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CONFIRMATORY SAMPLING INVESTIGATION REPORT AREAS OF CONCERN 711, 715 AND 718 ZONE I REGARDING OIL/WATER SEPARATORS CNC CHARLESTON SC
3/13/2003
CH2M HILL

CONFIRMATORY SAMPLING INVESTIGATION REPORT

AOC 711, AOC 715, AOC 718, Zone I
Oil/Water Separators

Charleston Naval Complex
North Charleston, South Carolina

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

CH2M Jones

March 2003

Revision No. 1
Contract N62467-99-C-0960

CH2M HILL
3011 S.W Williston Road
Gainesville, FL
32608-3928
Mailing address:
PO Box 147009
Gainesville, FL
32614-7009
Tel 352.335.7991
Fax 352.335.2959

CH2MHILL

March 13, 2003

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

Re: Confirmatory Sampling Investigation Report (Revision 1) — AOCs 711, 715, and 718, Zone I

Dear Mr. Scaturo:

Enclosed please find four copies of the Confirmatory Sampling Investigation Report (Revision 1) for AOCs 711, 715, and 718 in Zone I 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 Louise Palmer. Please contact her at (704) 329-0072, extension 296, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

CONFIRMATORY SAMPLING INVESTIGATION REPORT

AOC 711, AOC 715, AOC 718, Zone I
Oil/Water Separators

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North Charleston, South Carolina

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PREPARED BY
CH2M-Jones

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158814.ZI.PR.13

Certification Page for Confirmatory Sampling Investigation Report (Revision 1) – AOCs 711, 715, and 718, Zone I

Oil/Water Separators

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

South Carolina

P. E. No. 21428

Dean Williamson, P.E.

3/14/2003

Date

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Acronyms and Abbreviations

AOC	Area of concern
BEQ	Benzo[a]pyrene equivalent
BRAC	Base Realignment and Closure Act
BRC	Background reference concentration
CA	Corrective action
CNC	Charleston Naval Complex
COPC	Chemical of potential concern
COC	Chemical of concern
CSC	Coastal Service Center
CSI	Confirmatory sampling investigation
DAF	Dilution attenuation factor
DPT	Direct-push technology
EPA	U.S. Environmental Protection Agency
EnSafe	EnSafe Inc.
ft bls	Feet below land surface
HI	Hazard index
μg/L	Microgram per liter
mg/kg	Milligram per kilogram
MCL	Maximum contaminant level
NAVBASE	Naval base
NFA	No further action
NFI	No further investigation
NOAA	National Oceanographic Atmospheric Administration
OP	Organophosphorous
OWS	Oil/water separator
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl

Acronyms and Abbreviations, Continued

RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SCDHEC	South Carolina Department of Health and Environmental Control
SSL	Soil screening level
SWMU	Solid waste management unit
SVOC	Semivolatile organic compound
UST	Underground storage tank
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 the Final Permit (Permit No. SC0 170 022 560).

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to report the Confirmatory Sampling Investigation (CSI) for Oil/Water Separator (OWS) Areas of Concern (AOCs) 711, 715, and 718 in Zone I of the CNC. These AOCs were not included in the RCRA Facility Investigation (RFI) reports submitted for Zone I because they had not been identified as AOCs while the RFI was in progress. CSIs for these units were recommended in the *RCRA Facility Assessment (RFA) Revision 1, Charleston Naval Complex* (Department of the Navy, Southern Division, February 2001). There is no reason to believe that hazardous materials have been released from these OWS units. Figure 1-1 illustrates the locations of AOCs 711, 715, and 718 within Zone I of the CNC.

1.1 Background

AOCs 711, 715, and 718 were added to the RCRA Part B permit in 2001. These sites were designated for CSI because no historical information or visual evidence exists regarding potential releases of hazardous substances to the environment. The AOCs described in this CSI report have been investigated as part of other AOCs or Solid Waste Management Units (SWMUs) within the CNC. As part of the previously investigated AOCs/SWMUs, environmental samples near the OWSs were collected and evaluated using the CNC RFI protocol. Additional CSI sampling has been conducted at each OWS to further characterize the sites, as provided in the *Sampling and Analysis Plan for Oil/Water Separator AOCs 711 through 720, Charleston Naval Complex* (CH2M-Jones, 2002a). The OWS AOCs discussed in this CSI report are proposed for No Further Investigation (NFI) and No Further Action

(NFA) status on the basis of a lack of potential threat to human health or the environment, which is based on the results of the previous RFI and the additional sampling.

1.2 Physical Setting

AOCs 711, 715, and 718 are located within Zone I. The physical setting of Zone I is discussed in detail in Section 2 – NAVBASE Physical Setting of the *Zone I RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1999). The RFI report includes a discussion of the regional setting, geologic and hydrogeologic conditions, and climate of the CNC. Excerpts of this discussion are presented in an appendix (Appendix I), which has been added to this Revision 1 CSI Report. The area around AOCs 711, 715, and 718 is zoned in the land use plan for future general business use (B-2).

Potentiometric surface maps of the shallow and deep groundwater aquifers are presented in Figures 1-2 and 1-3. These maps were prepared by EnSafe from measurements taken on January 20, 1998. The shallow groundwater map in Figure 1-2 indicates that the flow direction at AOC 711 is toward the Cooper River. Figure 1-2 also indicates a groundwater mound beneath Building 681, which influences flow toward the Cooper River at AOC 715, but implies a southerly flow component at AOC 718. The deep groundwater map in Figure 1-3 indicates flow toward the river. The groundwater in Zone I is also expected to have a tidal influence.

1.3 Potential Receptors

The potential receptors for Zone I sites are discussed in detail in Section 6 – Fate and Transport, Section 7 – Human Health Risk Assessment, and Section 8 – Ecological Risk Summary of the *Zone I RFI Report, Revision 0*. Because the investigated units are below grade, potential releases from the OWS AOCs would likely impact subsurface soil and groundwater. Thus, direct exposure concern from potential releases from these OWS units is minimal, due to the absence of surface exposure media.

1.4 Report Organization

This *CSI Report, AOCs 711, 715, and 718, Zone I, Revision 1* has been revised according to SCDHEC comments and responses from the *CSI Report, AOCs 711, 715, and 718, Zone I, Revision 0* issued by CH2M-Jones on September 19, 2002. Comments and responses are contained in Appendix J of this Revision 1 CSI Report.

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

1.0 Introduction — Presents the purpose of the report and general information regarding the facility setting and potential receptors at the AOC sites.

2.0 AOC 711 CSI – Oil/Water Separator at Building NS200— Presents a description of AOC 711 and summarizes the results for samples collected in the vicinity of the site.

3.0 AOC 715 CSI – Oil/Water Separator at Building 681— Presents a description of AOC 715 and summarizes the results for samples collected in the vicinity of the site.

4.0 AOC 718 CSI – Former Oil/Water Separator at Building 681— Presents a description of AOC 718 and summarizes the results for samples collected in the vicinity of the site.

5.0 CSI Conclusions and Recommendations—Provides conclusions and recommendations regarding potential contamination at the sites.

6.0 References — Lists the references used in this document.

Appendix A contains photographs of the AOC 711, 715, and 718 areas.

Appendix B contains data summary tables for AOC 711 samples.

Appendix C contains data validation summaries for AOC 711, 715, and 718 samples.

Appendix D contains DPT Groundwater Sample Logs for AOC 711 and AOC 715.

Appendix E contains data summary tables for AOC 715 samples.

Appendix F contains record drawings for the OWS at Building 681.

Appendix G contains data summary tables for AOC 718 samples.

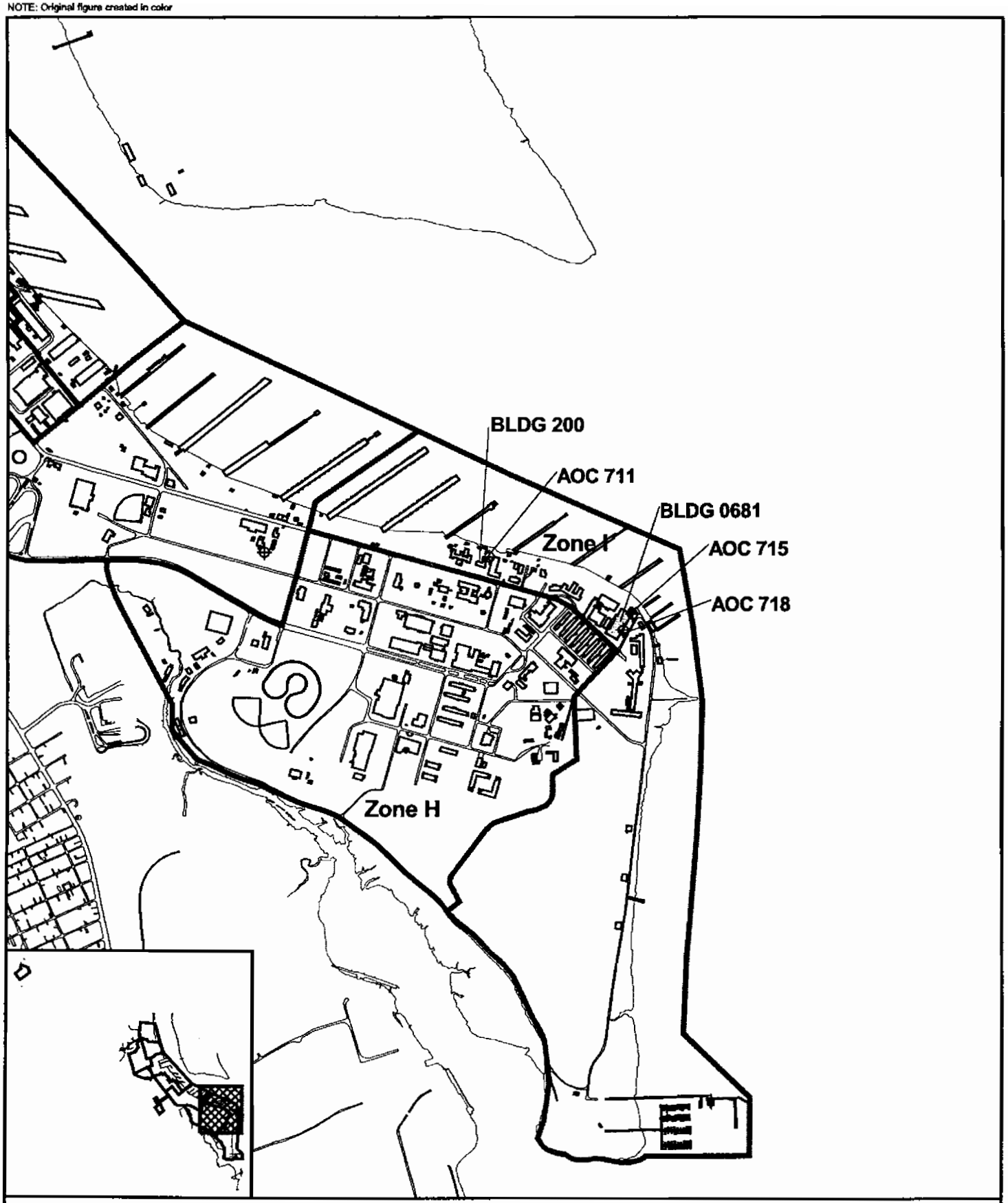
Appendix H contains data summary tables for SDG EN013 (Laboratory Blank Data).

Appendix I contains excerpts from the *Zone I RFI Report, Revision 0* (EnSafe, 1996).

Appendix J contains responses to SCDHEC comments made regarding the *CSI Report, AOCs 711, 715, 718, Zone I, Revision 0* (CH2M-Jones, 2002c).

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

NOTE: Original figure created in color



AOCs
Roads
Shoreline
Buildings
Zone Boundary

N

0 1500 3000 Feet

1 inch = 1500 feet

Figure 1-1
Location of AOCs 711, 715, and 718
Zone I
Confirmatory Sampling Investigation
Charleston Naval Complex

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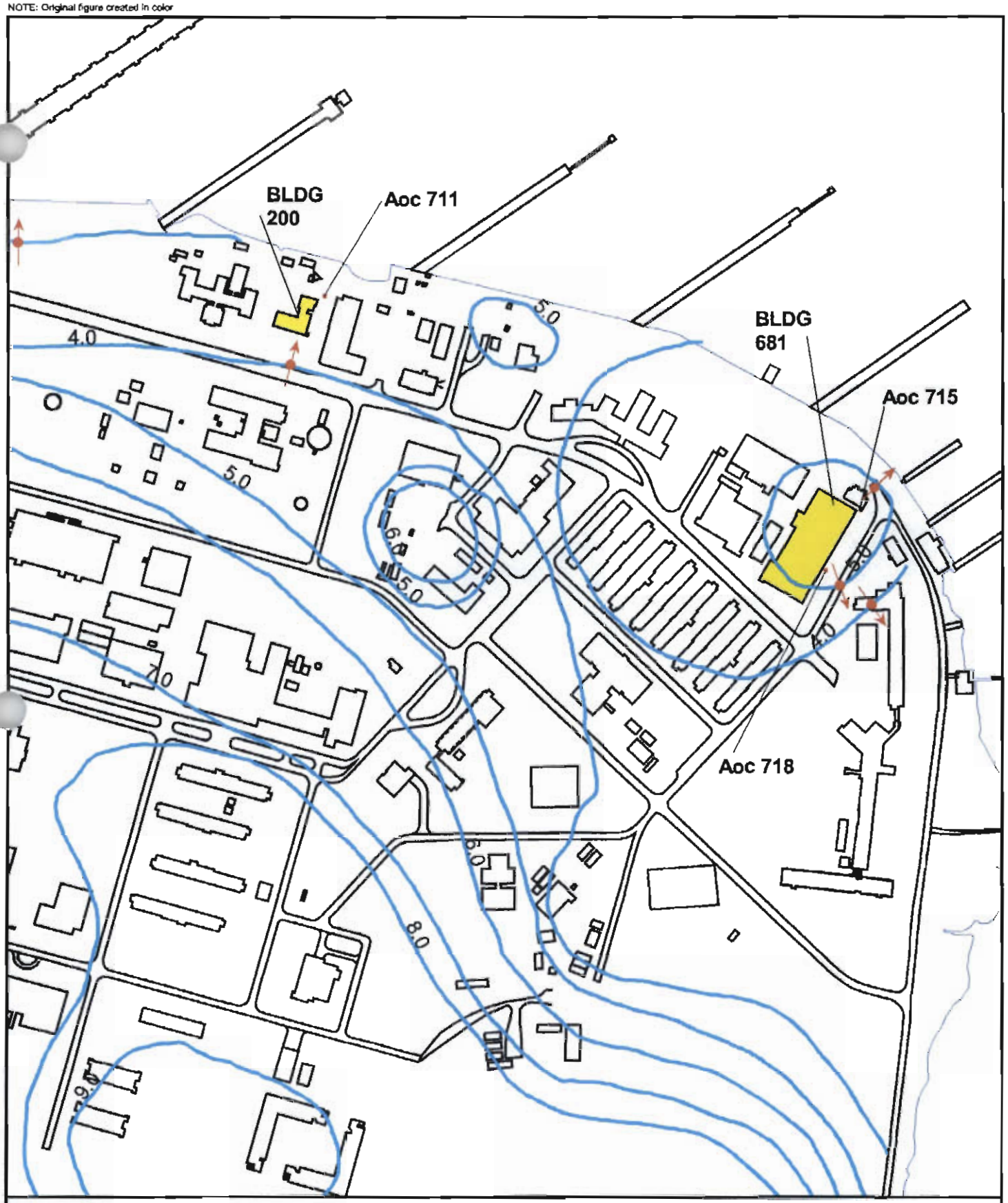
File Path: C:\18gis\Projects\Zone I\aoc_711_715_718_\Aprs\Figure1-1_D.apr, Date: 21 Aug 2002 15:50, User: dsantos, EGIS: Charleston Naval Complex - Figure 1-1 Location of AOCs 711, 715, and 718a

NOTE: Original figure created in color



Groundwater Flow Direction
Roads
Buildings
GW Shallow Contours (ft/msl) - 1/20/98
Inferred
Known

N

0 400 800 Feet

1 inch = 400 feet

Figure 1-2
Shallow Groundwater Contours
AOCs 711, 715, and 718
Charleston Naval Complex

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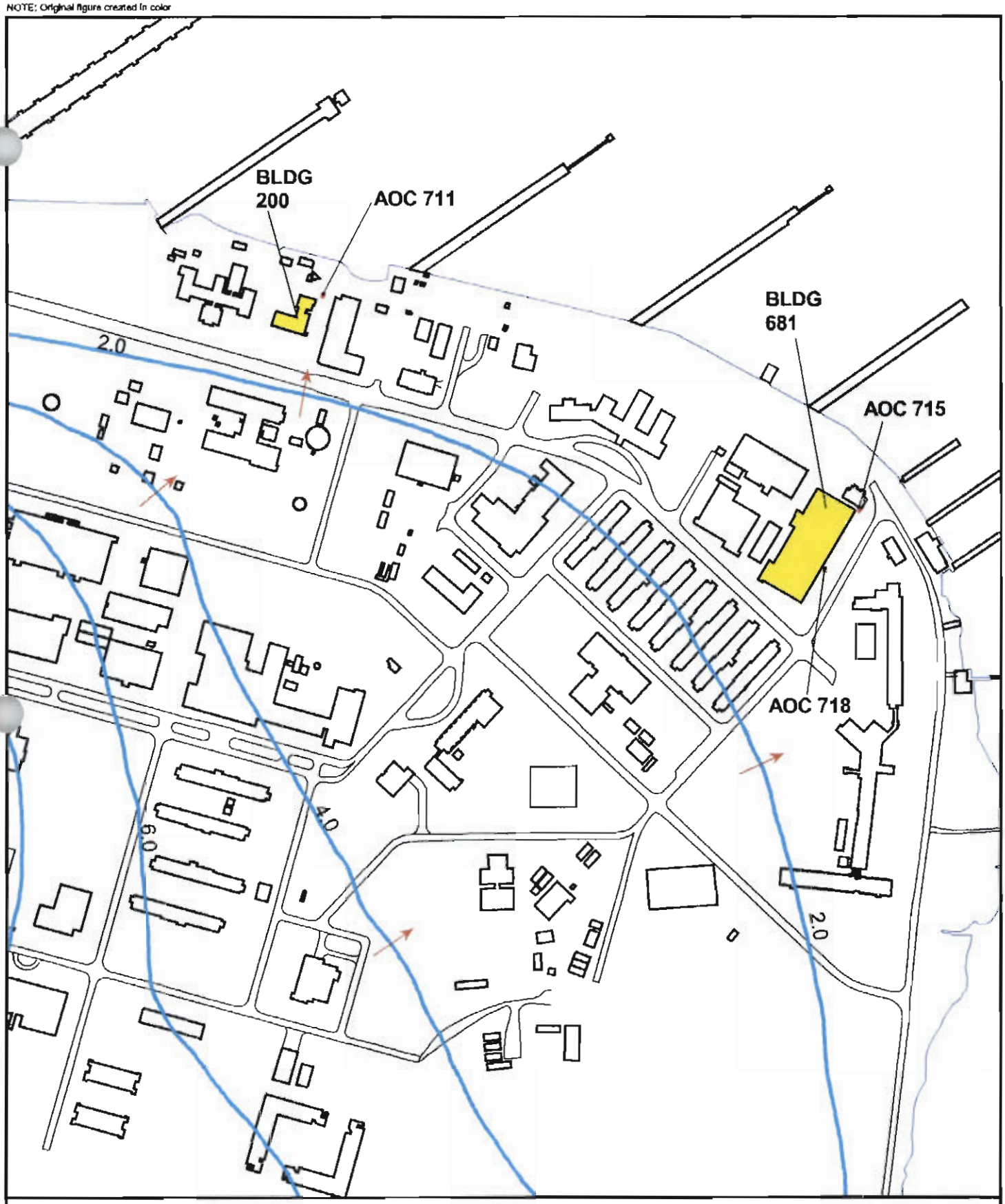

Groundwater Flow Direction
Roads
Buildings
GW Deep Contours (ft/msl) - 1/20/98
Inferred
Known

N

0 400 800 Feet

1 inch = 400 feet

Figure 1-3
Deep Groundwater Contours
AOCs 711, 715, and 718
Charleston Naval Complex

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2.0 AOC 711 CSI – Oil/Water Separator at Building NS200

2.1 Description of AOC 711

AOC 711 is described in the 2001 RFA as the OWS located at Building 200. Building 200 was previously used by the Navy as the Port Services Building, and is currently used by the National Oceanographic Atmospheric Administration (NOAA) as their Coastal Service Center (CSC Building 2). An OWS serviced effluent from the floor drains in the building's boiler room and from the 11 ft x 55 ft vehicle wash pad northeast of the building. There is no evidence suggesting management of hazardous materials at AOC 711. Figure 2-1 shows an aerial photograph dated 1997 of Building 200 and the OWS. Photographs of AOC 711 are presented in Appendix A.

Building 200 was constructed in 1954 for offices and navigation control of the shipyard. No information could be identified relating to the age of the OWS or its period of service. The 1996 removal report for a fuel oil underground storage tank (UST) located east of the building and upgradient of the OWS indicates that the OWS had been taken out of service in or before 1996 (the monitoring wells associated with the fuel oil UST investigation were removed). The area surrounding Building 200 is paved with asphaltic concrete. Surface water within the concrete wash pad is directed toward two catch basins that led to the OWS and the sanitary sewer. The topography surrounding the OWS area is level; surface water may be expected to flow toward the Cooper River, which is located approximately 120 ft north of AOC 711. Groundwater is also expected to flow toward the river (see Figure 1-2), although a tidal component of flow may exist. The depth to groundwater in this area is estimated at approximately 3 feet below land surface (ft bls).

The OWS is a 4.3-ft deep, 6 ft x 4 ft rectangular concrete and steel structure, with a steel cover at surface grade. The unit currently contains approximately 3 ft of water. Adjacent signs indicate that it no longer drains to the sanitary sewer. A 1,000-gallon oily waste holding tank has been reported adjacent to the OWS. The OWS and oily waste tank are considered the OWS system.

2.2 Environmental Sampling at AOC 711

Soil and groundwater samples were collected in the AOC 711 area for the Zone L, SWMU 37 RFI. The OWS system at Building 200 and its connection with the sanitary sewer were specifically investigated as a potential release area to surrounding soils and groundwater. Figure 2-2 presents the Zone L RFI samples collected in the vicinity of AOC 711. Within 10 feet of AOC 711, subsurface soil at two locations and surface soil from three locations were sampled from borings, and one monitoring well located near AOC 711 was originally installed to evaluate groundwater for the Zone L RFI. The complete data sets for the Zone L samples are located in the *Zone L RFI Report, Revision 0* (EnSafe, 1998).

For the AOC 711 CSI, one additional groundwater sample was collected on the north (downgradient) side of the OWS, and samples of sludge and water were collected from inside the OWS. The data set for the AOC 711 samples is presented in Appendix B of this report. Data validation summaries for the 2002 data are presented in Appendix C. The AOC 711 and the Zone L sample results are described below.

2.2.1 Soil Samples

In 1997, three surface soil and two subsurface soil samples were collected around the OWS system for the SWMU 37 RFI. The subsurface soil samples were collected from 3 to 5 ft bls, intended to include soil most likely to have been impacted by a potential release from the OWS piping and base (4.3 ft bls) Samples from stations LI037SB005, LI037SB006, and LI037SB008 were analyzed for cyanide, polychlorinated biphenyls (PCBs), pesticides, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. Borings at LI037SB005 and LI037SB008 were sampled for both surface and subsurface soil, only surface soil was collected at LI037SB006.

Analytes detected in the surface soil samples are listed in Table 2-1 and analytes detected in subsurface soil are listed in Table 2-2. Surface soil concentrations were compared to unrestricted land use risk-based concentrations (RBCs) from the U.S. Environmental Protection Agency (EPA) Region III October 2000 tables, adjusted for a hazard index (HI)=0.1, and to soil screening levels (SSLs) from the *EPA Soil Screening Guidance, Appendix A* (1996). SSLs were adjusted for dilution attenuation factors (DAFs) of 1.0 for VOCs and 10 for other analytes. Subsurface soil concentrations were compared to SSLs only. Soil metals concentrations were also compared to background concentrations for subsurface or surface soil from Zone I grid samples, and benzo[a]pyrene equivalents (BEQs) were compared to CNC sitewide reference concentrations.

The results of the soil screening analyses using the criteria described are discussed below. Any chemicals exceeding the screening criteria are identified as chemicals of potential concern (COPCs).

