited contamination for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Calcium	238 ug/l	no impact
Chromium	0.73 ug/l	all water samples below 3.65 ug/l
Zinc	65.6 ug/l	all water samples below 328 ug/l

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

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 water samples below 3.65 ug/l	Cr.	+	U
all water samples below 328 ug/l	Zn.		
all "B" results	all analytes	B	J

PROJECT/JOB NO: 2908-001-04 '4-00  
 COC NO: \_\_\_\_\_  
 PO NO: 4  
 REL NO: 129  
 LAB NAME: SWL

MEMPHIS, TENNESSEE  
 3-7962  
 MEMPHIS, TENNESSEE  
 JACKSON, TN; KNOXVILLE, TN;  
 DALLAS, TX; HOUSTON, TX;  
 NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;  
 RALEIGH, NC; COLOGNE, GERMANY

CLIENT: Naval Base Charleston PROJECT MANAGER: Charlie Vernoy  
 LOCATION: Zone H TELE/FAX NO: (843) 984-0029 / 856-0107  
 ANALYSTS (SIGNATURE): Andrew Wertz [Signature]

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		ANALYSIS REQUIRED							REMARKS	
					TEMP	CHEMICAL	NO. OF CONTAINERS	VOCs + TICs	SVOCs + TICs	TAL Metals + Tin	Dioxin / Furan	Hydrazine	Explosives (K171)		
CG FDSGW01EC1	10/18/99	1230	W	See Comments	4°C	See Comments	10	X	X	X	X	X	X		
CG 638GW01C1		1300		↓			10	X	X	X	X	X	X		
CG 638HW01C1		1300		↓			10	X	X	X	X	X	X		
CG 638TW01C1	↓	-	↓	2-40 ml vial	↓	HCl	2	X							

Andrew Wertz  
10/18/99

RELINQUISHER: Andrew Wertz DATE: 10/18/99 TIME: 1600  
 RECEIVED BY: [Signature] DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 COMPANY: EnSafe PRINTED: Don Willis COMPANY: SWL

METHOD OF SHIPMENT: Fed Ex COMMENTS: 2-40 ml vial-HCl ; 6-1L amber-None ; 1-1L poly-HNO3 ; 1-500 ml poly-HCl  
 SHIPMENT NO: 4849148401  
 ANALYST RESULTS TO: Charlie Vernoy  
DDO III 14 Day TAT

## Data Validation Summary - Charleston Naval Complex - Zone G, AOC 638

TO: David Lane/CH2M HILL/GNV  
FROM: Herb Kelly/CH2M HILL/GNA  
DATE: September 13, 2001

The purpose of this memorandum is to present the results of the data validation process for the samples collected at site AOC 638 in Zone G. Two soil samples were collected on July 12, 2001.

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

The two samples, 638HA00101 and 638HA00201, were submitted to General Engineering Laboratories, Inc., in Charleston, South Carolina, for the following analyses: Metals (Arsenic only) following SW-846 method 6010.

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

The following primary flags were used to qualify the data:

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

## Secondary Data Validation Qualifiers

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

## Inorganic Parameters

### Quality Control Review

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

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Sample preparation, initial calibration blanks/continuing calibration blanks, and equipment blanks were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix," in which target parameters have been added prior to digestion/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.

- **Field Duplicate Samples** – These samples are collected to determine precision between a native and its duplicate. This information can only be determined when target compounds are detected.
- **Pre/Post Digestion Spike (MS/MSD)** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **ICP Interference Check Sample** – This sample verifies the lab's interelement and background correction factors.
- **Initial Calibration Verification** – This parameter ensures that the instrument is capable of producing acceptable quantitative data for the target analyte list to be measured.
- **Continuing Calibration Verification** – This one-point, mid-range parameter establishes that the initial calibration is still valid by checking the performance of the instrument on a continual basis.
- **ICP Serial Dilution** – The serial dilution of samples quantitated by ICP determines whether or not significant physical or chemical interferences exist due to the sample matrix.

#### **Metals Analyses - Arsenic**

The QA/QC parameters for the Arsenic analyses for all of the samples were within acceptable control limits.

## **Conclusion**

A review of the analytical data submitted regarding the investigation of site AOC 638 in Zone G at the Charleston Naval Complex, Charleston, South Carolina by CH2M HILL has been completed. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures have been adequately completed, and that the analytical results should be considered usable as qualified.