Metals in Soil Samples

With few exceptions, the detected metals in the soil samples were at concentrations within their background ranges for Zone I or were below the screening criteria. As presented in Tables 2-1 and 2-2, no metals concentrations exceeded unrestricted (i.e., residential) land use RBCs (adjusted for HI=0.1) or SSLs (DAF=10), along with background concentrations. No metal COPCs were identified in the soil samples.

VOCs in Soil Samples

As shown in Table 2-1, traces of toluene and xylenes were detected in surface soil at sample location LI037SB005. The concentrations of these compounds did not exceed unrestricted land use RBCs or SSLs. The source for these compounds is not clear, although it is not likely that potential releases from a subsurface OWS could have impacted surface soil. No VOCs were detected in subsurface soil. No VOC COPCs were identified in the soil samples.

SVOCs in Soil Samples

As shown in Table 2-1, SVOCs primarily related to petroleum hydrocarbons were detected in the surface soil samples at concentrations less than anthropogenic background concentrations at CNC. No SVOCs were detected in subsurface soil. No SVOC COPCs were identified in the soil samples.

Pesticides and PCBs in Soil Samples

PCBs were not detected in soil samples at AOC 711. As presented in Tables 2-1 and 2-2, low concentrations of pesticides were detected in both surface and subsurface soil. These are likely related to routine maintenance of the landscaped area on the east side of the AOC. Pesticide concentrations were all less than unrestricted land use RBCs and SSLs. No pesticide or PCB COPCs were identified in the soil samples.

2.2.2 Groundwater Samples

In 1997, groundwater monitoring well LI037GW001 was specifically installed at the OWS system for the Zone L SWMU 37 investigation. As reported in the Zone L RFI report, this monitoring well was sampled in 1997 for cyanide, VOCs, SVOCs, PCBs/pesticides, and metals. The well construction log for LI037GW001 was presented in the Zone L RFI report.

Groundwater was also sampled by direct-push technology (DPT) from I711GP001, located within a foot of the OWS between the OWS and the wash pad. The sample screened from 8 to 12 ft bls was analyzed for VOCs, SVOCs, and PCBs/pesticides; metals were not analyzed from the DPT sample because of the high turbidity expected in the sample. A log of the groundwater sample is presented in Appendix D.

Analytes detected in groundwater from LI037GW001 and I711GP001 are listed in Table 2-3. Concentrations were compared to maximum contaminant levels (MCLs); where MCLs do not exist they were compared to tap water RBCs from the EPA Region III October 2000 tables, adjusted for HI=0.1. Metals concentrations were also compared to background reference concentrations (BRCs) for shallow groundwater from Zone I.

As seen in Table 2-3, metals were detected in the monitoring well sample below applicable MCLs, RBCs, and BRCs. Trace concentrations of acetone, 1,2-DCE, and DDT were detected in the DPT sample; none exceeded MCLs. No SVOCs or PCBs were detected in the DPT or the monitoring well samples. No COPCs were identified in groundwater at AOC 711.

2.2.3 OWS Contents Sampling

In 2002, a sample of sludge and a water sample were collected from the OWS and analyzed for VOCs, SVOCs, PCBs/pesticides, and metals. As discussed in the Data Validation Summary Report, a laboratory oversight required the recollection and reanalysis of the sludge sample for VOCs. The original data were provided by the laboratory, however, they were qualified with an "S," to be used for screening purposes only, due to the problems identified by the laboratory. The resampling data, however, met all applicable QC requirements.

Tables 2-4 and 2-5 present analytes detected in the OWS. The analytes detected in the OWS are discussed briefly below.

Metals in OWS Contents

Metals were detected in both sludge and water samples at concentrations comparable to background values for both surface soil and shallow groundwater. It is suspected that surface soil from the surrounding area makes up a majority of the sludge in the OWS.

VOCs in OWS Contents

Trace concentrations of VOCs, primarily petroleum hydrocarbons, were detected in the OWS sludge. Only acetone was detected in the OWS water sample.

SVOCs in OWS Contents

Trace amounts of polycyclic aromatic hydrocarbons (PAHs) were identified in the OWS sludge. Concentrations are similar to those found in the surface soil surrounding the site. Only bis(2-ethylhexyl)phthalate and fluoranthene were detected in the water sample, at trace concentrations.

Pesticides and PCBs in OWS Contents

Trace amounts of pesticides were detected in the sludge sample, similar to the soil concentrations. No PCBs were detected in the sludge sample. No pesticides or PCBs were detected in the water sample.

2.3 Investigation Summary – AOC 711

Metals detected in soil and groundwater samples at AOC 711 indicated naturally occurring concentrations and not impacts from suspected releases from the OWS system at Building 200. Although traces of organic compounds and pesticides were detected in the soil and groundwater samples collected in the vicinity of AOC 711, the concentrations were reflective of the general industrial setting at CNC and influenced by the proximity of landscaping activities, and not specific to OWS operations. No COPCs were identified in soil or groundwater from around the OWS at AOC 711. The current contents of the OWS do not indicate a threat to the site groundwater. Therefore, no removal actions are needed for the contents of the OWS.

2.4 AOC 711 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 711:

- The OWS system was taken out of service in or before 1996. No construction details have been located for the system.
- Soil and groundwater samples were collected adjacent to the OWS system specifically to investigate the OWS system, as provided in the approved Zone L RFI Work Plan and the *Sampling and Analysis Plan for Oil/Water Separator AOCs 711 through 720, Charleston Naval Complex* (CH2M-Jones, 2002a).
- Soil and groundwater samples analyzed for the full suite of analytes including VOCs, SVOCs, PCBs, pesticides, and metals indicate no COPCs at AOC 711, and none were identified above either detection limits or screening criteria. Thus, no releases of significance from the OWS system are noted.

It is concluded that sufficient data exist to evaluate AOC 711, and that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore, NFA status is recommended for this site.

TABLE 2-1
Analytes Detected in Surface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Metals							
Aluminum	LI037SB005	05/19/1997	7,490	=	7,800	NL	3,470 - 27,400
	LI037SB006	06/09/1997	4,590	=			
	LI037SB008	06/09/1997	7,120	=			
Arsenic	LI037SB005	05/19/1997	4.5	=	0.43	15	0.46 - 20
Barium	LI037SB005	05/19/1997	15.7	J	550	800	7.8 - 43
	LI037SB006	06/09/1997	10.2	=			
	LI037SB008	06/09/1997	14.1	=			
Beryllium	LI037SB005	05/19/1997	0.46	J	16	32	0.34 - 0.95
	LI037SB006	06/09/1997	0.36	J			
Cadmium	LI037SB005	05/19/1997	0.26	J	7.8	4	0.13 - 0.61
	LI037SB006	06/09/1997	0.51	J			
	LI037SB008	06/09/1997	0.14	J			
Calcium	LI037SB005	05/19/1997	25,400	=	NL	NL	1,670 - 59,500
	LI037SB006	06/09/1997	190,000	=			
	LI037SB008	06/09/1997	1,360	=			
Chromium, Total	LI037SB005	05/19/1997	19.0	J	210[d]	19	7.5 - 54
	LI037SB006	06/09/1997	9.9	=			
	LI037SB008	06/09/1997	7.9	=			
Cobalt	LI037SB005	05/19/1997	2.5	J	470	1,000	0.64 - 5.8
	LI037SB006	06/09/1997	4.1	=			
	LI037SB008	06/09/1997	0.6	J			
Copper	LI037SB005	05/19/1997	6.2	=	310	5,300	2.4 - 556
	LI037SB006	06/09/1997	10.3	=			
	LI037SB008	06/09/1997	3.9	=			
Iron	LI037SB005	05/19/1997	6,220	=	2,300	NL	1,730 - 22,700
	LI037SB006	06/09/1997	4,710	=			

TABLE 2-1
Analytes Detected in Surface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Iron	LI037SB008	06/09/1997	3,800	=	2,300	NL	1,730 - 22,700
Lead	LI037SB005	05/19/1997	9.3	=	400[d]	400	5.0 - 203
	LI037SB006	06/09/1997	6.5	=			
	LI037SB008	06/09/1997	10.3	=			
Magnesium	LI037SB005	05/19/1997	1,080	=	NL	NL	424 - 3,820
	LI037SB006	06/09/1997	2,060	=			
	LI037SB008	06/09/1997	313	=			
Manganese	LI037SB005	05/19/1997	61.5	=	160	480	15 - 426
	LI037SB006	06/09/1997	319	=			
	LI037SB008	06/09/1997	49.2	=			
Mercury	LI037SB008	06/09/1997	0.04	=	2.3	1	0.13 - 0.47
Nickel	LI037SB005	05/19/1997	7.0	J	160	65	1.5 - 18
	LI037SB006	06/09/1997	7.2	=			
	LI037SB008	06/09/1997	2.4	J			
Potassium	LI037SB005	05/19/1997	514	J	NL	NL	493 - 2,730
	LI037SB006	06/09/1997	416	J			
	LI037SB008	06/09/1997	169	J			
Selenium	LI037SB005	05/19/1997	0.85	=	39	2.5	0.50 - 1.1
	LI037SB006	06/09/1997	0.54	J			
Sodium	LI037SB005	05/19/1997	788	=	NL	NL	181 - 2,030
	LI037SB006	06/09/1997	272	J			
	LI037SB008	06/09/1997	146	J			
Tin	LI037SB005	05/19/1997	1.5	J	4,700	NL	0.98 - 7.5
Vanadium	LI037SB005	05/19/1997	17.2	=	55	3,000	8.5 - 53
	LI037SB006	06/09/1997	11.7	=			
	LI037SB008	06/09/1997	8.3	=			
Zinc	LI037SB005	05/19/1997	27.3	=	2,300	6,000	5.9 - 150

TABLE 2-1
Analytes Detected in Surface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Zinc	LI037SB006	06/09/1997	64.2	=	2,300	6,000	5.9 - 150
	LI037SB008	06/09/1997	14.6	=			
Pesticides							
Endrin Ketone	LI037SB008	06/09/1997	0.013	J	2.3	0.5	NA
gamma-Chlordane	LI037SB006	06/09/1997	0.0018	J	1.8	5	NA
p,p'-DDE	LI037SB005	05/19/1997	0.018	=	1.9	27	NA
	LI037SB006	06/09/1997	0.012	=			
	LI037SB008	06/09/1997	0.022	=			
p,p'-DDT	LI037SB008	06/09/1997	0.020	J	1.9	16	NA
Semivolatile Organic Compounds							
BEQs	LI037SB005	05/19/1997	0.439	=	0.087	NA	1.304[e]
	LI037SB008	06/09/1997	0.584	=			
Benzo[a]Anthracene	LI037SB005	05/19/1997	0.038	J	0.87	1	0.616
	LI037SB008	06/09/1997	0.120	J			
Benzo[a]Pyrene	LI037SB008	06/09/1997	0.180	J	0.087	4	0.598
Benzo[b]Fluoranthene	LI037SB005	05/19/1997	0.038	J	0.87	2.5	0.608
	LI037SB008	06/09/1997	0.140	J			
Benzo[g,h,i]Perylene	LI037SB008	06/09/1997	0.130	J	NL	NL	NA
Benzo[k]Fluoranthene	LI037SB005	05/19/1997	0.038	J	8.7	25	0.596
	LI037SB008	06/09/1997	0.190	J			
Chrysene	LI037SB005	05/19/1997	0.050	J	87	80	0.62
	LI037SB008	06/09/1997	0.140	J			
Fluoranthene	LI037SB005	05/19/1997	0.062	J	310	2,100	NA
	LI037SB008	06/09/1997	0.210	J			
Indeno(1,2,3-c,d)pyrene	LI037SB008	06/09/1997	0.110	J	0.87	7	NA

TABLE 2-1
Analytes Detected in Surface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Phenanthrene	LI037SB008	06/09/1997	0.160	J	NL	NL	NA
Pyrene	LI037SB005	05/19/1997	0.059	J	230	2,100	NA
	LI037SB008	06/09/1997	0.210	J			
Volatile Organic Compounds							
Toluene	LI037SB005	05/19/1997	0.003	J	1,600	0.6	NA
Xylenes, Total	LI037SB005	05/19/1997	0.002	J	16,000	9	NA

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

[a] Unrestricted (i.e., residential) land use risk-based concentrations (RBCs) are taken from EPA Region III RBC Tables, October 2000, adjusted for hazard index (HI)=0.1.

[b] Soil screening levels (SSLs) from EPA Soil Screening Guidance: User's Guide; dilution attenuation factor (DAF)=1.0 for VOCs, DAF=10 for others.

[c] Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

[d] RBCs for Total Chromium and Lead from EPA Region IX PRG Tables, November 2000.

[e] Background values for BEQs and its components are from base-wide background concentrations.

NA Not available

NL Not listed

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

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

TABLE 2-2
Analytes Detected in Subsurface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background Range[b]
Metals						
Aluminum	LI037SB005	05/19/1997	3,760	=	NL	4,590 - 11,700
	LI037SB008	06/09/1997	7,630	=		
Arsenic	LI037SB005	05/19/1997	2.1	=	15	0.88 - 4.4
	LI037SB008	06/09/1997	4.2	=		
Barium	LI037SB005	05/19/1997	7.8	J	800	9.5 - 19
	LI037SB008	06/09/1997	15.8	=		
Beryllium	LI037SB005	05/19/1997	0.25	J	32	0.33 - 0.51
	LI037SB008	06/09/1997	0.38	J		
Cadmium	LI037SB005	05/19/1997	0.17	J	4	0.48
	LI037SB008	06/09/1997	0.36	J		
Calcium	LI037SB005	05/19/1997	6,570	J	NL	528 - 63,900
	LI037SB008	06/09/1997	24,100	=		
Chromium, Total	LI037SB005	05/19/1997	10.5	J	19	7.6 - 41
	LI037SB008	06/09/1997	22.9	=		
Cobalt	LI037SB005	05/19/1997	1.5	J	1,000	2.1 - 2.2
	LI037SB008	06/09/1997	1.8	J		
Copper	LI037SB005	05/19/1997	6.7	=	5,300	1.2 - 12
	LI037SB008	06/09/1997	10.8	=		
Iron	LI037SB005	05/19/1997	3,270	=	NL	3,730 - 7,250
	LI037SB008	06/09/1997	6,650	=		
Lead	LI037SB005	05/19/1997	8.3	=	400	3.1 - 7.2
	LI037SB008	06/09/1997	15.9	=		
Magnesium	LI037SB005	05/19/1997	528	J	NL	196 - 3,990
	LI037SB008	06/09/1997	1,340	=		
Manganese	LI037SB005	05/19/1997	25.2	=	480	8.6 - 55
	LI037SB008	06/09/1997	54.7	=		

TABLE 2-2
Analytes Detected in Subsurface Soil at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background Range[b]
Mercury	LI037SB008	06/09/1997	0.06	=	1	ND
Nickel	LI037SB005	05/19/1997	3.7	J	65	3.5 - 16
	LI037SB008	06/09/1997	7.0	=		
Potassium	LI037SB005	05/19/1997	231	J	NL	930 - 2,230
	LI037SB008	06/09/1997	450	J		
Selenium	LI037SB008	06/09/1997	0.60	J	2.5	0.59 - 1.4
Sodium	LI037SB005	05/19/1997	214	J	NL	226 - 1,770
	LI037SB008	06/09/1997	325	=		
Tin	LI037SB005	05/19/1997	1.8	J	NL	NA
Vanadium	LI037SB008	06/09/1997	18.8	=	3,000	11 - 24
Zinc	LI037SB005	05/19/1997	23.5	=	6,000	4.7 - 29
	LI037SB008	06/09/1997	53.0	=		
Pesticides						
Alpha-chlordane	LI037SB005	05/19/1997	0.0021	=	5	NA
	LI037SB008	06/09/1997	0.0380	=		
Gamma-chlordane	LI037SB005	05/19/1997	0.0036	=	5	NA
	LI037SB008	06/09/1997	0.1300	=		
Heptachlor Epoxide	LI037SB008	06/09/1997	0.058	=	0.35	NA
p,p'-DDD	LI037SB005	05/19/1997	0.0094	=	8	NA
p,p'-DDE	LI037SB005	05/19/1997	0.018	=	27	NA
	LI037SB008	06/09/1997	0.0056	=		
p,p'-DDT	LI037SB008	06/09/1997	0.0072	J	16	NA

[a] Soil screening levels (SSLs) from EPA Soil Screening Guidance: User's Guide; dilution attenuation factor (DAF)=1.0 for VOCs, DAF=10 for others.

[b] Background Range values for metals are minimum and maximum concentrations detected in Zone I grid samples.

NA Not available

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

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

TABLE 2-3
Analytes Detected in Groundwater at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*	Zone I BRC
Metals						
Aluminum	LI037GW001	07/25/1997	381	=	*3,700*	1,440
Antimony	LI037GW001	07/25/1997	1.9	J	6	3 - 6 *
Arsenic	LI037GW001	07/25/1997	4.0	J	50	23
Barium	LI037GW001	07/25/1997	17.5	=	2,000	110
Calcium	LI037GW001	07/25/1997	154,000	=	NL	39,000 - 980,000 *
Chromium, Total	LI037GW001	07/25/1997	2.1	J	100	14.3
Copper	LI037GW001	07/25/1997	3.8	J	1,300	4.4
Iron	LI037GW001	07/25/1997	6,390	=	*1,100*	49 - 31,900 *
Magnesium	LI037GW001	07/25/1997	27,100	=	NL	8,580 - 1,410,000 *
Manganese	LI037GW001	07/25/1997	207	=	*73*	5,430
Nickel	LI037GW001	07/25/1997	3.0	J	*73*	13.3
Potassium	LI037GW001	07/25/1997	13,900	=	NL	7,060 - 550,000 *
Sodium	LI037GW001	07/25/1997	46,000	=	NL	NA
Vanadium	LI037GW001	07/25/1997	1.9	J	*26*	14
Zinc	LI037GW001	07/25/1997	8.5	J	*1,100*	24.4
Volatile Organic Compounds						
1,2-Dichloroethene (total)	I711GP001	06/17/2002	0.32	J	70	NA
Acetone	I711GP001	06/17/2002	3.7	J	*61*	NA
cis-1,2-Dichloroethylene	I711GP001	06/17/2002	0.32	J	70	NA
Pesticides						
p,p'-DDT	I711GP001	06/17/2002	0.0069	J	*0.2*	NA

TABLE 2-3
Analytes Detected in Groundwater at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*	Zone I BRC

All values are presented in units of micrograms per liter (µg/L).

RBCs are listed in italics where no primary MCL exists. RBCs are from EPA Region III RBC (October 2000) table, adjusted for HI = 0.1

* Range of grid sample concentrations; no BRC calculated.

BRC Background Reference Concentration

NA Not available

NL No MCL or RBC listed

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

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

TABLE 2-4
Analytes Detected in OWS Sediment at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Surface Soil Background Range	Subsurface Soil Background Range
Metals							
Aluminum	I711VAOWS	06/06/2002	3,630	=	NL	3,470 - 27,400	4,590 - 11,700
Arsenic	I711VAOWS	06/06/2002	3.13	=	15	0.46 - 20	0.88 - 4.4
Barium	I711VAOWS	06/06/2002	27	J	800	7.8 - 43	9.5 - 19
Beryllium	I711VAOWS	06/06/2002	0.191	J	32	0.34 - 0.95	0.33 - 0.51
Cadmium	I711VAOWS	06/06/2002	0.856	J	4	0.13 - 0.61	0.48
Calcium	I711VAOWS	06/06/2002	24,700	=	NL	1,670 - 59,500	528 - 63,900
Chromium, Total	I711VAOWS	06/06/2002	26.5	=	19	7.5 - 54	7.6 - 41
Cobalt	I711VAOWS	06/06/2002	4.98	J	1,000	0.64 - 5.8	2.1 - 2.2
Copper	I711VAOWS	06/06/2002	30.4	=	5,300	2.4 - 556	1.2 - 12
Iron	I711VAOWS	06/06/2002	8770	=	NL	1,730 - 22,700	3,730 - 7,250
Lead	I711VAOWS	06/06/2002	35.2	=	400	5.0 - 203	3.1 - 7.2
Magnesium	I711VAOWS	06/06/2002	932	J	NL	424 - 3,820	196 - 3,990
Manganese	I711VAOWS	06/06/2002	83.9	=	480	15 - 426	8.6 - 55
Mercury	I711VAOWS	06/06/2002	0.01	J	1	0.13 - 0.47	ND
Nickel	I711VAOWS	06/06/2002	7.26	J	65	1.5 - 18	3.5 - 16
Potassium	I711VAOWS	06/06/2002	378	J	NL	493 - 2,730	930 - 2,230
Sodium	I711VAOWS	06/06/2002	448	J	NL	181 - 2,030	226 - 1,770
Vanadium	I711VAOWS	06/06/2002	16.7	=	3,000	8.5 - 53	11 - 24
Zinc	I711VAOWS	06/06/2002	383	=	6,000	5.9 - 150	4.7 - 29
Pesticides							
Alpha-chlordane	I711VAOWS	06/06/2002	0.0011	J	5	NA	NA
Endosulfan Sulfate	I711VAOWS	06/06/2002	0.0016	J	9	NA	NA
Endrin Aldehyde	I711VAOWS	06/06/2002	0.0038	J	0.5	NA	NA

TABLE 2-4
Analytes Detected in OWS Sediment at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Surface Soil Background Range	Subsurface Soil Background Range
p,p'-DDE	I711VAOWS	06/06/2002	0.0026	J	27	NA	NA
p,p'-DDT	I711VAOWS	06/06/2002	0.0172	J	16	NA	NA
Semivolatile Organic Compounds							
Anthracene	I711VAOWS	06/06/2002	0.0372	J	6,000	NA	NA
BEQs	I711VAOWS	06/06/2002	0.477	=	NL	1.304	1.4
Benzo[a]Anthracene	I711VAOWS	06/06/2002	0.175	J	1	0.616	0.627
Benzo[a]Pyrene	I711VAOWS	06/06/2002	0.173	J	4	0.598	0.623
bis(2-Ethylhexyl) Phthalate	I711VAOWS	06/06/2002	0.267	J	1,800	NA	NA
Chrysene	I711VAOWS	06/06/2002	0.228	J	80	0.62	0.616
Dimethyl Phthalate	I711VAOWS	06/06/2002	0.0295	J	NL	NA	NA
Fluoranthene	I711VAOWS	06/06/2002	0.454	J	2,100	NA	NA
Fluorene	I711VAOWS	06/06/2002	0.0181	J	280	NA	NA
Phenanthrene	I711VAOWS	06/06/2002	0.261	J	NL	NA	NA
Pyrene	I711VAOWS	06/06/2002	0.483	=	2,100	NA	NA
Volatile Organic Compounds							
Acetone	I711VAOWS	06/06/2002	0.0136	SJ	0.8	NA	NA
	I711VAOWS	07/09/2002	0.0331	J			
2-Butanone	I711VAOWS	07/09/2002	0.0078	J	0.4	NA	NA
Ethylbenzene	I711VAOWS	07/09/2002	0.0018	J	0.65	NA	NA
Styrene	I711VAOWS	07/09/2002	0.0026	J	0.2	NA	NA
Toluene	I711VAOWS	06/06/2002	0.0038	SJ	0.6	NA	NA
	I711VAOWS	07/09/2002	0.0113	=			
Xylenes, Total	I711VAOWS	07/09/2002	0.0064	J	9.5	NA	NA

Note: OWS contents are conservatively compared to criteria for subsurface soil

[a] SSLs from EPA Soil Soil Screening Guidance: User's Guide; DAF = 1.0 for VOCs, DAF = 10 for others DAF = 10 for

TABLE 2-4
Analytes Detected in OWS Sediment at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Surface Soil Background Range	Subsurface Soil Background Range

others.

Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

NA Not available

NL Not listed

SJ Estimated concentration, for screening purposes only

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

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

TABLE 2-5
Analytes Detected in OWS Water at AOC 711
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*	Zone I BRC (Shallow)
Metals						
Aluminum	I711ZAOWS	06/06/2002	612	=	*3,700*	1,440
Barium	I711ZAOWS	06/06/2002	22.1	J	2,000	110
Calcium	I711ZAOWS	06/06/2002	30300	=	NL	39,000 - 980,000 *
Chromium, Total	I711ZAOWS	06/06/2002	4.43	J	100	14.3
Copper	I711ZAOWS	06/06/2002	7.85	J	1,300	4.4
Iron	I711ZAOWS	06/06/2002	8450	=	*1,100*	49 - 31,900 *
Lead	I711ZAOWS	06/06/2002	4.26	=	15	4.4
Magnesium	I711ZAOWS	06/06/2002	1450	J	NL	8,580 - 1,410,000 *
Manganese	I711ZAOWS	06/06/2002	209	=	*73*	5,430
Nickel	I711ZAOWS	06/06/2002	1.25	J	*73*	13.3
Potassium	I711ZAOWS	06/06/2002	1960	J	NL	7,060 - 550,000 *
Sodium	I711ZAOWS	06/06/2002	4260	J	NL	NA
Vanadium	I711ZAOWS	06/06/2002	3.02	J	*26*	14
Zinc	I711ZAOWS	06/06/2002	73.5	=	*1,100*	24.4
Semivolatile Organic Compounds						
bis(2-Ethylhexyl) Phthalate	I711ZAOWS	06/06/2002	1.9	J	6	NA
Fluoranthene	I711ZAOWS	06/06/2002	0.51	J	*150*	NA
Volatile Organic Compounds						
Acetone	I711ZAOWS	06/06/2002	7	J	*61*	NA

Note: OWS contents are conservatively compared to criteria for shallow groundwater

RBCs are listed in italics where no primary MCL exists. RBCs are from EPA Region III RBC (October 2000) table, adjusted for HI = 0.1

* Range of shallow groundwater grid sample concentrations; no BRC calculated

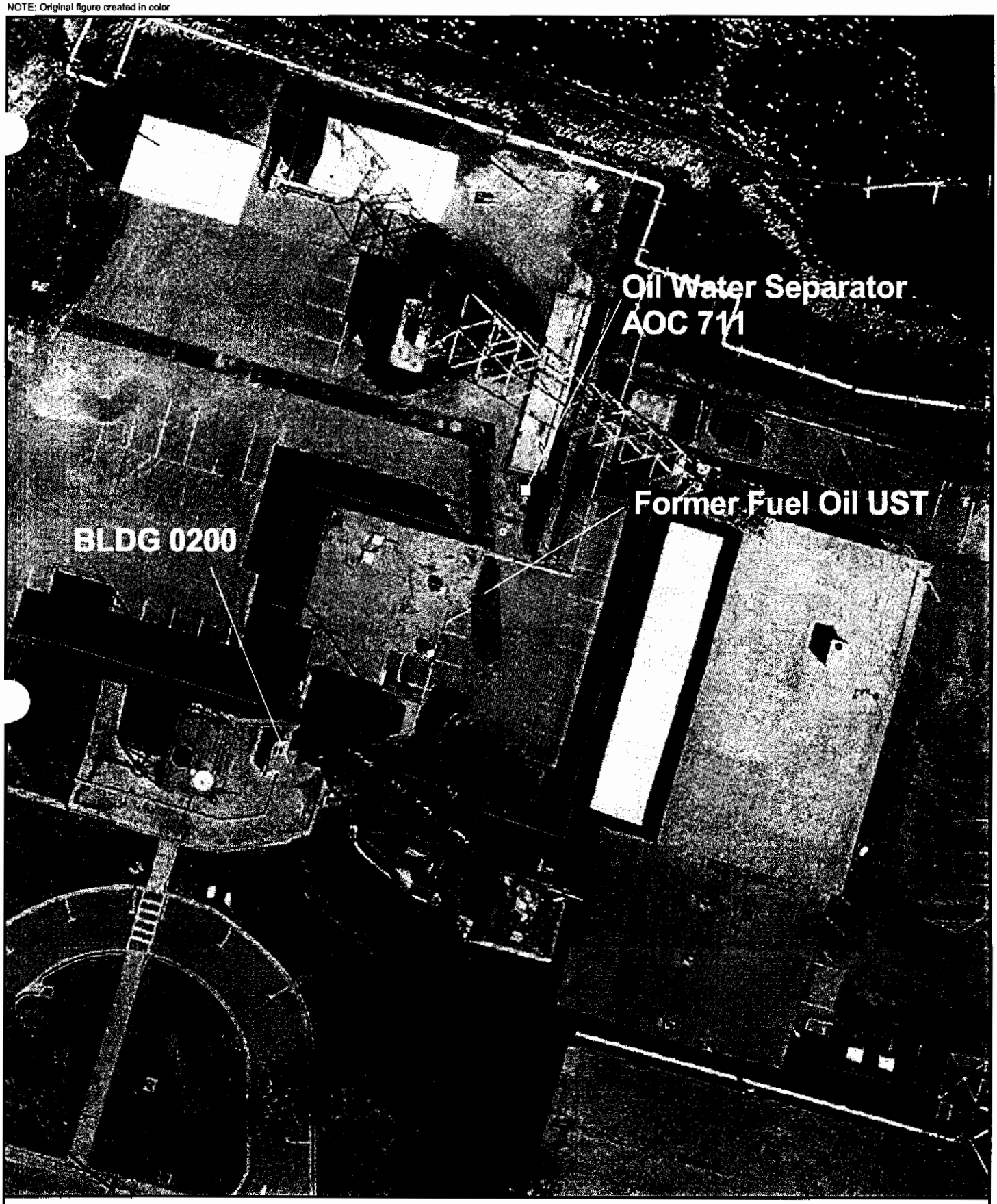
NA Not available

NL No MCL or RBC listed

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

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

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



☐ AOCs
⊕ UST

N

0 40 80 Feet

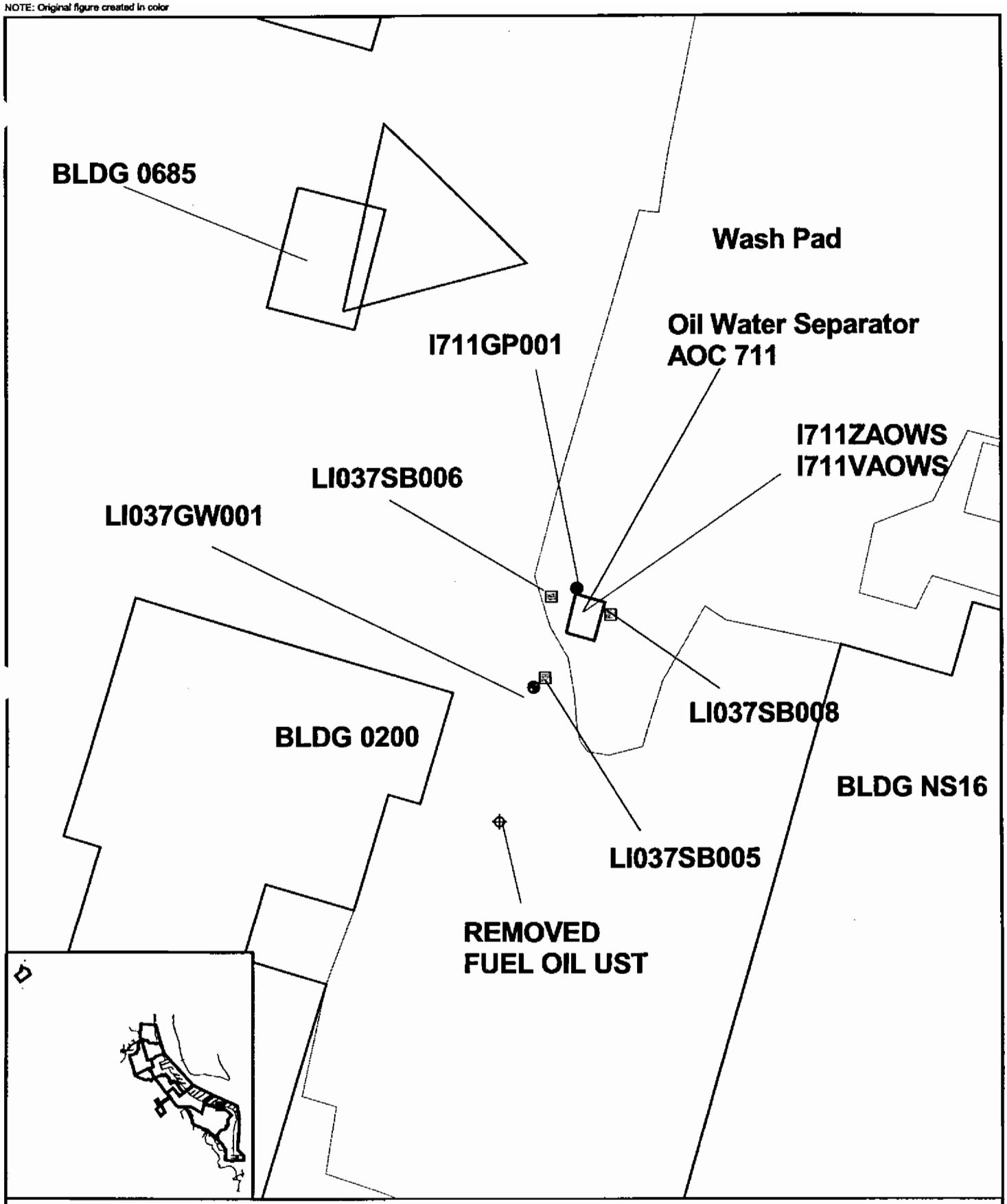
1 inch = 40 feet

Figure 2-1
Aerial Photo of AOC 711
Zone I
Confirmatory Sampling Investigation
Charleston Naval Complex

CH2MHILL

File Path: d:\18gis\projects\zone_i\aocs_711_715_718\aprs\aoc_711_715_718_figure2-1_d.apr, Date: 11 Feb 2003 9:58, User: DSANTOS, EGIS: Charleston Naval Complex - Figure 2-1 Aerial Photo of AOC 711

NOTE: Original figure created in color



Soil Boring
Groundwater Well
Groundwater Probe
UST
Pavement
Buildings

N

0 20 40 Feet

1 inch = 20 feet

Figure 2-2
AOC 711 RFI Sampling Locations
Zone I
Confirmatory Sampling Investigation
Charleston Naval Complex

CH2MHILL

File Path: d:\18gis\projects\zone_i\aocs_711_715_718\aprs\aoc_711_715_718_figure2-2_d.apr, Date: 11 Feb 2003 10:19, User: DSANTOS, EGIS: Charleston Naval Complex - Figure 2-2 AOC 711 RFI Sampling Locations

3.0 AOC 715 CSI – Oil/Water Separator at Building 681

3.1 Description of AOC 715

AOC 715 is described in the 2001 RFA as the former OWS located at the northeast corner of Building 681. Building 681 is the intermediate maintenance facility for the Coast Guard, previously used by the Navy for the same purpose. Figure 3-1 shows an aerial photograph dated 1997 of Building 681 and the former OWSs at AOC 715, at the northeast corner, and AOC 718, on the east side of the building.

Building 681 was constructed in 1985. Record drawings for Building 681 do not show the OWS at AOC 715. However, a sanitary and industrial sewer system site plan map from 1968 indicates that an OWS and associated UST had been historically located at the northeast corner of what is now Building 681. The OWS system at AOC 715 is defined as the OWS and its related UST. Its configuration, construction materials, uses, and waste management procedures are unknown. There is no evidence suggesting management of hazardous materials at AOC 715.

A concrete structure approximately 2 ft x 3 ft, with two PVC caps exposed in the concrete, is visible at the ground surface near the lawn area separating Building 681 and Building NS27. It is assumed that this concrete structure is related to, or in the same general vicinity of, the former OWS system. However, no sediment or water is present inside the structure. The area surrounding AOC 715 is maintained lawn. Photographs of the AOC 715 area are presented in Appendix A. Surface water at AOC 715 is assumed to flow northeast to a storm water catch basin. As noted in Figure 1-2, shallow groundwater is likely to flow in a northeasterly or easterly direction to Cooper River. Because AOC 715 is approximately 150 ft from the Cooper River, the groundwater flow direction may be tidally influenced due to the close proximity to the Cooper River which is tidally influenced. The depth to groundwater at AOC 715 is approximately 5 ft bls.

The area surrounding AOC 715 has been investigated as part of the Zone I RFI, AOC 681, reported in the *Zone I RFI Report, Revision 0* (EnSafe, 1999), and amended by the *Zone I RFI Report Addendum, Revision 1* (CH2M-Jones, 2001). The area is discussed further in the *Zone I*

Corrective Measures Study Work Plan, Revision 1(CH2M-Jones, 2002b), and has been approved for NFA by SCDHEC.

3.2 Environmental Sampling at AOC 715

Soil and groundwater samples were collected in the AOC 715 area for the Zone I RFI at AOC 681. Additional soil and groundwater samples were collected in 2002 for the OWS CSI. Figure 3-2 presents the samples collected in the vicinity of AOC 715. Within 25 feet of AOC 715, surface and subsurface soil at five boring locations was sampled: two for the Zone I RFI at AOC 681 and three for the AOC 715 CSI. In addition, background (grid) soil samples were collected 55 feet downgradient from the OWS. Groundwater was sampled from two monitoring wells screened in the shallow water-bearing zone and from one well screened in a deeper zone, and from one DPT probe sample. These samples are described below. The complete datasets for the AOC 681 and Zone I grid samples are located in the *Zone I RFI Report, Revision 0* (EnSafe, 1999), and the *Zone I RFI Report Addendum, Revision 1* (CH2M-Jones, 2001). Data summary tables for the additional samples collected in 2002 for the AOC 715 CSI are presented in Appendix E. Data validation summaries for the data collected for the AOC 715 CSI are presented in Appendix C.

3.2.1 Soil Samples

In 1995, samples of surface (0 to 1 ft bls) and subsurface (3 to 5 ft bls) soil were collected for the Zone I background study at grid location IGDISB013, located approximately 55 ft downgradient from the assumed location of AOC 715. These samples were analyzed for cyanide, metals, PCBs/pesticides, organophosphorous (OP) pesticides, VOCs, and SVOCs. In 1998, surface and subsurface soil samples were collected for the AOC 681 RFI at sample stations I681SB006 and I681SB011, located within 25 feet of the suspected OWS system. These samples were analyzed for cyanide, PCBs/pesticides, VOCs, SVOCs, and metals. In 2002, subsurface soil samples were collected from three locations in the vicinity of the assumed OWS location. Samples from I715SB001, I715SB002, and I715SB003 were collected from 3 to 5 ft bls and analyzed for PCBs/pesticides, VOCs, SVOCs, and metals. The 3 to 5 ft bls depth was intended to include soil that was most likely to have been impacted by a potential release from an OWS piping and base.

Analytes detected in the surface soil samples are listed in Table 3-1 and the subsurface soil samples are listed in Table 3-2. Surface soil concentrations were compared to unrestricted land use (i.e., residential) RBCs from the EPA Region III October 2000 tables, adjusted for HI=0.1, and to SSLs from the *EPA Soil Screening Guidance, Appendix A* (1996). SSLs were

adjusted for dilution attenuation factors (DAFs) of 1.0 for VOCs and 10 for other analytes. Subsurface soil concentrations were compared to SSLs. Soil metals concentrations were also compared to background concentrations for subsurface or surface soil from Zone I grid samples.

Results of the soils analysis screening by comparing against the above identified criteria to determine if any COPCs are present in the environmental media at this OWS are discussed below.

Metals in Soil Samples

With few exceptions, metals in the soil samples were detected at concentrations within their background ranges. As presented in Table 3-1, surface soil at I681SB011 contained concentrations of chromium (73.5 mg/kg) that exceeded its background concentration for Zone I, and its SSL, and iron (32,400 mg/kg) that exceeded the unrestricted land use RBC (adjusted for HI=0.1), along with background concentrations in Zone I. These metals may be considered COPCs and are discussed further in Section 3.3. Table 3-2 shows that no metals concentrations in subsurface soil exceeded both SSLs and Zone I subsurface soil background concentrations.

PCBs and Pesticides in Soil Samples

The area surrounding Building 681 is maintained as lawn and landscaping, and pesticides may have been routinely applied in maintenance activities not associated with OWS use. As shown in Table 3-1, trace levels of PCB (Aroclor-1254) and pesticides were detected in the surface soil from both the AOC 681 samples and the background (grid) sample. With the exception of dieldrin (0.0065 and 0.0059 mg/kg), concentrations of detected PCBs and pesticides were less than both RBCs and SSLs in surface soils. Table 3-2 presents trace levels of pesticides within the soil borings immediately surrounding the OWS location. In subsurface soil, with the exception of alpha BHC, all other pesticides and PCBs were detected at concentrations less than SSLs. Dieldrin and alpha BHC may be considered COPCs at AOC 715 and are discussed further in Section 3.3.

VOCs in Soil Samples

As shown in Table 3-1 and Table 3-2, traces of acetone, styrene, toluene, and xylenes were detected in soils in the AOC 715 area. None of these VOC concentrations exceeded unrestricted land use RBCs or SSLs. Therefore, VOCs in soil are not considered COPCs at AOC 715.

SVOCs in Soil Samples

Trace amounts of bis(2-ethylhexyl)phthalate and di-n-butyl phthalate, commonly identified with field or laboratory contamination, were reported in the surface soil and subsurface soil samples. In addition, the PAHs fluoranthene, phenanthrene, and pyrene were detected in surface soil at AOC 715, at concentrations less than RBCs/SSLs, and therefore are not considered COPCs. No PAHs were detected in subsurface soil. All other SVOC concentrations were less than RBCs and SSLs, and are not a concern at AOC 715.

3.2.2 Groundwater Samples

Groundwater monitoring well I681GW003 was installed for the AOC 681 RFI specifically to sample groundwater in the vicinity of the former OWS system (AOC 715). Grid wells IGDIGW013 and IGDIGW13D, installed to measure background concentrations within Zone I, are also located within 55 ft of AOC 715 in the downgradient direction. Well construction logs are presented in the *Zone I RFI Report, Revision 0* (EnSafe, 1999). I681GW003 and IGDIGW013 are screened in the shallow water-bearing zone; IGDIGW13D is screened in a deeper zone. DPT sample I715GP001 was collected several feet downgradient of the suspected location of the former OWS, and was screened from an 8 to 12-ft depth. A log of the DPT groundwater sample is presented in Appendix D. Data from these three wells and DPT location are used to evaluate groundwater quality at AOC 715.

In 1995 and 1996, samples were collected from the two grid wells during four sampling events. These samples were analyzed for general chemistry parameters (sulfates, chlorides, and total dissolved solids), cyanide, metals, PCBs, pesticides, VOCs, and SVOCs, with OP pesticides also analyzed during the first sampling round. Samples collected from these two wells during two sampling events in 1998 were analyzed for VOCs and SVOCs; metals were also analyzed from the August 20, 1998 samples.

RFI monitoring well I681GW003 was sampled three times in 1998 and 1999; samples were analyzed for cyanide, metals, VOCs, and SVOCs. PCBs and pesticides were also analyzed from the January 26, 1999 sample.

I715GP001 was sampled in 2002 for the AOC 715 CSI and analyzed for VOCs, SVOCs, and PCBs/pesticides. Results of the groundwater analyses are discussed below.

Metals in Groundwater Samples

Table 3-3 presents analytes detected in the shallow groundwater from I681GW003, IGDIGW013, and I715GP001, and Table 3-4 presents analytes detected in the deep groundwater sampled from IGDIGW13D. As seen in both tables, cyanide and metals were

detected in the groundwater samples within MCLs (or tap water RBCs adjusted for HI=0.1) and BRCs. No metal COPCs were identified.

Pesticides and PCBs in Groundwater Samples

As seen in Table 3-3, Aroclor-1260 (a PCB) was detected in the shallow groundwater at I715GP001 at an estimated concentration of 0.34 μg/L, below the MCL. No pesticides were detected in any of the shallow groundwater samples. However, in the deeper water-bearing unit at IGDIGW13D, alpha-BHC (alpha-Hexachlorocyclohexane), beta-BHC (beta-Hexachlorocyclohexane), gamma-BHC (lindane), and heptachlor were detected in the first sampling event. Of the four pesticides detected, alpha-BHC and beta-BHC were detected in one sample at respective concentrations of 0.39 μg /L and 0.23 μg /L, compared to the tap water RBCs of 0.011 μg /L and 0.037 μg /L, adjusted for HI=0.1. These two compounds are identified as COPCs at AOC 715, and are further evaluated in Section 3.3.

SVOCs in Groundwater Samples

As shown in Tables 3-3 and 3-4, traces of SVOCs were detected in some of the groundwater samples collected at AOC 715. All concentrations were less than MCLs or tap water RBCs adjusted for HI=0.1; no SVOC COPCs were identified at AOC 715.

VOCs in Groundwater Samples

As seen in Tables 3-3 and 3-4, traces of VOCs were detected in some of the groundwater samples collected at AOC 715. Except for chloroethane, detected at an estimated concentration of 6 μg/L in the deep well IGDIGW13D, all concentrations were less than MCLs or tap water RBCs adjusted for HI=0.1. Chloroethane may be considered a COPC in groundwater, and is evaluated further in Section 3.3.

3.3 COPC Evaluation and Refinement

This section discusses chemicals that were identified as COPCs because their concentrations exceeded background levels and a screening criterion. The screening criteria include unrestricted land use RBCs (for surface soil), SSLs (for surface or subsurface soil), or MCLs or RBCs for groundwater. Each of the chemicals identified as COPC is further evaluated to determine if it is considered a chemical of concern (COC) requiring further actions.

3.3.1 Surface and Subsurface Soil COPC Refinement

Chromium, iron, and dieldrin were identified as COPCs in surface soil, and alpha-BHC was identified as a COPC in subsurface soil. Data for each of these chemicals are provided in Tables 3-5 and 3-6, and are discussed below.

As noted in Table 3-5, the total chromium concentration in surface soil at I681SB011 was detected at a maximum concentration of 73.5 mg/kg, compared to the unrestricted land use RBC of 210 mg/kg (HI=1.0), the SSL (DAF=10) of 19 mg/kg, and the range of background concentrations in Zone I of 7.5 to 54 mg/kg. The chromium data for surface and subsurface soil at AOC 681 was evaluated as part of the RFI for AOC 681 (EnSafe, 1999), and chromium was determined to not pose a significant threat to human health or groundwater. It was therefore not identified as a COC for AOC 681.

Although the chromium concentration exceeded the Zone I background range (composed of a limited data set), it is within the range of background concentrations measured in Zone H (3.4 to 114 mg/kg), located directly adjacent to Building 681. Comparison of the data to the Zone H background data is appropriate since the site is located directly adjacent to Zone H. In addition, both Zones H and I have a similar operational history and the soils consist largely of fill material of similar origins. Furthermore, the total chromium SSL of 19 mg/kg is developed for chromium VI, and the majority of the soil chromium is in the less soluble/mobile trivalent form. Use of the 19 mg/kg SSL value is based on the hexavalent form of chromium. Therefore, the SSL is not relevant to the total chromium in surface soil at AOC 715. The subsurface soil sample collected at I681SB011 had a chromium value of 8.8 mg/kg, indicating that chromium is not leaching at this location. The site groundwater did not have chromium concentrations above background levels or MCLs; thus, chromium is not leaching to the site groundwater. Therefore, surface soil chromium is not likely to affect groundwater quality or human health. Therefore, chromium is not considered a COC in surface soil.

Iron was detected at a concentration of 32,400 mg/kg in I681SB011, compared to the unrestricted land use RBC (HI=1.0) of 23,000 mg/kg and the Zone I range of background concentrations of 1,730 to 22,700 mg/kg. There is no SSL for iron. The concentration detected at AOC 715 is within the range of background concentrations of 695 to 38,800 mg/kg for adjacent Zone H. Iron is a commonly occurring element and a major component of clay soils. The detected iron concentration appears to be within background soil levels for CNC (e.g., Zone H). Therefore, the iron detected at AOC 715 is within naturally occurring levels and is not a concern in surface soil at AOC 715.

Dieldrin was detected in surface soil at boring locations I681SB006 and I681SB011 at respective concentrations of 0.0065 and 0.0059 mg/kg. These concentrations are near detection limits for dieldrin in soil, and below the unrestricted land use RBC of 0.04 mg/kg, but greater than the SSL (DAF=10) of 0.002 mg/kg. Dieldrin has not been detected in subsurface soil or in groundwater in the vicinity of AOC 715, indicating that it is not migrating downward or affecting groundwater quality. The dieldrin data were evaluated during the RFI for AOC 681, and dieldrin was determined not to be a COC at AOC 681. There is no reason to believe that these low level detections of dieldrin in surface soil at these locations are related to releases of contaminants from the former OWS at AOC 715. Based on these considerations, dieldrin is not considered a COC at AOC 715.

As noted in Table 3-6, alpha-BHC was detected in one of the six subsurface samples, I715SB003, at an estimated concentration of 0.00055 mg/kg, very close to the detection limit. Alpha-BHC was not detected in any of the 11 surface soil samples analyzed during the RFI for AOC 681, indicating that it is not present at significant concentrations in this area. This compound was not detected in groundwater under the same area, for example at I715GP001, located approximately 4 ft downgradient of the soil sample location, indicating its presence is not extensive, and is not migrating from the soil. Therefore, alpha-BHC is not considered a COC at AOC 715.

3.3.2 Groundwater COPC Refinement

No COPCs were identified in shallow groundwater at AOC 715. However, alpha-BHC, beta-BHC, and chloroethane were identified as COPCs in the deeper groundwater unit within Grid Well IGDIGW13D downgradient of AOCs 681 and 715. Data for each of these chemicals are provided in Tables 3-7 and are discussed below.