The validation review demonstrated that the analytical systems were in control and the data results can be used in the decision making process without qualification.

**TABLE C-1**  
 SPLP Metals Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration	Units	Qualifier
Aluminum, SPLP	G638SB005	112	µg/L	J
	G638SB007	3,400		=
	G638SB008	3,690		=
	G638SB009	724		=
Antimony, SPLP	G638SB005	2.9	µg/L	J
	G638SB007	4.1		J
Arsenic, SPLP	G638SB005	4.4	µg/L	J
	G638SB007	4.3		J
	G638SB008	5.3		J
	G638SB009	4.7		J
Barium, SPLP	G638SB005	327	µg/L	=
	G638SB007	1,030		=
	G638SB008	1,190		J
	G638SB009	574		J
Cadmium, SPLP	G638SB005	0.4	µg/L	J
	G638SB008	1.6		J
Calcium, SPLP	G638SB005	18,500	µg/L	=
	G638SB007	7,250		=
	G638SB008	7,080		=
	G638SB009	14,400		=
Chromium, Total	G638SB005	0.8	µg/L	J
	G638SB007	4.7		J
	G638SB008	6.4		J
	G638SB009	4.7		J
Copper, SPLP	G638SB005	2	µg/L	J
	G638SB007	3.3		J
	G638SB008	6.4		J
	G638SB009	1.2		J
Iron, SPLP	G638SB005	101	µg/L	=
	G638SB007	2,350		=
	G638SB008	4,520		=
	G638SB009	484		=
Lead, SPLP	G638SB005	2.7	µg/L	J
	G638SB007	5		J
	G638SB008	13.5		=
	G638SB009	3.4		J
Magnesium, SPLP	G638SB005	1,020	µg/L	J
	G638SB007	2,170		J

**TABLE C-1**  
 SPLP Metals Detected in Subsurface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration	Units	Qualifier
Magnesium, SPLP	G638SB008	1,560	µg/L	J
	G638SB009	688		J
Manganese, SPLP	G638SB005	1.1	µg/L	J
	G638SB007	9.8		J
	G638SB008	44.1		=
Nickel, SPLP	G638SB005	2	µg/L	J
	G638SB007	2.4		J
	G638SB008	2.8		J
	G638SB009	1.2		J
Potassium, SPLP	G638SB005	262	µg/L	J
	G638SB007	4,740		J
	G638SB008	526		J
	G638SB009	185		J
Selenium, SPLP	G638SB007	2.2	µg/L	J
	G638SB008	2		J
	G638SB009	1.7		J
Sodium, SPLP	G638SB005	3,550	µg/L	J
	G638SB007	25,800		=
	G638SB008	7,430		=
	G638SB009	5,570		=
Vanadium, SPLP	G638SB005	4.4	µg/L	J
	G638SB007	9.6		J
	G638SB008	13.5		J
	G638SB009	2.5		J
Zinc, SPLP	G638SB005	17.9	µg/L	J
	G638SB007	45.8		=
	G638SB008	124		=
	G638SB009	23.5		=

µg/L    micrograms per liter  
 J        chemical detected at concentration below the method detection limit, concentration not known  
 =        chemical detected at the concentration shown