The complete data set for alpha-BHC and beta-BHC in groundwater at AOC 715 is presented in Table 3-7. As noted in the table, these two pesticides were only detected in the first of four sampling events, and only in the deeper groundwater unit. They were not detected in subsequent sampling events for the same deep well, nor in shallow groundwater from I681GW003 or I715GP001, located in the area of the suspected OWS system. The more recent analytical data suggest that these pesticides are anomalous detections and do not represent groundwater contamination, or are no longer present in site groundwater. Therefore, alpha-BHC and beta-BHC are not identified as COCs for groundwater at AOC 715.

The complete dataset for chloroethane in groundwater at AOC 715 is presented in Table 3-7. As noted in the table, this VOC was detected in only the first out of six sampling events, and

only in the deeper groundwater unit. It was not detected in subsequent sampling events, nor in groundwater from I681GW003 or I715GP001, located closer to the OWS system. The more recent data suggest that chloroethane is no longer present in site groundwater; therefore, it is not considered to be of concern at AOC 715.

3.4 Investigation Summary – AOC 715

Metals detected in soil and groundwater samples at AOC 715 were within background levels and not from site-specific activities at AOC 715. Traces of organic chemicals were detected in surface and subsurface soil, at concentrations below screening criteria. Alpha-BHC was detected in one subsurface soil sample in excess of its generic SSL (DAF=10), but not detected in site shallow groundwater, thus not likely a leaching concern. Pesticides present in site soils are likely from past facility maintenance operations across the base, and not specific to AOC 715 activities. No COCs have been identified in soil at AOC 715.

Traces of SVOCs and VOCs have been sporadically detected in shallow and deep groundwater. Detected concentrations were well below screening criteria. Low-level pesticides detected in deep groundwater were generally never detected in shallow groundwater. The one-time detection of low-level VOCs and pesticides (in 1995) in deep groundwater was not confirmed in later sampling events. No COCs have been identified in groundwater at AOC 715.

3.5 AOC 715 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 715:

- The exact location of the former OWS system has not been identified, although it is suspected to have been beneath a concrete slab within the lawn area near the northeast corner of Building 681. Construction or operation details of the OWS system are not known.
- Soil was sampled at 6 locations and groundwater was sampled at 4 locations within 55 feet of this historical OWS system.
- Soil and groundwater samples were analyzed for the full analytical suite of PCBs, pesticides, VOCs, SVOCs, and metals.
- Analytical data results were screened against criteria under unrestricted land use based exposures. No chemicals were identified as an exposure concern under current or future exposure conditions, thus no COCs were identified.

It is concluded that sufficient data exist to evaluate AOC 715, and the data indicate that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore this OWS system identified as AOC 715 is recommended for NFA status.

TABLE 3-1
Analytes Detected in Surface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Metals							
Aluminum	I681SB006	09/23/1998	8,080	=	7,800	NL	3,470 - 27,400
	I681SB011	10/06/1998	9,380	J			
	IGDISB013	02/17/1995	11,000	J			
Antimony	I681SB011	10/06/1998	2.3	J	3.1	2.5	NA
Arsenic	I681SB006	09/23/1998	1.4	J	0.43	15	0.46 - 20
	I681SB011	10/06/1998	6.6	=			
	IGDISB013	02/17/1995	2.1	J			
Barium	I681SB006	09/23/1998	16.3	J	550	800	7.8 - 43
	I681SB011	10/06/1998	34.5	=			
	IGDISB013	02/17/1995	20.1	J			
Beryllium	I681SB006	09/23/1998	0.15	J	16	32	0.34 - 0.95
	I681SB011	10/06/1998	0.20	J			
Cadmium	I681SB006	09/23/1998	0.23	J	7.8	4	0.13 - 0.61
	I681SB011	10/06/1998	2.40	=			
Calcium	I681SB006	09/23/1998	4,980	=	NL	NL	1,670 - 59,500
	I681SB011	10/06/1998	27,000	=			
	IGDISB013	02/17/1995	13,300	J			
Chromium, Total	I681SB006	09/23/1998	14.3	=	210[d]	19	7.5 - 54
	I681SB011	10/06/1998	**73.5**	=			
	IGDISB013	02/17/1995	18.4	=			
Cobalt	I681SB006	09/23/1998	1.7	J	470	1,000	0.64 - 5.8
	I681SB011	10/06/1998	11.4	=			
Copper	I681SB006	09/23/1998	16.0	=	310	5,300	2.4 - 556
	I681SB011	10/06/1998	98.4	=			
	IGDISB013	02/17/1995	18.9	=			
Iron	I681SB006	09/23/1998	4,400	=	2,300	NL	1,730 - 22,700

TABLE 3-1
Analytes Detected in Surface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Iron	I681SB011	10/06/1998	**32,400**	=	2,300	NL	1,730 - 22,700
	IGDISB013	02/17/1995	7,750	J			
Lead	I681SB006	09/23/1998	25.0	=	400[d]	400	5.0 - 203
	I681SB011	10/06/1998	39.2	=			
	IGDISB013	02/17/1995	33.3	J			
Magnesium	I681SB006	09/23/1998	482	J	NL	NL	424 - 3,820
	I681SB011	10/06/1998	929	J			
	IGDISB013	02/17/1995	597	J			
Manganese	I681SB006	09/23/1998	23.4	J	160	480	15 - 426
	I681SB011	10/06/1998	250	=			
	IGDISB013	02/17/1995	28.6	J			
Mercury	I681SB006	09/23/1998	0.06	=	2.3	1	0.13 - 0.47
	I681SB011	10/06/1998	0.06	=			
	IGDISB013	02/17/1995	0.13	=			
Nickel	I681SB006	09/23/1998	5.6	=	160	65	1.5 - 18
	I681SB011	10/06/1998	32.4	=			
	IGDISB013	02/17/1995	5.4	=			
Potassium	I681SB006	09/23/1998	214	J	NL	NL	493 - 2,730
Sodium	I681SB006	09/23/1998	59.3	J	NL	NL	181 - 2,030
Tin	IGDISB013	02/17/1995	0.98	J	4700	NL	0.98 - 7.5
Vanadium	I681SB006	09/23/1998	13.8	=	55	3,000	8.5 - 53
	I681SB011	10/06/1998	22.9	=			
	IGDISB013	02/17/1995	19.4	=			
Zinc	I681SB006	09/23/1998	38.9	J	2,300	6,000	5.9 - 150
	I681SB011	10/06/1998	213	J			
	IGDISB013	02/17/1995	28.0	J			

TABLE 3-1
Analytes Detected in Surface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
PCBs and Pesticides							
Aroclor 1254	I681SB006	09/23/1998	0.190	=	0.32	0.55	NA
alpha-Chlordane	I681SB011	10/06/1998	0.028	=	1.8	5	NA
Chlordane	IGDISB013	02/17/1995	0.041	=	1.8	5	NA
Dieldrin	I681SB006	09/23/1998	**0.0065**	=	0.04	0.002	NA
	I681SB011	10/06/1998	**0.0059**	=			
gamma-Chlordane	I681SB006	09/23/1998	0.0088	=	1.8	5	NA
	I681SB011	10/06/1998	0.09	=			
Heptachlor	I681SB011	10/06/1998	0.0025	=	0.14	12	NA
Heptachlor Epoxide	I681SB011	10/06/1998	0.0036	=	0.07	0.35	NA
	IGDISB013	02/17/1995	0.0110	J			
p,p'-DDE	IGDISB013	02/17/1995	0.0050	=	1.9	27	NA
Semivolatile Organic Compounds							
bis(2-Ethylhexyl) Phthalate	I681SB006	09/23/1998	0.022	J	46	1,800	NA
	I681SB011	10/06/1998	0.150	J			
Fluoranthene	I681SB006	09/23/1998	0.025	J	310	2,100	NA
Phenanthrene	I681SB006	09/23/1998	0.018	J	NL	NL	NA
Pyrene	I681SB006	09/23/1998	0.019	J	230	2,100	NA
	I681SB011	10/06/1998	0.064	J			
Volatile Organic Compounds							
Toluene	I681SB011	10/06/1998	0.002	J	1,600	0.6	NA

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

Concentrations shown outlined and in bold print indicate exceedance of screening criteria.

[a] Unrestricted land use RBCs from EPA Region III RBC Tables, October 2000, adjusted for HI = 0.1.

[b] SSLs from EPA Soil Screening Guidance: User's Guide; DAF = 1.0 for VOCs, DAF = 10 for others.

TABLE 3-1
Analytes Detected in Surface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]

[c] Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

[d] RBCs for Total Chromium and Lead from EPA Region IX PRG Tables, November 2000.

NA Not available/not applicable

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

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

TABLE 3-2
Analytes Detected in Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background[b]
Metals						
Aluminum	I681SB006	09/23/1998	11,400	=	NL	4,590 - 11,700
	I681SB011	10/06/1998	8,590	J		
	IGDISB013	02/17/1995	6,540	J		
	I715SB001	06/10/2002	12,700	=		
	I715SB002	06/10/2002	11,200	=		
	I715SB003	06/10/2002	13,900	=		
Arsenic	I681SB006	09/23/1998	2.30	J	15	0.88 - 4.4
	I681SB011	10/06/1998	2.70	=		
	IGDISB013	02/17/1995	0.88	J		
	I715SB001	06/10/2002	2.51	=		
	I715SB002	06/10/2002	2.25	=		
	I715SB003	06/10/2002	3.87	=		
Barium	I681SB006	09/23/1998	18.4	J	800	9.5 - 19
	I681SB011	10/06/1998	16.3	J		
	IGDISB013	02/17/1995	13.8	J		
	I715SB001	06/10/2002	20.1	J		
	I715SB002	06/10/2002	16.8	J		
	I715SB003	06/10/2002	20.6	J		
Beryllium	I681SB006	09/23/1998	0.11	J	32	0.33 - 0.51
	I681SB011	10/06/1998	0.09	J		
	I715SB001	06/10/2002	0.108	J		
	I715SB002	06/10/2002	0.103	J		
	I715SB003	06/10/2002	0.137	J		
Cadmium	I681SB006	09/23/1998	0.29	J	4	0.48
Calcium	I681SB006	09/23/1998	4,370	=	NL	528 - 63,900
	I681SB011	10/06/1998	792	=		
	IGDISB013	02/17/1995	528	J		
Chromium, Total	I681SB006	09/23/1998	11.3	=	19	7.6 - 41

TABLE 3-2
Analytes Detected in Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background[b]
Chromium, Total	I681SB011	10/06/1998	8.8	=	19	7.6 - 41
	IGDISB013	02/17/1995	7.6	=		
	I715SB001	06/10/2002	11.8	J		
	I715SB002	06/10/2002	11.3	J		
	I715SB003	06/10/2002	17.7	J		
Cobalt	I681SB006	09/23/1998	0.42	J	1,000	2.1 - 2.2
	I681SB011	10/06/1998	1.20	J		
	I715SB001	06/10/2002	0.79	J		
	I715SB002	06/10/2002	0.705	J		
	I715SB003	06/10/2002	0.856	J		
Copper	I681SB006	09/23/1998	1.5	J	5,300	1.2 - 12
	I681SB011	10/06/1998	2.7	=		
	IGDISB013	02/17/1995	1.2	J	5,300	
	I715SB001	06/10/2002	1.74	J		
	I715SB002	06/10/2002	2.39	J		
	I715SB003	06/10/2002	18.5	=		
Iron	I681SB006	09/23/1998	7,920	=	NL	3,730 - 7,250
	I681SB011	10/06/1998	6,470	=		
	IGDISB013	02/17/1995	4,680	J		
	I715SB001	06/10/2002	6,580	J		
	I715SB002	06/10/2002	6,630	J		
	I715SB003	06/10/2002	8,760	J		
Lead	I681SB006	09/23/1998	12.5	=	400	3.1 - 7.2
	I681SB011	10/06/1998	23.5	=		
	IGDISB013	02/17/1995	4.6	J		
	I715SB001	06/10/2002	5.97	J		
	I715SB002	06/10/2002	5.39	J		
	I715SB003	06/10/2002	14.4	J		
Magnesium	I681SB006	09/23/1998	382	J	NL	196 - 3,990

TABLE 3-2
Analytes Detected in Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background[b]
Magnesium	I681SB011	10/06/1998	246	J	NL	196 - 3,990
	IGDISB013	02/17/1995	196	J		
Manganese	I681SB006	09/23/1998	9.3	J	480	8.6 - 55
	I681SB011	10/06/1998	7.5	=		
	IGDISB013	02/17/1995	8.6	J		
	I715SB001	06/10/2002	10.1	J		
	I715SB002	06/10/2002	9.39	J		
	I715SB003	06/10/2002	11.7	J		
Mercury	I681SB006	09/23/1998	0.04	=	1	NA
	I715SB001	06/10/2002	0.007	J		
	I715SB002	06/10/2002	0.011	J		
	I715SB003	06/10/2002	0.072	J		
Nickel	I681SB006	09/23/1998	2.9	J	65	3.5 - 16
	I681SB011	10/06/1998	2.5	J		
	I715SB001	06/10/2002	3.8	J		
	I715SB002	06/10/2002	3.5	J		
	I715SB003	06/10/2002	5.17	J		
Potassium	I681SB006	09/23/1998	340	J	NL	930 - 2,230
Selenium	I681SB006	09/23/1998	0.46	J	2.5	0.59 - 1.4
	IGDISB013	02/17/1995	0.59	J		
	I715SB003	06/10/2002	0.413	J		
Sodium	I681SB006	09/23/1998	65.8	J	NL	226 - 1,770
Vanadium	I681SB006	09/23/1998	31.7	=	3,000	11 - 24
	I681SB011	10/06/1998	13.4	=		
	IGDISB013	02/17/1995	10.5	=		
	I715SB001	06/10/2002	15.2	=		
	I715SB002	06/10/2002	15.7	=		
	I715SB003	06/10/2002	22.4	=		

TABLE 3-2
Analytes Detected in Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background[b]
Zinc	I681SB006	09/23/1998	7.5	J	6,000	4.7 - 29
	I681SB011	10/06/1998	17.0	J		
	IGDISB013	02/17/1995	4.7	J		
	I715SB001	06/10/2002	8.51	J		
	I715SB002	06/10/2002	8	J		
	I715SB003	06/10/2002	25.5	J		
Semivolatile Organic Compounds						
bis(2-Ethylhexyl) Phthalate	I681SB006	09/23/1998	0.021	J	1,800	NA
Di-n-butyl Phthalate	I681SB006	09/23/1998	0.063	J	1,200	NA
Volatile Organic Compounds						
Acetone	IGDISB013	02/17/1995	0.05500	J	0.8	NA
	I715SB001	06/10/2002	0.00580	J		
	I715SB002	06/10/2002	0.00510	J		
	I715SB003	06/10/2002	0.00740	J		
Styrene	I715SB001	06/10/2002	0.00062	J	0.2	NA
	I715SB002	06/10/2002	0.00047	J		
	I715SB003	06/10/2002	0.00071	J		
Toluene	IGDISB013	02/17/1995	0.0040	J	0.6	NA
	I715SB001	06/10/2002	0.0022	J		
Xylenes, Total	I715SB001	06/10/2002	0.00047	J	9.5	NA
PCBs and Pesticides						
alpha-BHC (alpha-Hexachlorocyclohexane)	I715SB003	06/10/2002	**0.00055**	J	0.00025	NA
alpha-Chlordane	I715SB003	06/10/2002	0.0037	J	5	NA
beta-BHC (beta-Hexachlorocyclohexane)	I715SB003	06/10/2002	0.0010	J	0.0015	NA
Chlordane	I715SB003	06/10/2002	0.0617	=	5	NA

TABLE 3-2
Analytes Detected in Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	Qualifier	SSL[a]	Subsurface Soil Background[b]
delta-BHC (delta-Hexachlorocyclohexane)	I715SB003	06/10/2002	0.0012	J	0.0045	NA
gamma-BHC (Lindane)	I715SB003	06/10/2002	0.0036	=	0.0045	NA
gamma-Chlordane	I715SB003	06/10/2002	0.0104	J	5	NA
Heptachlor	I715SB003	06/10/2002	0.00077	J	12	NA
p,p'-DDD	I715SB001	06/10/2002	0.00210	J	8	NA
	I715SB002	06/10/2002	0.00052	J	8	
	I715SB003	06/10/2002	0.02230	J	8	
p,p'-DDE	I715SB001	06/10/2002	0.00085	J	27	NA
	I715SB003	06/10/2002	0.00680	J	27	
p,p'-DDT	I715SB002	06/10/2002	0.0013	J	16	NA
	I715SB003	06/10/2002	0.0365	J	16	
PCB-1260 (Aroclor 1260)	I715SB003	06/10/2002	0.0065	J	NL	NA

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

[a] SSLs from EPA Soil Screening Guidance: User's Guide; DAF = 1.0 for VOCs, DAF = 10 for others.

[b] Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

NA Not available/not applicable

NL Not listed

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

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

TABLE 3-3
Analytes Detected in Shallow Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Shallow)
Inorganic Analytes						
Chloride	IGDIGW013	04/26/1995	845,000	=	NL	NA
		12/06/1995	230,000	=		
		05/28/1996	566,000	=		
		09/04/1996	361,000	=		
Sulfate (as SO4)	IGDIGW013	04/26/1995	2,100,000	=	NL	NA
		12/06/1995	840,000	=		
		05/28/1996	932,000	=		
		09/04/1996	673,000	=		
Aluminum	I681GW003	10/20/1998	131	J	*3,700*	1,440
		01/26/1999	48.3	J		
Arsenic	I681GW003	10/20/1998	4.3	J	50	23
		01/26/1999	4.4	J		
	IGDIGW013	04/26/1995	9.7	J		
		12/06/1995	12.0	=		
		05/28/1996	19.0	=		
		09/04/1996	23.8	=		
		08/20/1998	23.9	=		
Barium	I681GW003	10/20/1998	41.0	J	2,000	110
		01/26/1999	34.2	=		
		06/02/1999	39.0	=		
	IGDIGW013	04/26/1995	37.8	J		
		12/06/1995	50.9	J		
		05/28/1996	47.7	J		
	IGDIGW013	09/04/1996	37.4	J		
		08/20/1998	56.2	J		
Beryllium	IGDIGW013	09/04/1996	0.46	J	4	1.1
Calcium	I681GW003	10/20/1998	113,000	=	NL	39,000 - 980,000 [b]
		01/26/1999	122,000	=		

TABLE 3-3
Analytes Detected in Shallow Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Shallow)
Calcium	I681GW003	06/02/1999	101,000	=	NL	39,000 - 980,000 [b]
	IGDIGW013	04/26/1995	308,000	=		
		12/06/1995	263,000	=		
		05/28/1996	292,000	=		
		09/04/1996	193,000	=		
		08/20/1998	253,000	=		
Chromium, Total	IGDIGW013	08/20/1998	13.4	=	100	14.3
Cobalt	I681GW003	01/26/1999	1.7	J	*220*	2.2
Copper	I681GW003	01/26/1999	1.10	J	1,300	4.4
Iron	I681GW003	10/20/1998	2,090	=	*1,100*	49 - 31,900 [b]
		01/26/1999	521	J		
		06/02/1999	2,500	=		
	IGDIGW013	04/26/1995	19,000	=		
		12/06/1995	8,950	=		
		05/28/1996	14,500	=		
		09/04/1996	11,500	=		
		08/20/1998	15,500	=		
Lead	IGDIGW013	04/26/1995	2.0	J	15	4.4
Magnesium	I681GW003	10/20/1998	15,600	=	NL	8,580 - 1,410,000 [b]
		01/26/1999	14,600	=		
		06/02/1999	13,700	=		
	IGDIGW013	04/26/1995	105,000	=		
		12/06/1995	67,600	=		
		05/28/1996	92,700	=		
		09/04/1996	53,800	=		
		08/20/1998	50,000	=		
Manganese	I681GW003	10/20/1998	64.9	=	*73*	5,430
		01/26/1999	91.2	=		

TABLE 3-3
Analytes Detected in Shallow Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Shallow)
Manganese	I681GW003	06/02/1999	73.6	=	*73*	5,430
	IGDIGW013	04/26/1995	236	=		
		12/06/1995	148	=		
		05/28/1996	176	=		
		09/04/1996	134	=		
		08/20/1998	126	=		
Mercury	I681GW003	06/02/1999	0.19	J	2	0.1 - 1.1 [b]
Nickel	I681GW003	01/26/1999	1.90	J	*73*	13.3
	IGDIGW013	12/06/1995	2.40	J		
Potassium	I681GW003	10/20/1998	8,200	=	NL	7,060 - 550,000 [b]
		01/26/1999	6,580	=		
		06/02/1999	6,180	=		
	IGDIGW013	04/26/1995	78,300	J		
		12/06/1995	35,200	J		
		05/28/1996	45,800	=		
		09/04/1996	33,200	=		
		08/20/1998	31,800	=		
Selenium	I681GW003	06/02/1999	2.90	J	50	27 [b]
Silver	I681GW003	06/02/1999	2.30	J	*18*	1.3 [b]
Sodium	I681GW003	10/20/1998	60,200	=	NL	NA
		01/26/1999	52,900	=		
		06/02/1999	50,400	=		
	IGDIGW013	04/26/1995	532,000	=		
		12/06/1995	354,000	=		
		05/28/1996	515,000	=		
		09/04/1996	294,000	=		
		08/20/1998	220,000	=		
Thallium	I681GW003	06/02/1999	2.40	J	2	6.6

TABLE 3-3
Analytes Detected in Shallow Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Shallow)
Vanadium	I681GW003	06/02/1999	1.10	J	*26*	14
	IGDIGW013	04/26/1995	0.67	J		
Zinc	I681GW003	01/26/1999	2.70	J	*1,100*	24.4
	IGDIGW013	04/26/1995	7.30	J		
		12/06/1995	4.80	J		
Semivolatile Organic Compounds						
2,4,6-Trichlorophenol	IGDIGW013	12/06/1995	2.0	J	*6.1*	NA
4-Nitrophenol	I681GW003	01/26/1999	4.0	J	*29*	NA
Benzoic acid	IGDIGW013	05/28/1996	2.0	J	*15,000*	NA
		09/04/1996	2.0	J		
bis(2-Ethylhexyl) Phthalate	I681GW003	01/26/1999	3.0	J	6	NA
Volatile Organic Compounds						
1,2-Dichloroethane	IGDIGW013	09/04/1996	2.0	J	5	NA
1,2-Dichloroethene (total)	IGDIGW013	08/20/1998	2.0	J	70	NA
Acetone	IGDIGW013	04/26/1995	19.0	=	*61*	NA
	I715GP001	06/17/2002	3.6	J		
Toluene	I715GP001	06/17/2002	0.43	J	1,000	NA
PCBs and Pesticides						
PCB-1260 (Aroclor 1260)	I715GP001	06/17/2002	0.34	J	0.5	NA

[a] RBCs are listed in italics where no primary MCL exists. RBCs are from EPA Region III RBC (October 2000) table, adjusted for HI = 0.1.

[b] Range of grid sample concentrations; no BRC calculated for analyte.

NA Not available

NL No MCL or RBC listed

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

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

TABLE 3-4
Analytes Detected in Deep Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Deep)
Inorganic Analytes						
Cyanide	IGDIGW13D	12/06/1995	8.9	J	200	27.2
Chloride	IGDIGW13D	06/02/1995	11,000,000	J	NL	NA
		12/06/1995	15,800,000	=		
		05/28/1996	13,500,000	=		
		09/04/1996	15,400,000	=		
Sulfate (as SO4)	IGDIGW13D	06/02/1995	29,900	=	NL	NA
		12/06/1995	26,000	=		
		05/28/1996	21,000	=		
		09/04/1996	50,000	=		
Arsenic	IGDIGW13D	05/28/1996	6.5	J	50	14.2
		08/20/1998	2.4	J		
Barium	IGDIGW13D	06/02/1995	114	J	2,000	347
		12/06/1995	73.1	J		
		05/28/1996	77.8	J		
		09/04/1996	79.3	J		
		08/20/1998	98.7	J		
Beryllium	IGDIGW13D	12/06/1995	1	J	4	1.2
		09/04/1996	1	J		
Cadmium	IGDIGW13D	12/06/1995	2.5	J	5	0.3 - 3.0[b]
Calcium	IGDIGW13D	06/02/1995	291,000	J	NL	78,600 - 1,030,000[b]
		12/06/1995	227,000	=		
		05/28/1996	263,000	=		
		09/04/1996	248,000	=		
		08/20/1998	363,000	=		
Chromium, Total	IGDIGW13D	06/02/1995	3.7	J	100	6.7
	IGDIGW13D	12/06/1995	2	J		
	IGDIGW13D	08/20/1998	49.5	=		

TABLE 3-4
Analytes Detected in Deep Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Deep)
Cobalt	IGDIGW13D	06/02/1995	0.76	J	*220*	2.3
Iron	IGDIGW13D	12/06/1995	59.3	J	*1,100*	34 - 12,200[b]
	IGDIGW13D	08/20/1998	261	=		
Magnesium	IGDIGW13D	06/02/1995	1,080,000	=	NL	8,550 - 1,460,000[b]
	IGDIGW13D	12/06/1995	1,180,000	=		
	IGDIGW13D	05/28/1996	1,030,000	=		
	IGDIGW13D	09/04/1996	1,200,000	=		
	IGDIGW13D	08/20/1998	1,100,000	=		
Manganese	IGDIGW13D	06/02/1995	56.8	J	*73*	261
	IGDIGW13D	08/20/1998	29.8	=		
Potassium	IGDIGW13D	06/02/1995	431,000	J	NL	1,960 - 495,000[b]
	IGDIGW13D	12/06/1995	288,000	J		
	IGDIGW13D	05/28/1996	260,000	=		
	IGDIGW13D	09/04/1996	331,000	J		
	IGDIGW13D	08/20/1998	316,000	=		
Sodium	IGDIGW13D	06/02/1995	7,140,000	=	NL	NA
	IGDIGW13D	12/06/1995	8,970,000	=		
	IGDIGW13D	05/28/1996	8,420,000	=		
	IGDIGW13D	09/04/1996	7,720,000	J		
	IGDIGW13D	08/20/1998	8,030,000	J		
Vanadium	IGDIGW13D	06/02/1995	5.2	J	*26*	15.7
	IGDIGW13D	12/06/1995	8.6	J		
	IGDIGW13D	09/04/1996	4.6	J		
	IGDIGW13D	08/20/1998	14.8	J		
Pesticides						
alpha-BHC (alpha-Hexachlorocyclohexane)	IGDIGW13D	06/02/1995	**0.39**	=	*0.011*	NA
beta BHC (beta-Hexachlorocyclohexane)	IGDIGW13D	06/02/1995	**0.23**	J	*0.037*	NA

TABLE 3-4
Analytes Detected in Deep Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)	Qualifier	MCL/*RBC*[a]	Zone I BRC (Deep)
Gamma-BHC (Lindane)	IGDIGW13D	06/02/1995	0.075	J	0.2	NA
Heptachlor	IGDIGW13D	06/02/1995	0.29	J	0.4	NA
Semivolatile Organic Compounds						
2,4-Dimethylphenol	IGDIGW13D	06/02/1995	5	J	*73*	NA
Benzoic acid	IGDIGW13D	05/28/1996	2	J	*15,000*	NA
Phenol	IGDIGW13D	12/06/1995	23	=	*2,200*	NA
Volatile Organic Compounds						
Carbon Disulfide	IGDIGW13D	04/15/1998	0.95	J	*100*	NA
Chloroethane	IGDIGW13D	06/02/1995	**6**	J	*3.6*	NA

All values are presented in units of micrograms per liter (µg/L).

Concentrations in bold type and outlined exceed MCL/RBC and BRC.

[a] RBCs are listed in italics where no primary MCL exists. RBCs are from EPA Region III RBC (October 2000) table, adjusted for HI = 0.1

[b] Range of grid sample concentrations; no BRC calculated.

BRC background reference concentration

NA Not available

NL No MCL or RBC listed

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

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

TABLE 3-5
COPC Refinement, Surface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

			Parameter	**Chromium, Total**		**Iron**		**Dieldrin**	
			RBC	210		23,000		0.04	
			SSL (DAF=10)	19		NL		0.002	
			Zone I Background Concentration Range	7.5 - 54		1,730 - 22,700		NA	
			Zone H Background Concentration Range	3.4 - 114		695 - 38,800		NA	
Location	**Date Sampled**	**Units**		**Concentration**		**Concentration**		**Concentration**	
I681SB006	09/23/1998	mg/kg		14.3	=	4,400	=	**0.0065**	=
I681SB011	10/06/1998	mg/kg		**73.5**	=	**32,400**	=	**0.0059**	=
IGDISB013	02/17/1995	mg/kg		18.4	=	7,750	J	0.0017	U

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

Concentrations in bold type exceed background concentrations and RBCs or SSLs (DAF=10).

SSL from EPA Soil Screening Guidance Appendix A, 1996.

NA Not available

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

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

U Indicates that the concentration was not detected.

TABLE 3-6
COPC Refinement, Subsurface Soil at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

		Parameter	**Alpha BHC**	
		SSL (DAF=10)	0.00025	
Location	**Date Sampled**	**Units**	**Concentration**	
I681SB006	09/23/1998	mg/kg	0.0019	U
I681SB011	10/06/1998	mg/kg	0.002	U
IGDISB013	02/17/1995	mg/kg	0.0012	U
I715SB001	06/10/2002	mg/kg	0.0015	U
I715SB002	06/10/2002	mg/kg	0.0015	U
I715SB003	06/10/2002	mg/kg	**0.00055**	J

All values presented in units of milligrams per kilogram (mg/kg).
Concentrations in bold type exceed SSLs (DAF=10).
SSL from USEPA Soil Screening Guidance Appendix A, 1996.

J Indicates an estimated value.

U Indicates that the analyte was not detected.

TABLE 3-7
COPC Refinement, Groundwater at AOC 715
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

		Parameter	Alpha BHC		Beta BHC		Chloroethane	
		RBC	*0.011*		*0.037*		*3.6*	
Sample Location	**Date Sampled**	**Units**	**Concentration**		**Concentration**		**Concentration**	
I715GP001	06/17/2002	µg/L	0.04	UJ	0.04	UJ	10	U
I681GW003	10/20/1998	µg/L	NA		NA		5	U
	01/26/1999	µg/L	0.04	U	0.04	U	5	U
	06/02/1999	µg/L	NA		NA		5	U
IGDIGW013	04/26/1995	µg/L	0.03	U	0.03	U	10	UJ
	12/06/1995	µg/L	0.042	U	0.042	U	10	UJ
	05/28/1996	µg/L	0.04	U	0.04	U	10	U
	09/04/1996	µg/L	0.04	U	0.04	U	10	U
	04/15/1998	µg/L	NA		NA		1	U
	08/20/1998	µg/L	NA		NA		3	U
IGDIGW13D	06/02/1995	µg/L	**0.39**	=	**0.23**	J	**6**	J
	12/06/1995	µg/L	0.042	U	0.042	U	10	UJ
	05/28/1996	µg/L	0.04	U	0.04	U	10	U
	09/04/1996	µg/L	0.04	U	0.04	U	10	U
	04/15/1998	µg/L	NA		NA		1	U
	08/20/1998	µg/L	NA		NA		15	U

Concentrations in bold type exceed RBCs.

No primary MCLs exist for analytes. RBCs are from EPA Region III RBC (October 2000) table.

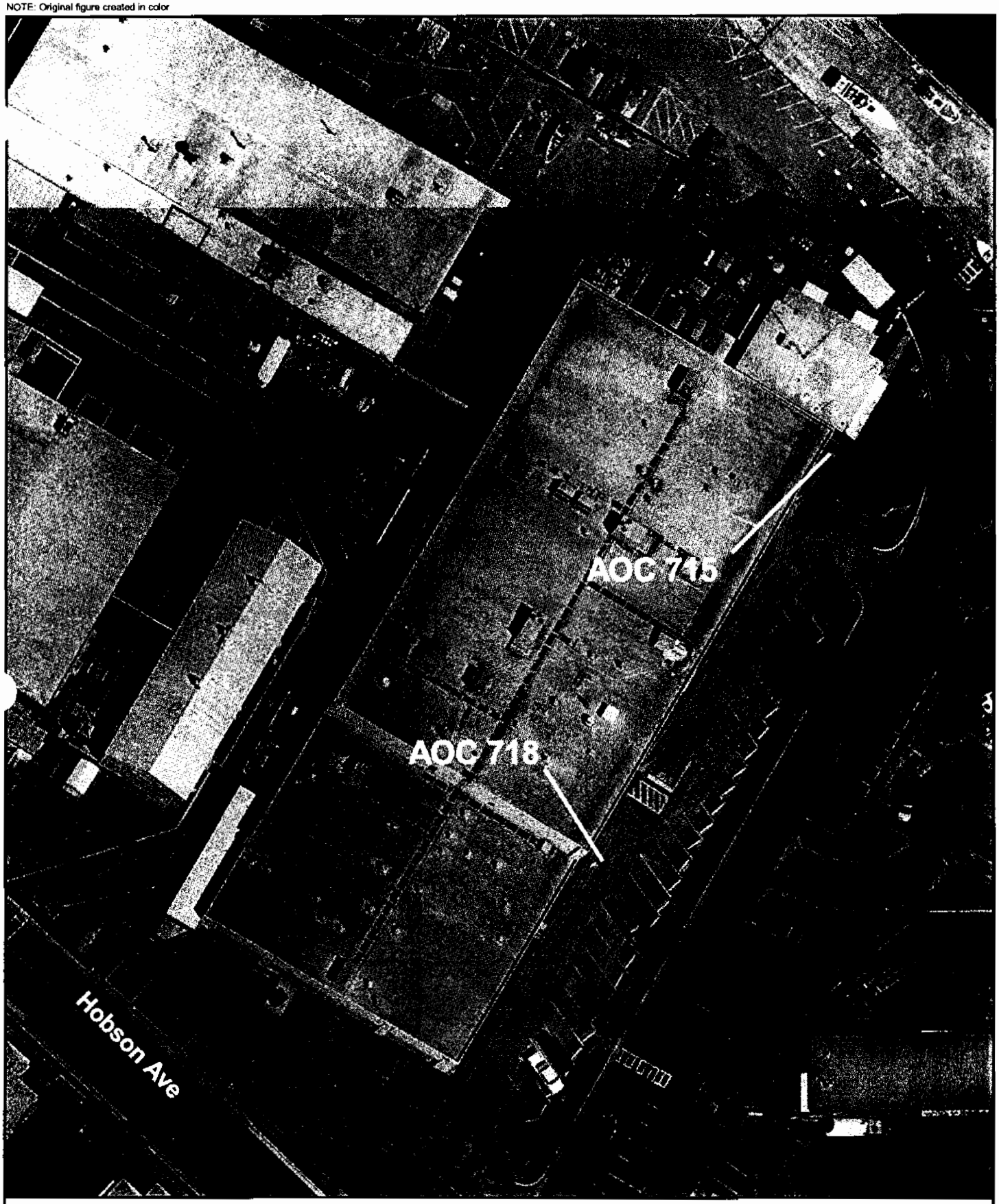
NA Not analyzed

J Indicates an estimated value.

U Indicates that the analyte was not detected.

UJ Indicates that the analyte was not detected and the detection limit is estimated.

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



AOC Boundary
SWMU Boundary
Roads

N

0 60 120 Feet

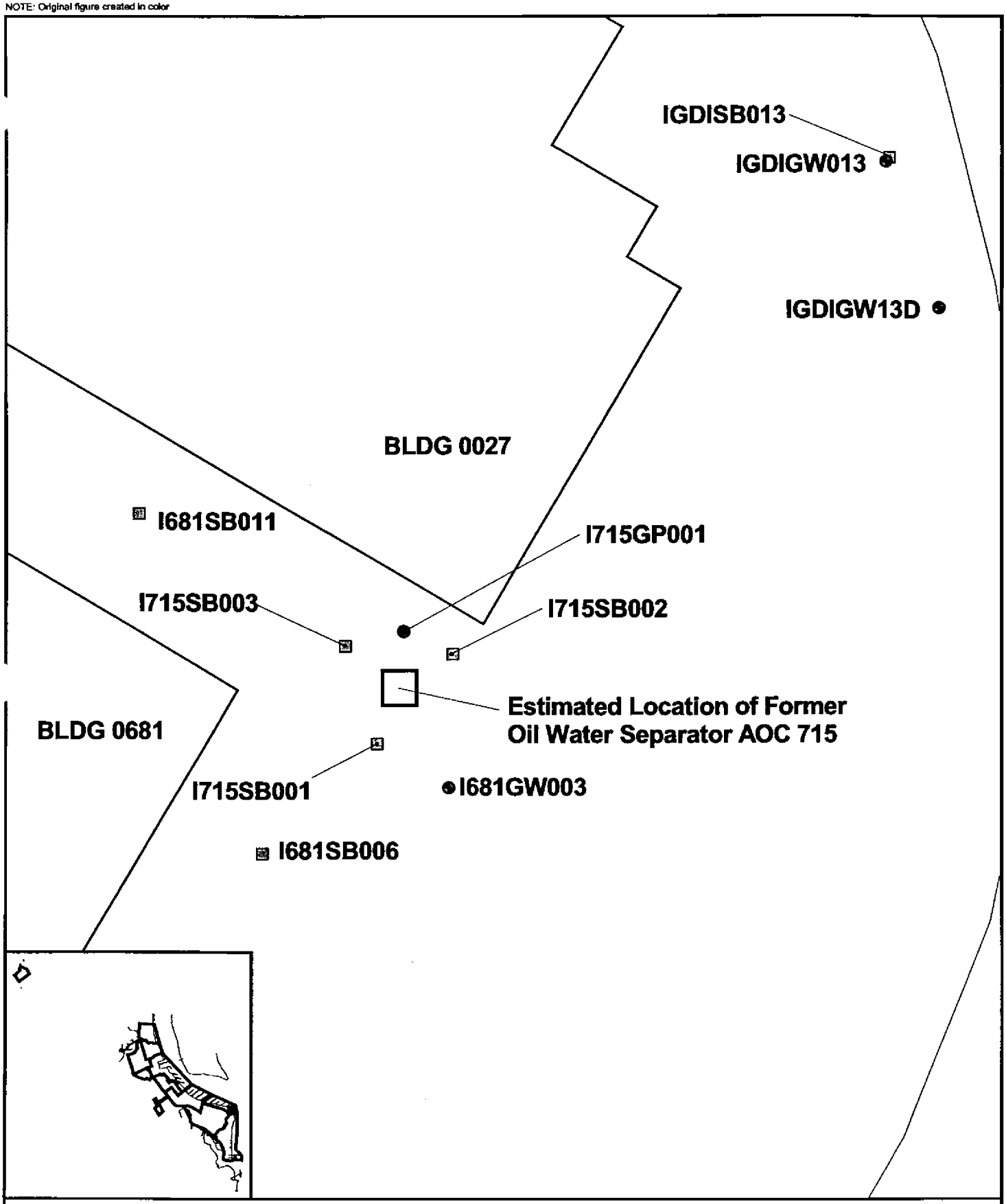
1 inch = 60 feet

Figure 3-1
Aerial Photo of AOC 715 and 718
Zone I
Confirmatory Sampling Investigation
Charleston Naval Complex

CH2MHILL

File Path: d:\18gis\projects\zone_i\aocs_711_715_718\aprs\aoc_711_715_718_figure3-1_d.apr, Date: 11 Feb 2003 9:43, User: DSANTOS, EGIS: Charleston Naval Complex - Figure 3-1 Aerial Photo of AOC 715 and 718

NOTE: Original figure created in color



Soil Boring
AOCs
Groundwater Well
Groundwater Probe
Roads
Buildings

N

0 10 20 Feet

1 inch = 10 feet

Figure 3-2
AOC 715 RFI Sampling Locations
Confirmatory Sampling Investigation
Charleston Naval Complex

CH2MHILL

File Path: d:\18gis\projects\zone_i\aocs_711_715_718\aprs\aoc_711_715_718_figure3-2.apr, Date: 27 Feb 2003 9:40, User: DSANTOS, EGIS: Charleston Naval Complex - Figure 3-2 AOC 715 RFI Sampling Locations

4.0 AOC 718 CSI – Former Oil/Water Separator at Building 681

4.1 Description of AOC 718

AOC 718 is described in the 2001 RFA as the OWS located at the eastern wall of Building 681. Building 681 is the intermediate maintenance facility for the Coast Guard, previously used by the Navy for the same purpose. Refer to Figure 3-1 for an aerial photograph dated 1997 of Building 681, the OWS at AOC 718, and the former OWS system at AOC 715, at the northeast corner of the building.

Building 681 was constructed in 1985. Appendix F presents record drawings showing the location of the OWS at AOC 718 adjacent to the building. The OWS at AOC 718 serviced effluent from building floor drains, and was taken out of service on or before 1991. OWS construction materials, dimensions, and configuration are unknown. Degreasing operations are known to have occurred within the building, however there is no evidence of disposal in the drains. There is no record of management of hazardous materials involving AOC 718.

The 100-gallon waste oil UST adjacent to the OWS was removed in 1997, in accordance with the SCDHEC UST program. Soil and groundwater samples collected during the closure indicated detectable concentrations of selected VOCs, SVOCs, and metals which were below risk-based levels.

The area surrounding AOC 718 has been investigated as part of the Zone I RFI, AOC 681, reported in the *Zone I RFI Report, Revision 0* (EnSafe, 1999), and amended by the *Zone I RFI Report Addendum, Revision 1* (CH2M-Jones, 2001). AOC 681 is also discussed in the *Corrective Measures Study Work Plan for Zone I Revision 1*, (CH2M-Jones, 2002b), and the SCDHEC has approved the recommendation for NFA.

The OWS at AOC 718 was located within a narrow landscaping area between the building wall and the paved parking area. Photographs of the AOC 718 area are presented in Appendix A. The waste oil UST was beneath the edge of the pavement. Surface water runoff from the area around AOC 718 is likely to flow southeast to a storm water catch basin, based on the surface grade in the area. As noted in Figure 1-2, shallow groundwater is assumed to flow in a southerly direction, governed by a groundwater mound beneath Building 681. Because AOC 718 is approximately 300 ft from the Cooper River, the regional groundwater

Pesticides and PCBs in Soil Samples

No PCBs were detected. Chlordane and its isomers alpha-chlordane and gamma-chlordane, heptachlor epoxide, and DDD and DDE were detected in the surface and subsurface soil samples at low concentrations near the detection limits. As shown in Tables 4-1 and 4-2, concentrations of these compounds were at least two orders of magnitude less than unrestricted land use RBCs and SSLs. All of these are discontinued organo-chlorine pesticides, likely from the historical application across the base as part of the general facility maintenance activities in this highly disturbed/industrial area of CNC. Therefore, the pesticides detected at AOC 718 are not selected as COPCs as they are below the levels considered for exposure or leachability concern, and do not appear related to OWS system operations.

SVOCs in Soil Samples

No SVOCs were detected in the surface soil sample, but as shown in Table 4-2, trace concentrations of bis(2-ethylhexyl)phthalate and PAHs were detected in the subsurface soil samples. The concentrations of these SVOCs were less than their respective SSLs, indicating detected concentrations are not a concern as they would not contribute to groundwater contamination.

VOCs in Soil Samples

No VOCs were detected in the surface soil sample. Acetone, styrene, and xylenes were detected at trace levels in the subsurface soil. The concentrations of these VOCs were less than their respective SSLs, indicating they are not a leachability concern and would not contribute to groundwater contamination.

4.2.2 Groundwater Samples

Groundwater monitoring well I681GW002 was installed specifically to sample groundwater in the vicinity of the former OWS at AOC 718, and was located within several feet of the OWS. Monitoring well construction logs are presented in the *Zone I RFI Report, Revision 0* (EnSafe, 1999). RFI monitoring well I681GW002 was sampled three times in 1998 and 1999; samples were analyzed for cyanide, metals, VOCs, and SVOCs. PCBs and pesticides were also analyzed from the January 26, 1999 sample.

Inorganic and organic analytes detected in groundwater from I681GW002 are listed in Table 4-3. Concentrations were compared to MCLs; where MCLs do not exist they were compared to tap water RBCs from the EPA Region III October 2000 tables, adjusted for HI=0.1. Metals concentrations were also compared to BRCs for shallow groundwater from Zone I.

Results of the groundwater analyses are discussed below.

Metals in Groundwater Samples

As seen in Table 4-3, metals were detected in the groundwater samples from AOC 718 concentrations below applicable MCLs (or tap water RBCs adjusted for HI=0.1) and BRCs. Thus no metals are identified as COPCs in groundwater at AOC 718.

Organic Compounds in Groundwater Samples

VOCs, PCBs, and pesticides were not detected in the groundwater samples from I681GW002. Bis(2-ethylhexyl)phthalate was the only SVOC detected, at estimated concentrations of 22 μg/L from the first sampling event and 1.0 μg/L from the second sampling event, compared to the MCL of 6 μg/L. This compound was identified as a COPC because it exceeded the MCL, and is discussed further in Section 4.3.

4.3 COPC Evaluation and Refinement

This section discusses chemicals that were identified as COPCs because their concentrations exceeded screening criteria, i.e., background values and either unrestricted land use RBCs (for surface soil), SSLs (for surface or subsurface soil), or MCLs or RBCs for groundwater. No COPCs were identified in surface or subsurface soil. Bis(2-ethylhexyl)phthalate was identified as a COPC in groundwater.

Table 4-4 presents bis(2-ethylhexyl)phthalate concentrations measured at AOC 718. Because the concentration was greatly reduced during the second sampling event and not detected during the third sampling event, it is suspected that the initial detection may have been an artifact of sampling or laboratory contamination. This chemical is also identified as a common laboratory contaminant by EPA. The bis(2-ethylhexyl)phthalate concentration in the latest sampling event is well below the MCL. A review of the laboratory blank data for the Sample Data Group associated with a reported value of 22 μg/L indicates that one of the laboratory blanks had a bis(2-ethylhexyl)phthalate value of 1 μg/L (see Appendix H). Based on EPA's "Ten Times" rule for common laboratory contaminants, all detections up to 10 μg/L would be considered non-detect. Although the reported value of 22 μg/L for this sample exceeds the 10 μg/L determined by the "Ten Times" rule, the detection of bis(2-ethylhexyl)phthalate in this laboratory blank sample does confirm the potential for this groundwater detection to be due to laboratory contamination. Therefore, bis(2-ethylhexyl)phthalate is not considered a COC for groundwater at AOC 718.

4.4 Investigation Summary – AOC 718

Metals detected in soil and groundwater samples at AOC 718 are within background levels indicating detected metals are naturally occurring and not related to operations associated with the AOC 718 OWS system. Traces of pesticides detected in soil samples are at concentrations below the risk-based criteria and are likely from historical facility maintenance activities, as these type of pesticides are no longer in use. A one-time elevated concentration of bis(2-ethylhexyl)phthalate detected in one groundwater sample was not confirmed in subsequent samples and is likely from plastic material in sampling and analytical equipment. No compounds were identified at AOC 718 that indicated a release from the OWS system, or specific threats to soil or groundwater quality.

4.5 AOC 718 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 718:

- The OWS and former UST were adjacent to each other. Samples were collected surrounding the units identified as AOC 718, associated with the AOC 681 RFI and the subsequent CSI for AOC 718.
- Surface soil was sampled at one location, subsurface soil was sampled at three locations, and groundwater was sampled at one location specifically to investigate the OWS system at AOC 718.
- Soil and groundwater samples were analyzed for the full suite of VOCs, SVOCs, pesticides, and PCBs.
- None of the detected soil constituents were identified as COPCs; thus no COCs.
- Groundwater had one of the phthalates as a COPC, but no COCs were identified for groundwater around AOC 718.

It is concluded that sufficient data to characterize site environmental conditions exist to evaluate AOC 718, and that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore, NFA status is recommended for AOC 718.

TABLE 4-1
Analytes Detected in Surface Soils at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)		EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]
Metals							
Aluminum	I681SB007	10/06/1998	5,050	J	7,800	NL	3,470 - 27,400
Arsenic	I681SB007	10/06/1998	2.7	=	0.43	15	0.46 - 20
Barium	I681SB007	10/06/1998	22.0	=	550	800	7.8 - 43
Calcium	I681SB007	10/06/1998	62,000	=	NL	NL	1,670 - 59,500
Chromium, Total	I681SB007	10/06/1998	20.2	=	210[d]	19	7.5 - 54
Cobalt	I681SB007	10/06/1998	1.1	J	470	1,000	0.64 - 5.8
Copper	I681SB007	10/06/1998	5.5	=	310	5,300	2.4 - 556
Iron	I681SB007	10/06/1998	3,390	=	2,300	NL	1,730 - 22,700
Lead	I681SB007	10/06/1998	21.7	=	400[d]	400	5.0 - 203
Magnesium	I681SB007	10/06/1998	2,920	J	NL	NL	424 - 3,820
Manganese	I681SB007	10/06/1998	40.9	=	160	480	15 - 426
Mercury	I681SB007	10/06/1998	0.08	=	2.3	1.0	0.13 - 0.47
Nickel	I681SB007	10/06/1998	7.4	=	160	65	1.5 - 18
Selenium	I681SB007	10/06/1998	0.42	J	39	2.5	0.50 - 1.1
Vanadium	I681SB007	10/06/1998	11.4	=	55	3,000	8.5 - 53
Zinc	I681SB007	10/06/1998	29.1	J	2,300	6,000	5.9 - 150
Pesticides							
alpha-Chlordane	I681SB007	10/06/1998	0.0039	=	1.8	5.0	NA
gamma-Chlordane	I681SB007	10/06/1998	0.0097	=	1.8	5.0	NA
Heptachlor Epoxide	I681SB007	10/06/1998	0.0020	=	0.07	0.35	NA

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

[a] Unrestricted land use RBCs from EPA Region III RBC Tables, October 2000, adjusted for HI = 0.1.