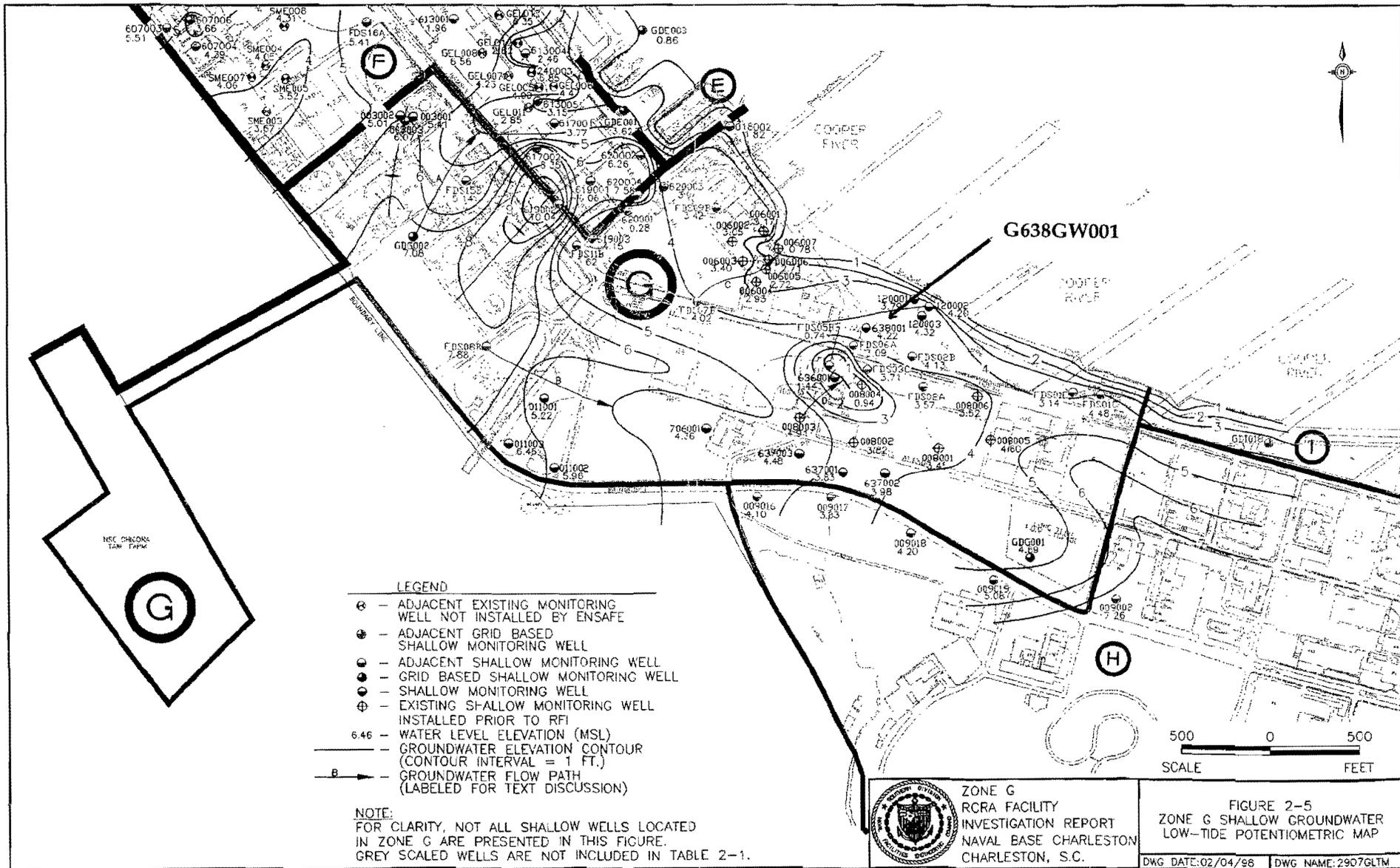
**TABLE C-2**  
 SPLP Metals Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration	Units	Qualifier
Aluminum, SPLP	G638SB005	350	µg/L	J
	G638SB007	605		=
	G638SB008	1,210		=
	G638SB009	2,270		=
Antimony, SPLP	G638SB005	3.7	µg/L	J
	G638SB007	5.3		J
Arsenic, SPLP	G638SB005	51.7	µg/L	=
	G638SB007	8.9		J
	G638SB008	2.1		J
	G638SB009	4.2		J
Barium, SPLP	G638SB005	455	µg/L	=
	G638SB007	624		=
	G638SB008	816		J
	G638SB009	782		J
Cadmium, SPLP	G638SB005	0.4	µg/L	J
	G638SB007	0.5		J
	G638SB008	2.1		J
	G638SB009	1.9		J
Calcium, SPLP	G638SB005	10,900	µg/L	=
	G638SB007	8,310		=
	G638SB008	12,600		=
	G638SB009	16,100		=
Chromium, Total	G638SB005	2.3	µg/L	J
	G638SB007	4.2		J
	G638SB008	2.1		J
	G638SB009	4.8		J
Copper, SPLP	G638SB005	5.2	µg/L	J
	G638SB007	16.9		J
	G638SB008	3.6		J
	G638SB009	4.1		J
Iron, SPLP	G638SB005	287	µg/L	J
	G638SB007	702		=
	G638SB008	948		=
	G638SB009	1,790		=
Lead, SPLP	G638SB005	2.9	µg/L	J
	G638SB007	13.4		=
	G638SB008	17.1		=
	G638SB009	9.7		J