[b] SSLs from EPA Soil Screening Guidance: User's Guide; DAF = 1.0 for VOCs, DAF = 10 for others

[c] Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

TABLE 4-1
Analytes Detected in Surface Soils at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)	EPA Region III RBC[a]	SSL[b]	Surface Soil Background Range[c]

[d] RBCs for Total Chromium and Lead from EPA Region IX PRG Tables, November 2000.

NA Not available

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

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

TABLE 4-2
Analytes Detected in Subsurface Soil at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)		SSL[a]	Subsurface Soil Background Range[b]
Metals						
Aluminum	I681SB007	09/24/1998	5,500	=	NL	4,590 - 11,700
	I718SB001	06/10/2002	7,870	=		
	I718SB002	06/10/2002	7,240	=		
Arsenic	I681SB007	09/24/1998	3.2	J	15	0.88 - 4.4
	I718SB001	06/10/2002	4.36	=		
	I718SB002	06/10/2002	3.96	=		
Barium	I681SB007	09/24/1998	13.2	J	800	9.5 - 19
	I718SB001	06/10/2002	14	J		
	I718SB002	06/10/2002	15	J		
Beryllium	I681SB007	09/24/1998	0.19	J	32	0.33 - 0.51
	I718SB001	06/10/2002	0.28	J		
	I718SB002	06/10/2002	0.241	J		
Cadmium	I681SB007	09/24/1998	0.25	J	4	0.48
	I718SB001	06/10/2002	0.286	J		
	I718SB002	06/10/2002	0.342	J		
Calcium	I681SB007	09/24/1998	54,300	=	NL	528 - 63,900
	I718SB001	06/10/2002	86,700	=		
	I718SB002	06/10/2002	72,800	=		
Chromium, Total	I681SB007	09/24/1998	21.0	=	19	7.6 - 41
	I718SB001	06/10/2002	33.7	J		
	I718SB002	06/10/2002	23.8	J		
Cobalt	I681SB007	09/24/1998	1.4	J	1,000	2.1 - 2.2
	I718SB001	06/10/2002	0.92	J		
	I718SB002	06/10/2002	0.896	J		
Copper	I681SB007	09/24/1998	8.5	=	5,300	1.2 - 12
	I718SB001	06/10/2002	6.14	=		
	I718SB002	06/10/2002	11.1	=		

TABLE 4-2
Analytes Detected in Subsurface Soil at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)		SSL[a]	Subsurface Soil Background Range[b]
Iron	I681SB007	09/24/1998	3,840	=	NL	3,730 - 7,250
	I718SB001	06/10/2002	5,220	J		
	I718SB002	06/10/2002	4,450	J		
Lead	I681SB007	09/24/1998	6.0	=	400	3.1 - 7.2
	I718SB001	06/10/2002	6.76	J		
	I718SB002	06/10/2002	19.8	J		
Magnesium	I681SB007	09/24/1998	1,860	=	NL	196 - 3,990
	I718SB001	06/10/2002	3350	=		
	I718SB002	06/10/2002	2170	=		
Manganese	I681SB007	09/24/1998	45.9	J	480	8.6 - 55
	I718SB001	06/10/2002	74.4	J		
	I718SB002	06/10/2002	55.9	J		
Mercury	I681SB007	09/24/1998	0.07	=	1	NA
	I718SB001	06/10/2002	0.011	J		
	I718SB002	06/10/2002	0.01	J		
Nickel	I681SB007	09/24/1998	7.40	=	65	3.5 - 16
	I718SB001	06/10/2002	14.8	J		
	I718SB002	06/10/2002	11.2	J		
Potassium	I681SB007	09/24/1998	386	J	NL	930 - 2,230
	I718SB001	06/10/2002	683	J		
	I718SB002	06/10/2002	518	J		
Selenium	I681SB007	09/24/1998	0.15	J	2.5	0.59 - 1.4
	I718SB001	06/10/2002	0.376	J		
	I718SB002	06/10/2002	0.417	J		
Sodium	I681SB007	09/24/1998	222	J	NL	226 - 1,770
	I718SB001	06/10/2002	391	J		
	I718SB002	06/10/2002	340	J		

TABLE 4-2
Analytes Detected in Subsurface Soil at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)		SSL[a]	Subsurface Soil Background Range[b]
Vanadium	I681SB007	09/24/1998	12.7	=	3,000	11 - 24
	I718SB001	06/10/2002	19.7	=		
	I718SB002	06/10/2002	16.3	=		
Zinc	I681SB007	09/24/1998	29.3	J	6,000	4.7 - 29
	I718SB001	06/10/2002	30.5	J		
	I718SB002	06/10/2002	43.1	J		
Pesticides						
Alpha-chlordane	I681SB007	09/24/1998	0.0024	=	5	NA
	I718SB001	06/10/2002	0.0011	J		
	I718SB002	06/10/2002	0.0031	J		
Chlordane	I718SB002	06/10/2002	0.1360	J	5	NA
Gamma-chlordane	I681SB007	09/24/1998	0.0056	=	5	NA
	I718SB001	06/10/2002	0.0049	J		
	I718SB002	06/10/2002	0.0136	J		
Heptachlor Epoxide	I718SB002	06/10/2002	0.0040	J	0.35	NA
p,p'-DDD	I718SB001	06/10/2002	0.0032	J	8	NA
p,p'-DDE	I718SB001	06/10/2002	0.0043	J	27	NA
Semivolatile Organic Compounds						
BEQs	I718SB002	06/10/2002	0.264	=	NA	1.400
Benzo(a)Pyrene	I718SB002	06/10/2002	0.0276	J	4	0.623
bis(2-Ethylhexyl) Phthalate	I681SB007	09/24/1998	0.040	J	1,800	NA
	I718SB002	06/10/2002	0.264	J		
Chrysene	I718SB002	06/10/2002	0.0478	J	80	0.616
Fluoranthene	I718SB002	06/10/2002	0.0661	J	2,100	NA
Phenanthrene	I718SB002	06/10/2002	0.0416	J	NA	NA

TABLE 4-2
Analytes Detected in Subsurface Soil at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (mg/kg)		SSL[a]	Subsurface Soil Background Range[b]
Pyrene	I681SB007	09/24/1998	0.0180	J	2,100	NA
	I718SB002	06/10/2002	0.0495	J		
Volatile Organic Compounds						
Acetone	I718SB001	06/10/2002	0.0063	J	0.80	NA
	I718SB002	06/10/2002	0.0065	J		
Styrene	I718SB001	06/10/2002	0.00055	J	0.2	NA
	I718SB002	06/10/2002	0.00066	J		
Xylenes, Total	I718SB002	06/10/2002	0.00044	J	9.5	NA

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

[a] SSLs from EPA Soil Screening Guidance: User's Guide; DAF = 1.0 for VOCs, DAF = 10 for others.

[b]Background Range values for metals are the minimum and maximum concentrations detected in Zone I grid samples.

NA Not available

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

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

TABLE 4-3
Analytes Detected in Groundwater at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)		MCL/*RBC*	Zone I BRC (shallow)
Metals						
Arsenic	I681GW002	10/20/1998	3.3	J	50	23
		01/26/1999	3.8	J		
Barium	I681GW002	10/20/1998	32.7	J	2,000	110
		01/26/1999	26.3	=		
		06/02/1999	53.6	=		
Calcium	I681GW002	10/20/1998	146,000	=	NL	39,000 - 980,000 *
		01/26/1999	113,000	=		
		06/02/1999	203,000	=		
Copper	I681GW002	01/26/1999	10.1	J	1,300	4.4
Iron	I681GW002	10/20/1998	490	=	*1,100*	49 - 31,900 *
		01/26/1999	67.0	J		
		06/02/1999	968	=		
Lead	I681GW002	06/02/1999	3.3	=	15	4.4
Magnesium	I681GW002	10/20/1998	26,300	=	NL	8,580 - 1,410,000 *
		01/26/1999	44,400	=		
		06/02/1999	54,200	=		
Manganese	I681GW002	10/20/1998	44.1	=	*73*	5430
		01/26/1999	29.6	=		
		06/02/1999	56.9	=		
Mercury	I681GW002	06/02/1999	0.13	J	2	0.1 - 1.1 *
Nickel	I681GW002	01/26/1999	2.3	J	*73*	13.3
Potassium	I681GW002	10/20/1998	19,100	=	NL	7,060 - 550,000 *
		01/26/1999	42,800	=		
		06/02/1999	30,300	=		
Silver	I681GW002	10/20/1998	6.1	J	*18*	1.3 *
Sodium	I681GW002	10/20/1998	149,000	=	NL	NA

TABLE 4-3
Analytes Detected in Groundwater at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

Parameter	Sample Location	Date Sampled	Concentration (µg/L)		MCL/*RBC*	Zone I BRC (shallow)
Sodium		01/26/1999	233,000	=	NL	NA
		06/02/1999	27,300	=		
Vanadium	I681GW002	01/26/1999	1.3	J	*26*	14
bis(2-Ethylhexyl) Phthalate	I681GW002	10/20/1998	**22.0**	J	6	NA
		01/26/1999	1.0	J		

All values are presented in units of micrograms per liter (µg/L).

Concentrations in bold type and outlined exceed MCL/RBC and BRC.

[a] RBCs are listed in italics where no primary MCL exists. RBCs are from EPA Region III RBC (October 2000) table, adjusted for HI = 0.1

BRC Background reference concentration

* Range of grid sample concentrations; no BRC calculated.

NA Not available

NL Not listed

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

TABLE 4-4
COPC Refinement, Groundwater at AOC 718
Confirmatory Sampling Investigation Report, AOCs 711, 715, and 718, Zone I, Charleston Naval Complex

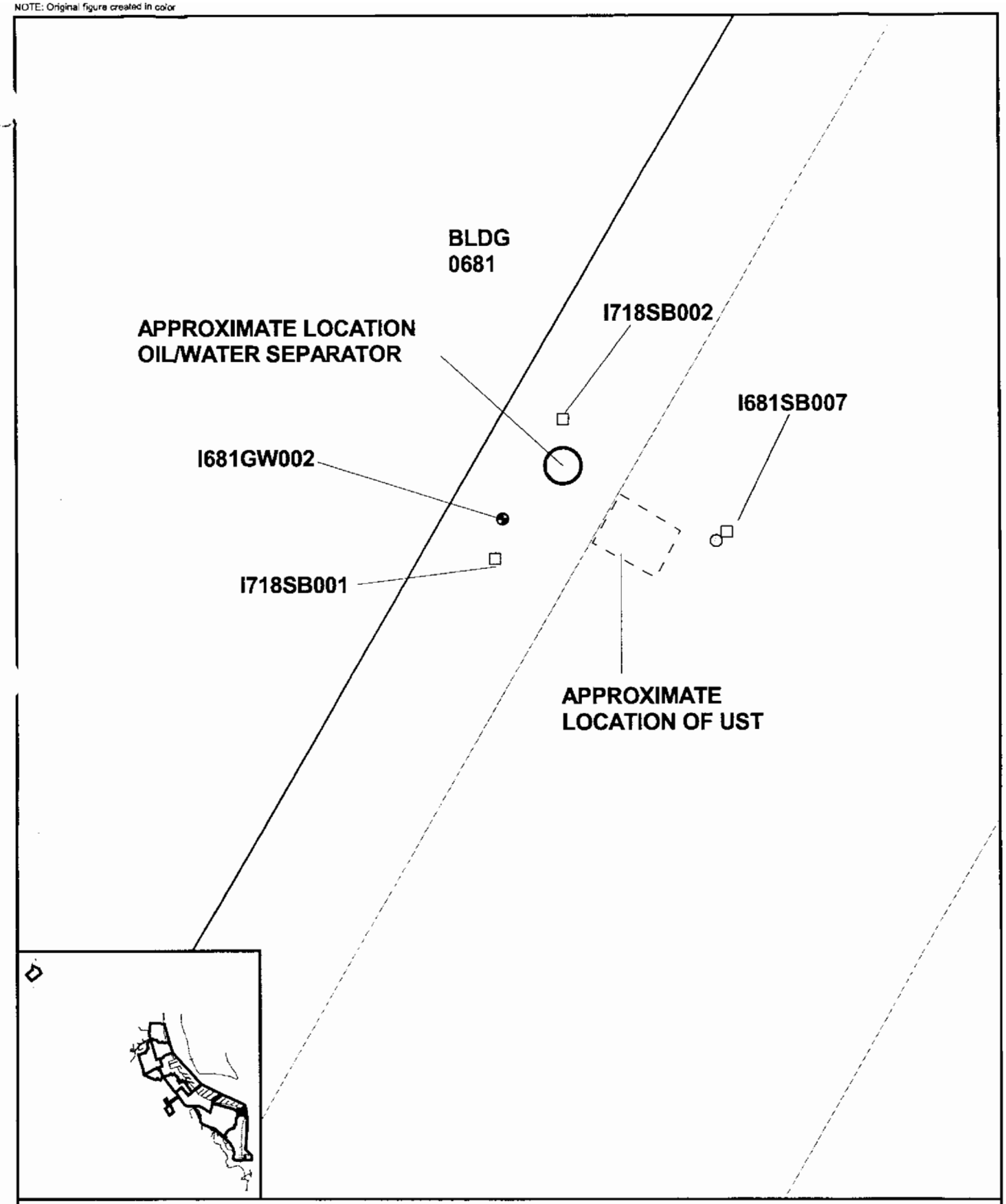
Parameter	Location	Date Sampled	Concentration (µg/L)		MCL
bis(2-Ethylhexyl)Phthalate	I681GW002	10/20/1998	**22.0**	J	6
		01/26/1999	1.0	J	
		06/02/1999	13.0	U	

Concentrations in bold type and outlined exceed MCL.

J Indicates an estimated value.

U Indicates that the analyte was not detected; value is detection limit.

NOTE: Original figure created in color



Soil Boring
Surface Soil
Groundwater Well
AOCs
Roads
Buildings

N

0 10 20 Feet

1 inch = 10 feet

Figure 4-1
AOC 718 RFI Sampling Locations
Confirmatory Sampling Investigation
Charleston Naval Complex

CH2MHILL

File Path: d:\18gis\projects\zone_i\aocs_711_715_718\aprs\aoc_711_715_718_figure4-1.apr, Date: 27 Feb 2003 9:49, User: DSANTOS, EGIS: Charleston Naval Complex - Figure 4-1 AOC 718 RFI Sampling Locations

5.0 CSI Conclusions and Recommendations

This section summarizes the conclusions and recommendations resulting from the data review for the CSIs at AOCs 711, 715, and 718.

5.1 AOC 711 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 711:

- The OWS system is composed of a concrete and steel structure with an adjacent oily waste UST reported. The system has been out of service on or before 1996.
- The OWS system reportedly received effluent from an adjacent wash pad and from building floor drains. No drawings or configuration details are known.
- Soil and groundwater samples were collected specifically to investigate the OWS system for the Zone L RFI and the AOC 711 CSI.
- Soil and groundwater RFI samples surrounding the OWS system were analyzed for the full range of VOCs, SVOCs, PCBs, pesticides, and metals, and indicate no COCs at the AOC.

It is concluded that sufficient data exist to evaluate AOC 711, and that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore, an NFA status is recommended for this site.

5.2 AOC 715 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 715:

- Construction details and exact location of the former OWS system are not known.
- Surface and subsurface soil was sampled at 6 locations and groundwater was sampled at 4 locations within 55 feet of the assumed location of the OWS system.
- Soil and groundwater samples analyzed for the full range of VOCs, SVOCs, and metals indicate no releases from the OWS system.

It is concluded that sufficient data exist to evaluate AOC 715 and that the data indicate that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore, an NFA status is recommended for this site.

5.3 AOC 718 CSI Conclusions and Recommendations

The following conclusions may be applied to the OWS system at AOC 718:

- The OWS and former UST were adjacent to each other, and the 1997 UST closure sampling indicated no further action was required regarding the UST removal.
- Surface and subsurface soil was sampled at three locations and groundwater was sampled at one location specifically to investigate the OWS system for the Zone I, AOC 681 RFI and the AOC 718 CSI.
- Soil and groundwater RFI samples analyzed for the full range of VOCs, SVOCs, pesticides, PCBs, and metals indicate no releases from the OWS system.

It is concluded that sufficient data exist to evaluate AOC 718 and that no COCs have been identified within the media that would have been impacted by a potential release from the OWS. Therefore, NFA status is recommended for this site.

6.0 References

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CH2M-Jones. *Sampling and Analysis Plan for Oil/Water Separator AOCs 711 through 720, Charleston Naval Complex*. May 1, 2002a.

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EnSafe Inc. *Zone I RFI Report, Revision 0, NAVBASE Charleston*. Revision 0. North Charleston, South Carolina. 1999.

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AOC 711 – Metal covers to OWS, located due south of bermed wash pad.

AOC 715 – Looking north toward Building 0027.

Former location of AOC 718 OWS, against Building 681 wall. UST was located beneath pavement edge.

AOC 718

Appendix B

Metals, OWS Sediment
AOC 711

	StationID	I711VAOWS		I711VAOWS	
	SampleID	711VAOWSM1		711VAOWSM1	
	DateCollected	6/6/2002		6/6/2002	
	DateExtracted	6/17/2002		6/21/2002	
	DateAnalyzed	6/19/2002		6/24/2002	
	SDGNumber	61678		61678	
Parameter	**Units**				
Aluminum	mg/kg	3630	=		
Antimony	mg/kg	0.66	U		
Arsenic	mg/kg	3.13	=		
Barium	mg/kg	27	J		
Beryllium	mg/kg	0.191	J		
Cadmium	mg/kg	0.856	J		
Calcium	mg/kg	24700	=		
Chromium, Total	mg/kg	26.5	=		
Cobalt	mg/kg	4.98	J		
Copper	mg/kg	30.4	=		
Iron	mg/kg	8770	=		
Lead	mg/kg	35.2	=		
Magnesium	mg/kg	932	J		
Manganese	mg/kg	83.9	=		
Nickel	mg/kg	7.26	J		
Potassium	mg/kg	378	J		
Selenium	mg/kg	0.368	U		
Silver	mg/kg	0.158	U		
Sodium	mg/kg	448	J		
Thallium	mg/kg	0.687	U		
Vanadium	mg/kg	16.7	=		
Zinc	mg/kg	383	=		
Mercury	mg/kg			0.01	J

PCBs, OWS Sediment
AOC 711

	StationID	I711VAOWS	
	SampleID	711VAOWSM1	
	DateCollected	6/6/2002	
	DateExtracted	6/11/2002	
	DateAnalyzed	6/18/2002	
	SDGNumber	61678	
Parameter	**Units**		
PCB-1016 (Arochlor 1016)	ug/kg	23.9	U
PCB-1221 (Arochlor 1221)	ug/kg	23.9	U
PCB-1232 (Arochlor 1232)	ug/kg	23.9	U
PCB-1242 (Arochlor 1242)	ug/kg	23.9	U
PCB-1248 (Arochlor 1248)	ug/kg	23.9	U
PCB-1254 (Arochlor 1254)	ug/kg	23.9	U
PCB-1260 (Arochlor 1260)	ug/kg	23.9	U

Pesticides, OWS Sediment
AOC 711

	StationID	I711VAOWS	
	SampleID	711VAOWSM1	
	DateCollected	6/6/2002	
	DateExtracted	6/11/2002	
	DateAnalyzed	6/20/2002	
	SDGNumber	61678	
Parameter	**Units**		
Aldrin	ug/kg	9.3	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	9.3	U
Alpha-chlordane	ug/kg	1.1	J
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	9.3	U
Chlordane	ug/kg	92.9	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	9.3	U
Dieldrin	ug/kg	17.9	U
Endosulfan I	ug/kg	9.3	U
Endosulfan II	ug/kg	17.9	U
Endosulfan Sulfate	ug/kg	1.6	J
Endrin Aldehyde	ug/kg	3.8	J
Endrin Ketone	ug/kg	17.9	U
Endrin	ug/kg	17.9	U
Gamma BHC (Lindane)	ug/kg	9.3	U
Gamma-chlordane	ug/kg	9.3	U
Heptachlor Epoxide	ug/kg	9.3	U
Heptachlor	ug/kg	9.3	U
Methoxychlor	ug/kg	92.9	U
p,p'-DDD	ug/kg	17.9	U
p,p'-DDE	ug/kg	2.6	J
p,p'-DDT	ug/kg	17.2	J
Toxaphene	ug/kg	594	U

SVOCs, OWS Sediment
AOC 711

	StationID	I711VAOWS	
	SampleID	711VAOWSM1	
	DateCollected	6/6/2002	
	DateExtracted	6/10/2002	
	DateAnalyzed	6/15/2002	
	SDGNumber	61678	
Parameter	**Units**		
Benzo(g,h,i)Perylene	ug/kg	473	UJ
Phenol	ug/kg	473	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	473	U
Bis(2-Chloroisopropyl)Ether	ug/kg	473	U
2-Chlorophenol	ug/kg	473	U
1,4-Dichlorobenzene	ug/kg	473	U
Benzyl alcohol	ug/kg	473	U
1,2-Dichlorobenzene	ug/kg	473	U
1,3-Dichlorobenzene	ug/kg	473	U
2-Methylphenol (o-Cresol)	ug/kg	473	U
N-Nitrosodi-n-propylamine	ug/kg	473	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	473	U
Hexachloroethane	ug/kg	473	U
Nitrobenzene	ug/kg	473	U
Isophorone	ug/kg	473	U
2-Nitrophenol	ug/kg	473	UJ
2,4-Dimethylphenol	ug/kg	473	U
bis(2-Chloroethoxy) Methane	ug/kg	473	U
2,4-Dichlorophenol	ug/kg	473	U
Benzoic acid	ug/kg	2290	U
1,2,4-Trichlorobenzene	ug/kg	473	U
Naphthalene	ug/kg	473	UJ
4-Chloroaniline	ug/kg	473	U
Hexachlorobutadiene	ug/kg	473	U
4-Chloro-3-methylphenol	ug/kg	430	U
2-Methylnaphthalene	ug/kg	473	U
Hexachlorocyclopentadiene	ug/kg	473	U
2,4,6-Trichlorophenol	ug/kg	473	U
2,4,5-Trichlorophenol	ug/kg	2290	U
2-Chloronaphthalene	ug/kg	473	U

SVOCs, OWS Sediment
AOC 711

	StationID	I711VAOWS	
	SampleID	711VAOWSM1	
	DateCollected	6/6/2002	
	DateExtracted	6/10/2002	
	DateAnalyzed	6/15/2002	
	SDGNumber	61678	
Parameter	**Units**		
2-Nitroaniline	ug/kg	473	U
3-Nitroaniline	ug/kg	2290	U
Dimethyl Phthalate	ug/kg	29.5	J
2,6-Dinitrotoluene	ug/kg	473	U
Acenaphthylene	ug/kg	473	U
Acenaphthene	ug/kg	430	U
2,4-Dinitrophenol	ug/kg	2290	U
Dibenzofuran	ug/kg	473	U
2,4-Dinitrotoluene	ug/kg	430	U
Diethyl Phthalate	ug/kg	473	U
4-Nitrophenol	ug/kg	2290	U
Fluorene	ug/kg	18.1	J
4-Chlorophenyl Phenyl Ether	ug/kg	473	U
4,6-Dinitro-2-methylphenol	ug/kg	2290	U
4-Nitroaniline	ug/kg	2290	U
Diphenylamine	ug/kg	473	U
4-Bromophenyl Phenyl Ether	ug/kg	473	U
Hexachlorobenzene	ug/kg	473	U
Pentachlorophenol	ug/kg	2290	U
Phenanthrene	ug/kg	261	J
Anthracene	ug/kg	37.2	J
Di-n-butyl Phthalate	ug/kg	473	U
Fluoranthene	ug/kg	454	J
Pyrene	ug/kg	483	=
Benzyl Butyl Phthalate	ug/kg	473	U
Benzo(a)Anthracene	ug/kg	175	J
3,3'-Dichlorobenzidine	ug/kg	946	U
Chrysene	ug/kg	228	J
bis(2-Ethylhexyl) Phthalate	ug/kg	267	J
Di-n-octylphthalate	ug/kg	473	UJ