**TABLE C-2**  
 SPLP Metals Detected in Surface Soil  
*RFI Report Addendum, AOC 638, Zone G, Charleston Naval Complex*

Parameter	Location	Concentration	Units	Qualifier
Magnesium, SPLP	G638SB005	367	µg/L	J
	G638SB007	1,130		J
	G638SB008	668		J
	G638SB009	546		J
Manganese, SPLP	G638SB005	2	µg/L	J
	G638SB007	10.2		J
	G638SB008	5.2		J
	G638SB009	8.3		J
Nickel, SPLP	G638SB005	1.4	µg/L	J
	G638SB007	4.9		J
	G638SB009	2		J
Potassium, SPLP	G638SB005	146	µg/L	J
	G638SB007	692		J
	G638SB008	206		J
	G638SB009	272		J
Selenium, SPLP	G638SB007	2.5	µg/L	J
	G638SB009	1.8		J
Sodium, SPLP	G638SB005	4,290	µg/L	J
	G638SB007	9,640		=
	G638SB008	5,970		=
	G638SB009	6,000		=
Vanadium, SPLP	G638SB005	4.6	µg/L	J
	G638SB007	9.8		J
	G638SB008	3.5		J
	G638SB009	6.7		J
Zinc, SPLP	G638SB005	26.8	µg/L	=
	G638SB007	89		=
	G638SB008	39.9		=
	G638SB009	62.2		=

µg/L    micrograms per liter  
 J        chemical detected at concentration below the method detection limit, concentration not known  
 =        chemical detected at the concentration shown



- LEGEND**
- ⊕ - ADJACENT EXISTING MONITORING WELL NOT INSTALLED BY ENSAFE
  - ⊙ - ADJACENT GRID BASED SHALLOW MONITORING WELL
  - ⊗ - ADJACENT SHALLOW MONITORING WELL
  - ⊘ - GRID BASED SHALLOW MONITORING WELL
  - ⊚ - SHALLOW MONITORING WELL
  - ⊕ - EXISTING SHALLOW MONITORING WELL INSTALLED PRIOR TO RFI
  - 6.46 - WATER LEVEL ELEVATION (MSL)
  - - GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL = 1 FT.)
  - B - GROUNDWATER FLOW PATH (LABELED FOR TEXT DISCUSSION)

**NOTE:**  
 FOR CLARITY, NOT ALL SHALLOW WELLS LOCATED IN ZONE G ARE PRESENTED IN THIS FIGURE. GREY SCALED WELLS ARE NOT INCLUDED IN TABLE 2-1.


**ZONE G**  
 RCRA FACILITY  
 INVESTIGATION REPORT  
 NAVAL BASE CHARLESTON  
 CHARLESTON, S.C.

**FIGURE 2-5**  
 ZONE G SHALLOW GROUNDWATER  
 LOW-TIDE POTENTIOMETRIC MAP  
 DWG DATE: 02/04/98    DWG NAME: 2907GLTM

## Comments and Responses on the Zone G RFI Report, Revision 0 June 25, 1999

### Comments by Stacey French (Specific)

#### Comment 12: Table 10.4.18 Summary of Risk and Hazard AOC 638

The acronym ND is used in the table, however it is not defined in the notes portion of the table. Please revise the notes to include a definition of ND.

#### Navy/EnSafe Response 12

The acronym ND will be identified in the notes of the table as "Not Determined" due to a lack of available risk information.

#### CH2M-Jones Response 12

*The Navy's response to the comment above provides clarification as to this acronym. No further revision is considered necessary.*

**Comments and Responses on the Zone G RFI Work Plan Addendum,  
Revision 0  
January 17, 2000**

**Comments by Susan Peterson**

**AOC 638**

**Comment 1: Clarification requested.**

The text states (section 2.3.2) that for subsurface soil, "several of these location will be selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs and to determine the need for additional monitoring wells." CNC provides Figure 2.3 that shows the location of the proposed surface soil samples. Are the locations of the "several of these locations" in fact 638SB005 and 638SB006? Table 2.3 states that soil will be collected from the 3-5' interval at SB005 and SB006. Since "several" is assumed to be "more than 2," the Department can only presume, based on the text's wording, that the Navy plans to collect subsurface soil samples at locations other than SB005 and SB006. Please supply a map showing the locations of the proposed subsurface soil samples and modify the text to give sufficient detail.