SVOCs, OWS Sediment
AOC 711

	StationID	I711VAOWS	
	SampleID	711VAOWSM1	
	DateCollected	6/6/2002	
	DateExtracted	6/10/2002	
	DateAnalyzed	6/15/2002	
	SDGNumber	61678	
Parameter	**Units**		
Benzo(b)Fluoranthene	ug/kg	473	UJ
Benzo(k)Fluoranthene	ug/kg	473	UJ
Benzo(a)Pyrene	ug/kg	173	J
Indeno(1,2,3-c,d)pyrene	ug/kg	473	UJ
Dibenz(a,h)anthracene	ug/kg	473	UJ
Carbazole	ug/kg	473	UJ

VOCs, OWS Sediment
AOC 711

	StationID	I711VAOWS		I711VAOWS	
	SampleID	711VAOWSM3		711VAOWSM1	
	DateCollected	7/9/2002		6/6/2002	
	DateExtracted	7/12/2002		6/12/2002	
	DateAnalyzed	7/12/2002		6/12/2002	
	SDGNumber	63281		61678	
Parameter	**Units**				
Chloromethane	ug/kg	14.7	U	14.6	SUJ
Vinyl chloride	ug/kg	14.7	U	14.6	SUJ
Bromomethane	ug/kg	14.7	U	14.6	SUJ
Chloroethane	ug/kg	14.7	U	14.6	SUJ
1,1-Dichloroethene	ug/kg	7.4	U	7.3	SUJ
Acetone	ug/kg	33.1	J	13.6	SJ
Carbon Disulfide	ug/kg	7.4	U	7.3	SUJ
Methylene Chloride	ug/kg	7.4	U	7.3	SUJ
trans-1,2-Dichloroethene	ug/kg	7.4	U	7.3	SUJ
1,1-Dichloroethane	ug/kg	7.4	U	7.3	SUJ
Vinyl acetate	ug/kg	14.7	UJ	14.6	SUJ
Methyl ethyl ketone (2-Butanone)	ug/kg	7.8	J	14.6	SUJ
cis-1,2-Dichloroethylene	ug/kg	7.4	U	7.3	SUJ
1,2-Dichloroethene (total)	ug/kg	7.4	U	7.3	SUJ
Chloroform	ug/kg	7.4	U	7.3	SUJ
1,1,1-Trichloroethane	ug/kg	7.4	U	7.3	SUJ
Carbon Tetrachloride	ug/kg	7.4	U	7.3	SUJ
1,2-Dichloroethane	ug/kg	7.4	U	7.3	SUJ
Benzene	ug/kg	7.4	U	7.3	SUJ
Trichloroethylene (TCE)	ug/kg	7.4	U	7.3	SUJ
1,2-Dichloropropane	ug/kg	7.4	U	7.3	SUJ
Bromodichloromethane	ug/kg	7.4	U	7.3	SUJ
2-Chloroethyl vinyl ether	ug/kg	14.7	UJ	14.6	SUJ
cis-1,3-Dichloropropene	ug/kg	7.4	U	7.3	SUJ
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	14.7	U	7.3	SUJ
Toluene	ug/kg	11.3	=	3.8	SJ
trans-1,3-Dichloropropene	ug/kg	7.4	U	7.3	SUJ
1,1,2-Trichloroethane	ug/kg	7.4	U	7.3	SUJ
2-Hexanone	ug/kg	14.7	U	14.6	SUJ
Tetrachloroethylene (PCE)	ug/kg	7.4	U	7.3	SUJ

VOCs, OWS Sediment
AOC 711

	StationID	I711VAOWS		I711VAOWS	
	SampleID	711VAOWSM3		711VAOWSM1	
	DateCollected	7/9/2002		6/6/2002	
	DateExtracted	7/12/2002		6/12/2002	
	DateAnalyzed	7/12/2002		6/12/2002	
	SDGNumber	63281		61678	
Parameter	**Units**				
Dibromochloromethane	ug/kg	7.4	U	7.3	SUJ
Chlorobenzene	ug/kg	7.4	U	7.3	SUJ
Ethylbenzene	ug/kg	1.8	J	7.3	SUJ
m+p Xylene	ug/kg	5.1	J	7.3	SUJ
o-Xylene	ug/kg	1.3	J	7.3	SUJ
Xylenes, Total	ug/kg	6.4	J	7.3	SUJ
Styrene	ug/kg	2.6	J	7.3	SUJ
Bromoform	ug/kg	7.4	U	7.3	SUJ
1,1,2,2-Tetrachloroethane	ug/kg	7.4	U	7.3	SUJ
1,3-Dichlorobenzene	ug/kg	7.4	U	7.3	SUJ
1,4-Dichlorobenzene	ug/kg	7.4	U	7.3	SUJ
1,2-Dichlorobenzene	ug/kg	7.4	U	7.3	SUJ
1,2,4-Trichlorobenzene	ug/kg	7.4	U	7.3	SUJ
1,2,3-Trichlorobenzene	ug/kg	7.4	U	7.3	SUJ

Metals, OWS Water
AOC 711

	StationID	I711ZAOWS		I711ZAOWS	
	SampleID	711ZAOWSM1		711ZAOWSM1	
	DateCollected	6/6/2002		6/6/2002	
	DateExtracted	6/14/2002		6/18/2002	
	DateAnalyzed	6/16/2002		6/18/2002	
	SDGNumber	61677		61677	
Parameter	**Units**				
Aluminum	ug/L			612	=
Antimony	ug/L			4.79	UJ
Arsenic	ug/L			3.97	U
Barium	ug/L			22.1	J
Beryllium	ug/L			0.185	U
Cadmium	ug/L			0.21	U
Calcium	ug/L			30300	=
Chromium, Total	ug/L			4.43	J
Cobalt	ug/L			0.581	U
Copper	ug/L			7.85	J
Iron	ug/L			8450	=
Lead	ug/L			4.26	=
Magnesium	ug/L			1450	J
Manganese	ug/L			209	=
Nickel	ug/L			1.25	J
Potassium	ug/L			1960	J
Selenium	ug/L			2.67	UJ
Silver	ug/L			1.15	U
Sodium	ug/L			4260	J
Thallium	ug/L			4.99	U
Vanadium	ug/L			3.02	J
Zinc	ug/L			73.5	=
Mercury	ug/L	0.04	U		

PCBs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/22/2002		6/10/2002	
	DateAnalyzed	7/4/2002		6/11/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
PCB-1016 (Arochlor 1016)	ug/L	9.8	U	0.97	U
PCB-1221 (Arochlor 1221)	ug/L	9.8	U	0.97	U
PCB-1232 (Arochlor 1232)	ug/L	9.8	U	0.97	U
PCB-1242 (Arochlor 1242)	ug/L	9.8	U	0.97	U
PCB-1248 (Arochlor 1248)	ug/L	9.8	U	0.97	U
PCB-1254 (Arochlor 1254)	ug/L	19.6	U	1.9	U
PCB-1260 (Arochlor 1260)	ug/L	19.6	U	1.9	U

Pesticides, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/26/2002		6/11/2002	
	DateAnalyzed	6/27/2002		6/13/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
Aldrin	ug/L	0.04	UJ	0.039	U
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	0.04	UJ	0.039	U
Alpha-chlordane	ug/L	0.04	UJ	0.039	U
Beta BHC (Beta Hexachlorocyclohexane)	ug/L	0.04	UJ	0.039	U
Chlordane	ug/L	0.4	UJ	0.39	U
Delta BHC (Delta Hexachlorocyclohexane)	ug/L	0.04	UJ	0.039	U
Dieldrin	ug/L	0.081	UJ	0.078	U
Endosulfan I	ug/L	0.04	UJ	0.039	U
Endosulfan II	ug/L	0.081	UJ	0.078	U
Endosulfan Sulfate	ug/L	0.081	UJ	0.078	U
Endrin Aldehyde	ug/L	0.081	UJ	0.078	U
Endrin Ketone	ug/L	0.081	UJ	0.078	U
Endrin	ug/L	0.081	UJ	0.078	U
Gamma BHC (Lindane)	ug/L	0.04	UJ	0.039	U
Gamma-chlordane	ug/L	0.04	UJ	0.039	U
Heptachlor Epoxide	ug/L	0.04	UJ	0.039	U
Heptachlor	ug/L	0.04	UJ	0.039	UJ
Methoxychlor	ug/L	0.38	UJ	0.37	UJ
p,p'-DDD	ug/L	0.081	UJ	0.078	U
p,p'-DDE	ug/L	0.081	UJ	0.078	U
p,p'-DDT	ug/L	0.0069	J	0.078	U
Toxaphene	ug/L	2.5	UJ	2.4	U

SVOCs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/24/2002		6/11/2002	
	DateAnalyzed	6/29/2002		6/13/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
Phenol	ug/L	10.2	U	9.6	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/L	10.2	U	9.6	U
2-Chlorophenol	ug/L	10.2	U	9.6	U
1,3-Dichlorobenzene	ug/L	10.2	U	9.6	U
1,4-Dichlorobenzene	ug/L	10.2	U	9.6	U
Benzyl alcohol	ug/L	10.2	U	9.6	U
1,2-Dichlorobenzene	ug/L	10.2	U	9.6	U
Bis(2-Chloroisopropyl)Ether	ug/L	10.2	U	9.6	U
2-Methylphenol (o-Cresol)	ug/L	10.2	U	9.6	U
N-Nitrosodi-n-propylamine	ug/L	10.2	U	9.6	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/L	10.2	U	9.6	U
Hexachloroethane	ug/L	10.2	U	9.6	U
Nitrobenzene	ug/L	10.2	U	9.6	U
Isophorone	ug/L	10.2	U	9.6	U
2-Nitrophenol	ug/L	10.2	U	9.6	U
2,4-Dimethylphenol	ug/L	10.2	U	9.6	U
bis(2-Chloroethoxy) Methane	ug/L	10.2	U	9.6	U
2,4-Dichlorophenol	ug/L	10.2	U	9.6	U
Benzoic acid	ug/L	51	U	48.1	U
1,2,4-Trichlorobenzene	ug/L	10.2	U	9.6	U
Naphthalene	ug/L	10.2	U	9.6	U
4-Chloroaniline	ug/L	10.2	U	9.6	U
Hexachlorobutadiene	ug/L	10.2	U	9.6	U
4-Chloro-3-methylphenol	ug/L	10.2	U	9.6	U
2-Methylnaphthalene	ug/L	10.2	U	9.6	U
Hexachlorocyclopentadiene	ug/L	10.2	U	9.6	U
2,4,6-Trichlorophenol	ug/L	10.2	U	9.6	U
2,4,5-Trichlorophenol	ug/L	51	U	48.1	U
2-Chloronaphthalene	ug/L	10.2	U	9.6	U
2-Nitroaniline	ug/L	51	U	48.1	U

SVOCs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/24/2002		6/11/2002	
	DateAnalyzed	6/29/2002		6/13/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
3-Nitroaniline	ug/L	51	U	48.1	U
Dimethyl Phthalate	ug/L	10.2	U	9.6	U
2,6-Dinitrotoluene	ug/L	10.2	U	9.6	U
Acenaphthylene	ug/L	10.2	U	9.6	U
Acenaphthene	ug/L	10.2	U	9.6	U
2,4-Dinitrophenol	ug/L	51	UJ	48.1	U
Dibenzofuran	ug/L	10.2	U	9.6	U
2,4-Dinitrotoluene	ug/L	10.2	U	9.6	U
Diethyl Phthalate	ug/L	10.2	U	9.6	U
4-Nitrophenol	ug/L	51	U	48.1	U
Fluorene	ug/L	10.2	U	9.6	U
4-Chlorophenyl Phenyl Ether	ug/L	10.2	U	9.6	U
4,6-Dinitro-2-methylphenol	ug/L	51	U	48.1	U
4-Nitroaniline	ug/L	51	U	48.1	U
Diphenylamine	ug/L	10.2	U	9.6	U
4-Bromophenyl Phenyl Ether	ug/L	10.2	U	9.6	U
Hexachlorobenzene	ug/L	10.2	U	9.6	U
Pentachlorophenol	ug/L	51	U	48.1	U
Phenanthrene	ug/L	10.2	U	9.6	U
Anthracene	ug/L	10.2	U	9.6	U
Di-n-butyl Phthalate	ug/L	10.2	U	9.6	U
Fluoranthene	ug/L	10.2	U	0.51	J
Pyrene	ug/L	10.2	U	9.6	U
Benzyl Butyl Phthalate	ug/L	10.2	U	9.6	U
Benzo(a)Anthracene	ug/L	10.2	U	9.6	U
3,3'-Dichlorobenzidine	ug/L	20.4	U	19.2	U
Chrysene	ug/L	10.2	U	9.6	U
bis(2-Ethylhexyl) Phthalate	ug/L	10.2	U	1.9	J
Di-n-octylphthalate	ug/L	10.2	U	9.6	U
Benzo(b)Fluoranthene	ug/L	10.2	U	9.6	U

SVOCs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/24/2002		6/11/2002	
	DateAnalyzed	6/29/2002		6/13/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
Benzo(k)Fluoranthene	ug/L	10.2	U	9.6	U
Benzo(a)Pyrene	ug/L	1	U	0.96	U
Indeno(1,2,3-c,d)pyrene	ug/L	10.2	U	9.6	U
Dibenz(a,h)anthracene	ug/L	10.2	U	9.6	U
Benzo(g,h,i)Perylene	ug/L	10.2	U	9.6	U
Carbazole	ug/L	10.2	U	9.6	U

VOCs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/24/2002		6/11/2002	
	DateAnalyzed	6/24/2002		6/11/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
Chloromethane	ug/L	10	U	10	U
Vinyl chloride	ug/L	10	U	10	U
Bromomethane	ug/L	10	U	10	U
Chloroethane	ug/L	10	U	10	U
1,1-Dichloroethene	ug/L	5	U	5	U
Acetone	ug/L	3.7	J	7	J
Carbon Disulfide	ug/L	5	U	5	U
Methylene Chloride	ug/L	5	U	5	U
trans-1,2-Dichloroethene	ug/L	5	U	5	U
1,1-Dichloroethane	ug/L	5	U	5	U
Vinyl acetate	ug/L	10	U	10	UJ
Methyl ethyl ketone (2-Butanone)	ug/L	10	U	10	U
cis-1,2-Dichloroethylene	ug/L	0.32	J	5	U
1,2-Dichloroethene (total)	ug/L	0.32	J	5	U
Chloroform	ug/L	5	U	5	U
1,1,1-Trichloroethane	ug/L	5	U	5	U
Carbon Tetrachloride	ug/L	5	U	5	U
1,2-Dichloroethane	ug/L	5	U	5	U
Benzene	ug/L	5	U	5	U
Trichloroethylene (TCE)	ug/L	5	U	5	U
1,2-Dichloropropane	ug/L	5	U	5	U
Bromodichloromethane	ug/L	5	U	5	U
2-Chloroethyl vinyl ether	ug/L	5	U	5	UJ
cis-1,3-Dichloropropene	ug/L	5	U	5	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	10	U	10	U
Toluene	ug/L	5	U	5	U
trans-1,3-Dichloropropene	ug/L	5	U	5	U
1,1,2-Trichloroethane	ug/L	5	U	5	U
2-Hexanone	ug/L	10	U	10	U
Tetrachloroethylene (PCE)	ug/L	5	U	5	U

VOCs, Groundwater and OWS Water
AOC 711

	StationID	I711GP001		I711ZAOWS	
	SampleID	711GP001M2		711ZAOWSM1	
	DateCollected	6/17/2002		6/6/2002	
	DateExtracted	6/24/2002		6/11/2002	
	DateAnalyzed	6/24/2002		6/11/2002	
	SDGNumber	62386		61677	
Parameter	**Units**				
Dibromochloromethane	ug/L	5	U	5	U
Chlorobenzene	ug/L	5	U	5	U
Ethylbenzene	ug/L	5	U	5	U
m+p Xylene	ug/L	5	U	5	U
o-Xylene	ug/L	5	U	5	U
Xylenes, Total	ug/L	5	U	5	U
Styrene	ug/L	5	U	5	U
Bromoform	ug/L	5	U	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U	5	U
1,3-Dichlorobenzene	ug/L	5	U	5	U
1,4-Dichlorobenzene	ug/L	5	U	5	U
1,2-Dichlorobenzene	ug/L	5	U	5	U
1,2,4-Trichlorobenzene	ug/L	5	U	5	U
1,2,3-Trichlorobenzene	ug/L	5	U	5	U

Data Validation Summary - Charleston Naval Complex - Zone I, AOCs 711, 715, and 718

TO: Louise Palmer/CH2M HILL/CLT

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

DATE: August 27, 2002

The purpose of this memorandum is to present the results of the data validation process for the samples collected in Zone I, AOCs 711, 715, and 718. The samples were collected between the dates of June 6, 2002 and July 9, 2002.

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

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 Environmental Protection Agency (EPA) *National Functional Guidelines for Inorganic Data Review (EPA 1994) and National Functional Guidelines for Organic Data Review (EPA 1999)*. Quality assurance/quality control (QA/QC) summary forms and data reports were reviewed.

Samples were submitted to General Engineering Laboratories, Inc., in Charleston, South Carolina, for the following analyses: SW-846 8260 Volatile Organic Compounds (VOC), SW-846 8270 Semivolatile Organic Compounds (SVOC), SW-846 8081 Organochlorine Pesticides, SW-846 8082 Polychlorinated Biphenyls, and Metals following SW-846 6010/7000 Series methodology.

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

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

The following primary flags were used to qualify the data:

[=] Detected. The analyte was analyzed for and detected at the concentration shown.

[J] Estimated. The analyte was present but the reported value may not be accurate or precise.

[U] Undetected. The analyte was analyzed for but not detected above the method detection limit.

[UJ] Detection limit estimated. The analyte was analyzed for but qualified as not detected; the result is estimated.

[R] Rejected. The data is not useable.

Secondary Data Validation Qualifiers

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

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

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	Start Depth	End Depth	Depth Units	Date Collected	SW-846	SW-846	SW-846	SW-846	SW-846	SW-846
61677	I711ZAOWS	711ZAOWSM1	61677001	WG	N				06/06/02	X	X	X	X	X	X
61677	LABQC	1200231998	1200231998	WQ	LB								X		
61677	LABQC	1200231999	1200231999	WQ	BS								X		
61677	LABQC	1200232065	1200232065	WQ	LB						X				
61677	LABQC	1200232066	1200232066	WQ	BS						X				
61677	LABQC	1200232113	1200232113	WQ	LB							X			
61677	LABQC	1200232114	1200232114	WQ	BS							X			
61677	LABQC	1200233384	1200233384	WQ	LB					X					
61677	LABQC	1200233385	1200233385	WQ	BS					X					
61677	LABQC	1200234222	1200234222	WQ	LB										X
61677	LABQC	1200234225	1200234225	WQ	BS										X
61677	LABQC	1200234652	1200234652	WQ	LB									X	
61677	LABQC	1200234656	1200234656	WQ	BS									X	
61678	I711VAOWS	711VAOWSM1	61678001	SO	N				06/06/02		X	X	X	X	X
61678	LABQC	1200232015	1200232015	SQ	LB								X		
61678	LABQC	1200232016	1200232016	SQ	BS								X		
61678	LABQC	1200232080	1200232080	SQ	LB						X				
61678	LABQC	1200232081	1200232081	SQ	BS						X				
61678	LABQC	1200232122	1200232122	SQ	LB							X			
61678	LABQC	1200232123	1200232123	SQ	BS							X			

SDG	Station ID	Sample ID	Extraction ID	Matrix	Sample Type	[illegible]	[illegible]	[illegible]	Date Collected	[illegible] SW846	SVOC SW8270C	[illegible] SW8081	PCBs SW8082	Metals SW6010B	Mercury SW7470A
61678	LABQC	1200234646	1200234646	SQ	LB									X	
61678	LABQC	1200234650	1200234650	SQ	BS									X	
61678	LABQC	1200242616	1200242616	SQ	LB										X
61678	LABQC	1200242619	1200242619	SQ	BS										X
61812	FIELDQC	718TB001M1	61812001	WQ	TB				06/10/02	X					
61812	LABQC	1200242596	1200242596	WQ	LB					X					
61812	LABQC	1200242598	1200242598	WQ	BS					X					
61813	I718SB001	718SB00102	61813001	SO	N		3	5	06/10/02	X	X	X	X	X	X
61813	I718SB001	718SB00102MS	1200239569	SO	MS		2	5	06/10/02					X	
61813	I718SB001	718SB00102SD	1200239570	SO	SD		2	5	06/10/02					X	
61813	I718SB001	718SB00102MS	1200242637	SO	MS		2	5	06/10/02						X
61813	I718SB001	718SB00102SD	1200242638	SO	SD		2	5	06/10/02						X
61813	I718SB002	718SB00202	61813002	SO	N		3	5	06/10/02	X	X	X	X	X	X
61813	I718SB002	718CB00202	61813003	SO	FD		3	5	06/10/02	X	X	X	X	X	X
61813	LABQC	1200233663	1200233663	SQ	LB								X		
61813	LABQC	1200233664	1200233664	SQ	BS								X		
61813	LABQC	1200234516	1200234516	SQ	LB						X				
61813	LABQC	1200234517	1200234517	SQ	BS						X				
61813	LABQC	1200234546	1200234546	SQ	LB							X			
61813	LABQC	1200234547	1200234547	SQ	BS							X			
61813	LABQC	1200239567	1200239567	SQ	LB									X	
61813	LABQC	1200239571	1200239571	SQ	BS									X	

Site	Station ID	Sample ID	Lab Sample ID	Matrix	Type	Qual	Depth	Depth	Sample Date	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61813	LABQC	1200242136	1200242136	SQ	LB					X					
61813	LABQC	1200242137	1200242137	SQ	BS					X					
61813	LABQC	1200242156	1200242156	SQ	BD					X					
61813	LABQC	1200242636	1200242636	SQ	LB										X
61813	LABQC	1200242639	1200242639	SQ	BS										X
61814	I715SB001	715SB00102	61814001	SO	N		3	5	06/10/02	X	X	X	X	X	X
61814	I715SB001	715CB00102	61814002	SO	FD		3	5	06/10/02	X	X	X	X	X	X
61814	I715SB002	715SB00202	61814003	SO	N		3	5	06/10/02	X	X	X	X	X	X
61814	I715SB003	715SB00302	61814004	SO	N		3	5	06/10/02	X	X	X	X	X	X
61814	I715SB003	715SB00302RE	61814004	SO	LR	RE	2	5	06/10/02				X		
61814	LABQC	1200233663	1200233663	SQ	LB								X		
61814	LABQC	1200233664	1200233664	SQ	BS								X		
61814	LABQC	1200234516	1200234516	SQ	LB						X				
61814	LABQC	1200234517	1200234517	SQ	BS						X				
61814	LABQC	1200234546	1200234546	SQ	LB							X			
61814	LABQC	1200234547	1200234547	SQ	BS							X			
61814	LABQC	1200239567	1200239567	SQ	LB									X	
61814	LABQC	1200239571	1200239571	SQ	BS									X	
61814	LABQC	1200242136	1200242136	SQ	LB					X					
61814	LABQC	1200242137	1200242137	SQ	BS					X					
61814	LABQC	1200242156	1200242156	SQ	BD					X					
61814	LABQC	1200242636	1200242636	SQ	LB										X

SDG	Station Id	Sample Id	Lab Sample Id	Matrix	Sample Type	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] SW846	SVOC SW8270C	[illegible] SW8015A	[illegible] SW8082	[illegible] SW6010B	[illegible] SW7471A
61814	LABQC	1200242639	1200242639	SQ	BS										X
61814	LABQC	1200253030	1200253030	SQ	LB								X		
61814	LABQC	1200253037	1200253037	SQ	BS								X		
61815	FIELDQC	715EB001M1	61815001	WQ	EB				06/10/02	X	X	X	X	X	X
61815	LABQC	1200233477	1200233477	WQ	LB								X		
61815	LABQC	1200233478	1200233478	WQ	BS								X		
61815	LABQC	1200233617	1200233617	WQ	LB							X			
61815	LABQC	1200233618	1200233618	WQ	BS							X			
61815	LABQC	1200234526	1200234526	WQ	LB						X				
61815	LABQC	1200234527	1200234527	WQ	BS						X				
61815	LABQC	1200238893	1200238893	WQ	LB										X
61815	LABQC	1200238896	1200238896	WQ	BS										X
61815	LABQC	1200239397	1200239397	WQ	LB									X	
61815	LABQC	1200239398	1200239398	WQ	BS									X	
61815	LABQC	1200242596	1200242596	WQ	LB					X					
61815	LABQC	1200242598	1200242598	WQ	BS					X					
62385	I715GP001	715GP001M2	62385001	WG	N				06/17/02	X	X	X	X		
62385	FIELDQC	715EP001M2	62385002	WQ	EB				06/17/02	X	X	X	X		
62385	LABQC	1200241350	1200241350	WQ	LB								X		
62385	LABQC	1200241351	1200241351	WQ	BS								X		
62385	LABQC	1200243012	1200243012	WQ	LB						X				
62385	LABQC	1200243013	1200243013	WQ	BS						X				

SDG	Station ID	Sample ID	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
62385	LABQC	1200243360	1200243360	WQ	LB							X			
62385	LABQC	1200243361	1200243361	WQ	BS							X			
62385	LABQC	1200244296	1200244296	WQ	LB					X					
62385	LABQC	1200244297	1200244297	WQ	BS					X					
62385	LABQC	1200252219	1200252219	WQ	LB					X					
62385	LABQC	1200252220	1200252220	WQ	BS					X					
62386	I711GP001	711GP001M2	62386001	WG	N				06/17/02	X	X	X	X		
62386	LABQC	1200241350	1200241350	WQ	LB								X		
62386	LABQC	1200241351	1200241351	WQ	BS								X		
62386	LABQC	1200243012	1200243012	WQ	LB						X				
62386	LABQC	1200243013	1200243013	WQ	BS						X				
62386	LABQC	1200250336	1200250336	WQ	LB							X			
62386	LABQC	1200250337	1200250337	WQ	BS							X			
62386	LABQC	1200250338	1200250338	WQ	BD							X			
62386	LABQC	1200252219	1200252219	WQ	LB					X					
62386	LABQC	1200252220	1200252220	WQ	BS					X					
63281	F711VAOWS	711VAOWSM3	63281001	SO	N				07/09/02	X					
63281	LABQC	1200261034	1200261034	SQ	LB					X					
63281	LABQC	1200261039	1200261039	SQ	BS					X					
63281	LABQC	1200261040	1200261040	SQ	BD					X					
63281	LABQC	1200262432	1200262432	SQ	LB					X					
63282	FIELDQC	712EB001M3**	63282001	WQ	EB				07/09/02	X					

SDG	Station ID	Sample ID	Lab Sample ID	Matrix	Sample Type	LR Type	Reason Code	Reanalysis Reason	Date Collected	Lab Received Date	SW8260B	SW8270C	SW8082	SW6010B	SW7471A
63282	FIELDQC	712TB001M3**	63282002	WQ	TB				07/09/02	X					
63282	LABQC	1200262476	1200262476	WQ	LB					X					
63282	LABQC	1200262479	1200262479	WQ	BS					X					

** These samples are not a part of the AOCs addressed in this report. They have been included in this table because they are field blanks associated with samples in this report.