This text seems to be cut and paste for most (if not all) of the Subsurface Soil sections of the Data Gaps sections. Please review the Subsurface Soil sections for each AOC/SWMU with respect to the above comment and make changes to the text and/or figure as applicable.

**Navy/EnSafe Response 1**

**Please see the following response to Danielson Comment # 12.**

**[Response 12:**

**The Department has indicated in past Project Team meetings that it was not concerned with the specific details of samples collected for SPLP analyses; therefore, these types of samples were only mentioned in the work plan addendum and not specifically detailed in the site-specific sampling and analysis plans. The Project Team agreed that it was not necessary to show the number of SPLP samples or locations in the work plan addendum. The Zone G Final RFI Report will show the locations where the SPLP samples were located and also provide the results of the calculated SSL results.]**

**CH2M-Jones Response 1**

*The Zone G RFI Report Addendum shows the sample locations and presents the results of the SPLP analyses. Some SSL calculations were performed initially, but in the subsequent screening of the RFI Report Addendum EPA Generic SSLs were used, as agreed to by the BCT.*

Responses to EPA Comments on the RFI Report Addendum,  
AOC 638, Zone G, Revision 0, Charleston Naval Complex  
Dated September 2001

---

**EPA GENERAL COMMENT:**

1. This document is well written and the conclusion that no land use restrictions are needed is supported by the data.

**EPA SPECIFIC COMMENTS:**

1. Page 4-1, Line 13. The text states that surface soil samples were collected to delineate arsenic to the north of the site. The rationale for collecting these arsenic samples in this location should be added to the text.

**CH2M-Jones Response 1:**

*Although arsenic was not a suspected site-related contaminant, and was not identified as a chemical of potential concern (COPC) or a chemical of concern (COC) during the RFI, one surface soil sample (G638SB00501) collected north of Bldg. 132 during RFI Work Plan Addendum work contained arsenic at 45.1 milligrams per kilogram (mg/kg), which exceeded the risk-based concentration (RBC), the soil screening level (SSL) and the Zone G background range. CH2M-Jones then collected two surface soil samples for arsenic analyses to ensure that the results in sample G638SO00501 were isolated and bounded by samples which completely delineated arsenic occurrence to SCDHEC's satisfaction. This information has been added to Section 4.1, and the revised page of text is enclosed.*

2. Page 5-1, Line 13. It is stated that arsenic fell outside the Zone G arsenic background range, thus, the entire data set for the CNC surface soils was used for the comparison with the ranges of background values. First, the uncertainty associated with using the CNC background set should be discussed in the uncertainty section. Second, additional text needs to be added to this section to support the use of the entire CNC background data set over background data collected from locations adjacent to this site.

**CH2M-Jones Response 2:**

*The text has been edited to remove references made to the use of the entire Charleston Naval Complex (CNC) background data set. The primary point which was being made is that arsenic is not specific to AOC 638 operations. Recent soil sampling along the CNC railroad lines and nearby runoff areas measured arsenic levels ranging from 1.3 to 92 mg/kg. These elevated detections are suspected of being related to routine arsenical pesticide application across the base (which followed guidelines for application), and are not related to RCRA activities at SWMUs or AOCs. The text has been edited to clarify this point, and replacement slip sheets for this section of the report are attached.*

3. Page 2-1, Line 26. The acronym "BRC" is included in this sentence. However, it is not defined in the text nor in the Acronyms and Abbreviations Page. This acronym should be defined appropriately.

**CH2M-Jones Response 3:**

*The acronym "BRC" represents a background reference concentration (BRC) for each inorganic parameter, determined for each Zone during the RFI using selected soil samples collected from a "background" data set. A single BRC value was established for each inorganic parameter in surface and subsurface soils, such as 17.2 mg/kg for arsenic in Zone G surface soil. The term has been added to the acronym list, and a replacement page is provided for insertion into the original Revision 0 binder.*