MATRIX CODE

WG – Groundwater
WQ – Water QC Sample
SO – Soil
SQ – Soil QC Sample

SAMPLE TYPE CODE

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

LR TYPE CODE

RE - Reanalysis

ANALYSIS CODE

VOC - Volatile Organic Compounds
SVOC - Semivolatile Organic Compounds
PCBs – Polychlorinated Biphenyls

Organic Parameters

Quality Control Review

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

- **Holding Times** – The holding times are evaluated to verify that samples were extracted and analyzed within holding times.
- **Blank samples** – Method blanks, equipment blanks, and trip blanks were provided for this project. Blank samples enable the reviewer to determine if an analyte may be attributed to sampling or laboratory procedures, rather than environmental contamination from site activities.
- **Surrogate Recoveries** – Surrogate Compounds are added to each sample and the recoveries are used to monitor lab performance and possible matrix interference.
- **Lab Control Sample (LCS)** – This sample is a "controlled matrix", either laboratory reagent water or Ottawa sand, in which target compounds have been added prior to extraction/analysis. The recoveries serve as a monitor of the overall performance of each step during the analysis, including sample preparation.
- **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples** – Spike recovery is used to evaluate potential matrix interferences, as well as accuracy. Precision information is also determined by calculating the reproducibility between the recoveries of each spiked parameter.
- **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.
- **GC/MS Tuning** – The mass spectrum of the tuning compound is evaluated for method compliance. The criteria are established to verify the proper mass assignment and mass resolution.
- **Initial Calibration** – The initial calibration ensures that the instrument is capable of producing acceptable qualitative and quantitative data for the compounds of interest.
- **Continuing Calibration** – The continuing calibration checks satisfactory performance of the instrument and its predicted response to the target compounds.
- **Pesticide Degradation** – Degradation checks on the gas chromatograph with electron capture detector system are performed to ensure minimal instrument breakdown of target compounds. These criteria are not sample specific.
- **Confirmation** – If GCMS methodology is not initially used for analysis, SW-846 method 8000 requires confirmation when the composition of samples is not well characterized. Therefore, even when the identification has been confirmed on a dissimilar column or detector, the agreement of the quantitative results on both columns is evaluated. For Pesticide and PCB analyses covered in this report, confirmation was performed using a

dissimilar analytical column. The laboratory analyzed samples with a gas chromatograph (GC) utilizing simultaneous primary and confirmation data acquisition. Per SW-86 method 8000, 40% RPD criteria was used as the acceptance limit.

- **Internal Standards** – The internal standards (retention time and response) are evaluated for method compliance. The internal standards are used in quantitation of the target parameters and monitor the instrument sensitivity and response for stability during each analysis.

Volatile Organic Compounds (VOC) Analyses

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

There were selected samples that had to be recollected and reanalyzed for the analysis of the Volatile Organic Compounds. All of the samples were originally collected following proper procedures, and for each sample, both EnCore samplers and a glass container were submitted to the laboratory. The glass container was to be used for screening proposes. However, the aliquots for analysis were taken from the glass container instead of from the EnCore samplers. Therefore the decision was made to recollect and reanalyze the samples following all proper protocol. The results from the first analysis were supplied to the Project Team, but were qualified in the database with an "S" qualifier, to be used as screening data only. The text in this report discusses the results from the samples that were recollected and reanalyzed. The "screening data" is also included, but is not considered adequate for the decision-making process.

The original sample ID numbers and the IDs of the recollected samples are compared in Table 2 below.

TABLE 2
Screening Samples vs Recollected Samples Cross Reference: VOCs
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
61678001	711VAOWSM1	63281001	711VAOWSM3

Blanks

The VOC target parameters detected in blank samples are listed in Table 3.

TABLE 3
Blank Contamination: VOCs
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

61677	1200233384	1200233384	LB	1,4-Dichlorobenzene	0.36	µg/L	1.8 µg/L
61813	718TB001M1	61812001	TB	Toluene	1.6	µg/L	8.0 µg/L
61813	718TB001M1	61812001	TB	1,4-Dichlorobenzene	0.37	µg/L	1.9 µg/L
61814	1200242136	1200242136	LB	Tetrachloroethylene	0.87	µg/L	4.4 µg/L
61814	715EB001M1	61815001	EB	Toluene	1.3	µg/L	6.5 µg/L
61814	715EB001M1	61815001	EB	1,4-Dichlorobenzene	0.28	µg/L	1.4 µg/L
63281	1200261034	1200261034	LB	Toluene	43.7	µg/Kg	219 µg/Kg
63281	712EB001M3	63282001	EB	Toluene	0.46	µg/L	2.3 µg/Kg
63281	712EB001M3	63282001	EB	Acetone	2.8	µg/L	28.0 µg/Kg
63281	712TB001M3	63282002	TB	Toluene	0.5	µg/L	2.5 µg/Kg
63281	712TB001M3	63282002	TB	Acetone	2.4	µg/L	24.0 µg/Kg

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

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

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

Recoveries - Surrogate, MS/MSD and LCS/LCSD

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD), Laboratory Control Sample (LCS) and Laboratory Control Duplicate Sample (LCSD) recoveries were within acceptable quality control limits, except as noted in Table 4 below.

TABLE 4
Surrogate, MS/MSD, and LCS/LCSD Recoveries Out of QC Limits: VOC
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61813, 61814	1200242137 LCS/ 1200242156 LCSD	Vinyl acetate	56* / 55.2*	70-130	61813 – All; 61814 – All	Detects-J, non-detects-UJ
		1,2,4-Trichlorobenzene	134* / 132.8*	70-130	61813 – All; 61814 – All	Detects only - J
63281	1200261039 LCS/ 1200261040 LCSD	Vinyl acetate	68.8* / 68.8*	70-130	63281 – All	Detects-J, non-detects-UJ
* - out of control limits						

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 5.

TABLE 5
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: VOC
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
VOA1-CCAL-06/11/02, 0942	Vinyl acetate	42.7% low	61677001
	2-Chloroethyl vinyl ether	26.5% low RRF=0.040	
VOA8-CCAL-06/21/02, 0800	Trichloroethylene	22.5% high	61813 – All 61814 – All
	Tetrachloroethylene	20.8% high	
	1,2,4-Trichlorobenzene	26.7% high	
	1,2,3-Trichlorobenzene	25.0% high	
VOA8-CCAL-06/24/02, 1911	2-Chloroethyl vinyl ether	63.8% high	62385001; 62386001
	cis-1,2-Dichloropropene	24.5% high	
	1,2,3-Trichlorobenzene	20.2% high	
VOA1-ICAL-06/19/02, 2308	2-Chloroethyl vinyl ether	RRF=0.043	63281 – All

TABLE 5
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: VOC
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
VOA1-CCAL-07/12/02, 0816	Acetone	RRF=0.049	63281 - All
	Bromomethane	29.8% high	
	Vinyl acetate	31.3% low	
	2-Chloroethyl vinyl ether	RRF=0.040	

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

- When the Average Relative Response Factor (RRF) was low in the initial calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was low in the continuing calibration standards, detected compounds were flagged "J" and non-detected compounds were flagged "UJ", as estimated.
- When the percent difference (%D) was high in the continuing calibration standards, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.
- When the Relative Response Factor (RRF) was low in the continuing calibration, detected compounds were flagged "J", and non-detected compounds were flagged "UJ", as estimated.

Semivolatile Organic Compounds (SVOC) Analyses

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

Blanks

The SVOC target parameters detected in blank samples are listed in Table 6.

TABLE 6
Blank Contamination: SVOCs
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

62385	1200243012	1200243012	LB	bis(2-Ethylhexyl)phthalate	2.1	µg/L	21.0 µg/L
62386	1200243012	1200243012	LB	bis(2-Ethylhexyl)phthalate	2.1	µg/L	21.0 µg/L

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

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

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

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 7.

TABLE 7
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: SVOC
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

MSD5-CCAL-06/13/02, 1137	bis(2-Chloroethyl) ether	35.7% high	61677001
	1,2-Dichlorobenzene	20.6% high	
	Hexachlorocyclopentadiene	20.3% high	
	2,4-Dinitrophenol	36.7% high	
	2-Methyl-4,6-dinitrophenol	35.7% high	
	bis(2-Ethylhexyl)phthalate	24.0% high	
MSD2-ICAL-06/12/02, 0035	2-Nitrophenol	R^2 =0.985	61678001
	Naphthalene	R^2 =0.987	

TABLE 7
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: SVOC
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
MSD2-CCAL-06/14/02, 1832	m-Nitroaniline	25.0% low	61678001
MSD8-ICAL-06/14/02, 2247	Benzoic acid	R^2=0.987	61813 – All 61814 - All
	2,4-Dinitrophenol	R^2=0.984	
MSD8-CCAL-06/17/02, 1400	Benzyl alcohol	20.3% high	61813 – All 61814 - All
	4-Nitrophenol	21.3% high	
	bis(2-Ethylhexyl)phthalate	23.6% high	
	Benzo(g,h,I)perylene	20.2% high	
	o-Nitroaniline	25.1% high	
MSD8-CCAL-06/29/02, 0934	2,4-Dinitrophenol	26.1% high	62385 – All 62386 - All
	o-Nitroaniline	26.5% high	

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

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

Internal Standard Area

All internal standard areas were within QC limits except as noted below.

- Perylene-d12 in sample 61678001 had a 72.5% low recovery. Detects were qualified as "J" and non-detects were qualified "UJ".

Organochlorine Pesticide Analyses

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

Recoveries - Surrogate, MS/MSD and LCS

All Surrogate, Matrix Spike (MS), Matrix Spike Duplicate (MSD), and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 8 below.

TABLE 8
Surrogate, MS/MSD and LCS Recoveries Out of QC Limits: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61677	1200232114 LCS	Heptachlor	52*	56-136	61677001	Detects-J, non-detects-UJ
62385	62385001	4-cmx	58*	60-150	62385001	Detects-J, non-detects-UJ
		Decachlorobiphenyl	40* / 40*	60-150		
62386	62386001	4-cmx	58* / 75	60-150	62386001	Detects-J, non-detects-UJ
		Decachlorobiphenyl	45* / 46*	60-150		
* - out of control limits						

Field Duplicate Samples

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

- The Percent Difference for Chlordane (tech) and gamma-Chlordane in the Native/Field Duplicate sample 718SB00202 / 718CB00202 was 43.7 percent and 44.6 percent, respectively, with a 35 percent limit.

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 9.

TABLE 9
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
ECD7-ICAL-06/11/02, 2211	Methoxychlor	R^2 =0.985	61677001
ECD1A-CCAL-06/14/02, 2000	Toxaphene	52.5% high	61678001

TABLE 9
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
ECD1A-#1-CCAL-06/14/02, 2011	Chlordane (tech)	44.0% high	61678001
ECD1A-#2-CCAL-06/14/02, 2011	Chlordane (tech)	22.0% high	61678001
ECD1A-CCAL-06/20/02, 1753	Toxaphene	37.5% high	61678001
ECD1A-#1-CCAL-06/20/02, 2042	Endosulfan sulfate	16.0% low	61678001
	4,4'-DDT	18.5% low	
	Endrin ketone	16.0% low	
ECD1A-#2-CCAL-06/20/02, 2042	Endosulfan sulfate	22.5% low	61678001
ECD5A-#1-CCAL-06/22/02, 1716	Aldrin	16.0% low	61813 - All
	Heptachlor epoxide	18.0% low	
	Endosulfan I	16.7% low	
	4,4'-DDE	18.0% low	
	Endosulfan II	20.5% low	
	Endosulfan sulfate	17.5% low	
	4,4'-DDT	23.5% low	
ECD5A-#1-CCAL-06/22/02, 1716	gamma-Chlordane	18.5% low	61813 - All
	alpha-Chlordane	19.8% low	
ECD5A-#2-CCAL-06/22/02, 1716	delta-BHC	17.0% high	61813 - All
	Dieldrin	26.5% high	
	Endrin	63.0% high	
	4,4'-DDD	48.5% high	
	Methoxychlor	28.0% high	
	Endrin ketone	29.0% high	
	Endrin aldehyde	26.5% high	
ECD5A-#1-CCAL-06/22/02, 1929	4,4'-DDE	16.5% low	61813 – All 61814 - All
	4,4'-DDT	28.5% low	

TABLE 9
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
ECD5A-#1-CCAL-06/22/02, 1929	Methoxychlor	15.2% low	61813 – All 61814 - All
	alpha-Chlordane	15.9% low	
ECD5A-#2-CCAL-06/22/02, 1929	delta-BHC	20.0% high	61813 – All 61814 - All
	Dieldrin	30.5% high	
	Endrin	64.0% high	
	4,4'-DDD	60.0% high	
	4,4'-DDT	19.0% low	
	Methoxychlor	21.0% high	
	Endrin ketone	31.0% high	
	Endrin aldehyde	31.5% high	
ECD5A-#1-CCAL-06/22/02, 2143	Aldrin	15.6% low	61814 - All
	Endosulfan I	15.3% low	
	4,4'-DDE	17.5% low	
	Endosulfan II	21.5% low	
	4,4'-DDT	33.5% low	
	Methoxychlor	17.7% low	
	gamma-Chlordane	17.5% low	
ECD5A-#1-CCAL-06/22/02, 2143	alpha-Chlordane	18.4% low	61814 - All
ECD5A-#2-CCAL-06/22/02, 2143	delta-BHC	20.0% high	61814 - All
	gamma-BHC	16.0% high	
	Dieldrin	34.0% high	
	Endrin	71.0% high	
	4,4'-DDD	69.0% high	
	4,4'-DDT	18.0% low	
	Methoxychlor	22.0% high	
	Endrin ketone	32.5% high	
	Endrin aldehyde	33.0% high	

TABLE 9
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
ECD5A-#1-CCAL-06/27/02, 1626	alpha-BHC	17.0% high	62386001
	delta-BHC	31.0% high	
	gamma-BHC	23.0% high	
	Heptachlor	21.0% high	
	Heptachlor epoxide	19.0% high	
	Dieldrin	39.0% high	
	Endrin	74.0% high	
	Endosulfan II	17.5% high	
	4,4'-DDD	61.5% high	
	Endosulfan sulfate	15.5% high	
	Methoxychlor	44.0% high	
	Endrin ketone	46.5% high	
	Endrin aldehyde	39.0% high	
ECD5A-#1-CCAL-06/27/02, 1840	alpha-BHC	17.0% high	62386001
	delta-BHC	32.0% high	
	gamma-BHC	24.0% high	
	Heptachlor	21.0% high	
ECD5A-#1-CCAL-06/27/02, 1840	Heptachlor epoxide	20.0% high	62386001
	Dieldrin	41.0% high	
	Endosulfan I	12.0% high	
	Endrin	58.0% high	
	Endosulfan II	19.5% high	
	4,4'-DDD	58.0% high	
	Endosulfan sulfate	20.0% high	
	Methoxychlor	44.0% high	
	Endrin ketone	51.5% high	
	Endrin aldehyde	41.5% high	

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

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

Degradation

Pesticide degradation percent breakdown was within criteria, except as listed in Table 10 below.

TABLE 10
Pesticide Degradation Percent Breakdown Out of QC Limits: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

ECD5A-#1-06/22/02, 1742	4,4'-DDT	22.6*	15	61813 – All 61814 - All	4,4'-DDD 4,4'-DDE 4,4'-DDT	Detects-J, non-detects-UJ
ECD5A-#2-06/22/02, 1742	4,4'-DDT	21.1*	15	61813 – All 61814 - All	4,4'-DDD 4,4'-DDE 4,4'-DDT	Detects-J, non-detects-UJ
* - out of control limits						

Second Column Confirmation

The second column confirmation percent difference (%D) for some detected parameters, exceeded the 40 %D criteria. Those results were flagged "J", as estimated. The laboratory reported the lower of the two concentrations. The individual samples and specific compounds that were flagged are listed in Table 11 below.

TABLE 11
Second Column Confirmation out of Criteria: Pesticides
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718 Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
61678	711VAOWMS1	61678001	4,4'-DDE
61678	711VAOWMS1	61678001	4,4'-DDT
61813	718SB00102	61813001	gamma-Chlordane
61813	718SB00102	61813001	alpha-Chlordane
61813	718SB00202	61813002	gamma-Chlordane
61813	718SB00202	61813002	alpha-Chlordane
61813	718SB00202	61813002	Chlordane (tech)
61813	718CB00202	61813003	Heptachlor epoxide
61813	718CB00202	61813003	4,4'-DDE
61813	718CB00202	61813003	gamma-Chlordane
61813	718CB00202	61813003	Chlordane (tech)
61814	715SB00102	61814001	4,4'-DDE
61814	715SB00202	61814003	4,4'-DDT
61814	715SB00302	61814004	alpha-BHC
61814	715SB00302	61814004	beta-BHC
61814	715SB00302	61814004	delta-BHC
61814	715SB00302	61814004	4,4'-DDE
61814	715SB00302	61814004	4,4'-DDD
61814	715SB00302	61814004	gamma-Chlordane

Polychlorinated Biphenyls (PCBs) Analyses

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

Holding Times

All holding times were met except for samples 61814004RE (715SB00302RE). This sample was re-extracted 8 days beyond holding time. The original sample data was chosen as the better set of data. No flags were applied to 61814004RE for holding time.

Initial and Continuing Calibration Criteria

All initial calibration criteria and continuing calibration criteria were met, except as listed in Table 12.

TABLE 12
Exceptions to Initial Calibration Criteria and Continuing Calibration Criteria: PCBs
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]
ECD3A-#1-CCAL-06/11/02, 1516	Aroclor-1016	18.4% high	61677001

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

- When the percent difference (%D) was high in the continuing calibration standards, detected compounds were flagged "J", as estimated. Non-detected compounds were not flagged.

Inorganic Parameters

Quality Control Review

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

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

Metals Analyses

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

Blanks

The metals target parameters detected in blank samples are listed in Table 13.

TABLE 13
Blank Contamination: Metals
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61677	CCB		CCB	Barium	0.271	µg/L	1.355 µg/L
61677	CCB		CCB	Cadmium	0.376	µg/L	1.88 µg/L
61677	CCB		CCB	Beryllium	0.242	µg/L	1.21 µg/L
61677	CCB		CCB	Calcium	21.5	µg/L	107.5 µg/L
61677	CCB		CCB	Zinc	2.04	µg/L	10.2 µg/L
61677	CCB		CCB	Iron	3.9	µg/L	19.5 µg/L
61677	ICB		ICB	Barium	0.218	µg/L	1.09 µg/L
61677	ICB		ICB	Cadmium	0.328	µg/L	1.64 µg/L
61677	1200234652	1200234652	LB	Zinc	2.08	µg/L	10.4 µg/L
61677	1200234652	1200234652	LB	Iron	2.6	µg/L	13.0 µg/L
61678	ICB		ICB	Barium	0.218	µg/L	13.0 mg/Kg
61678	ICB		ICB	Cadmium	0.328	µg/L	13.0 mg/Kg
61678	CCB		CCB	Barium	0.512	µg/L	0.128 mg/Kg
61678	CCB		CCB	Cadmium	0.479	µg/L	0.120 mg/Kg
61678	CCB		CCB	Beryllium	0.25	µg/L	0.0625 mg/Kg
61678	CCB		CCB	Calcium	36.4	µg/L	9.1 mg/Kg
61678	CCB		CCB	Zinc	2.25	µg/L	0.5625 mg/Kg
61678	CCB		CCB	Iron	17.5	µg/L	4.375 mg/Kg
61678	CCB		CCB	Magnesium	20.6	µg/L	5.15 mg/Kg
61678	CCB		CCB	Manganese	0.569	µg/L	0.14225 mg/Kg
61678	CCB		CCB	Cobalt	0.854	µg/L	0.2135 mg/Kg

TABLE 13
Blank Contamination: Metals
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61678	CCB		CCB	Aluminum	16.6	µg/L	4.15 mg/Kg
61678	CCB		CCB	Chromium	0.768	µg/L	0.192 mg/Kg
61678	CCB		CCB	Sodium	92.3	µg/L	23.075 mg/Kg
61678	CCB		CCB	Vanadium	0.838	µg/L	0.2095 mg/Kg
61678	CCB		CCB	Selenium	3.05	µg/L	0.7625 mg/Kg
61678	1200234646	1200234646	LB	Barium	0.025	mg/Kg	0.125 mg/Kg
61678	1200234646	1200234646	LB	Cadmium	0.025	mg/Kg	0.125 mg/Kg
61678	1200234646	1200234646	LB	Calcium	1.69	mg/Kg	8.45 mg/Kg
61678	1200234646	1200234646	LB	Zinc	0.208	mg/Kg	1.04 mg/Kg
61678	1200234646	1200234646	LB	Iron	0.833	mg/Kg	4.165 mg/Kg
61678	1200234646	1200234646	LB	Chromium	0.087	mg/Kg	0.435 mg/Kg
61678	1200234646	1200234646	LB	Sodium	8.19	mg/Kg	40.95 mg/Kg
61813	CCB		CCB	Barium	0.241	µg/L	0.06025 mg/Kg
61813	CCB		CCB	Iron	24.5	µg/L	6.125 mg/Kg
61813	CCB		CCB	Nickel	1.97	µg/L	0.4925 mg/Kg
61813	CCB		CCB	Beryllium	0.267	µg/L	0.06675 mg/Kg
61813	CCB		CCB	Calcium	18.3	µg/L	4.575 mg/Kg
61813	CCB		CCB	Cadmium	0.447	µg/L	0.11175 mg/Kg
61813	CCB		CCB	Thallium	31.4	µg/L	07.85 mg/Kg
61813	CCB		CCB	Aluminum	39.3	µg/L	9.825 mg/Kg
61813	CCB		CCB	Magnesium	46.3	µg/L	11.575 mg/Kg
61813	CCB		CCB	Copper	1.4	µg/L	0.35 mg/Kg
61813	CCB		CCB	Manganese	0.531	µg/L	0.13275 mg/Kg
61813	1200239567	1200239567	LB	Iron	0.364	mg/Kg	1.82 mg/Kg
61813	1200239567	1200239567	LB	Lead	0.128	mg/Kg	0.64 mg/Kg
61814	CCB		CCB	Barium	0.241	µg/L	0.06025 mg/Kg
61814	CCB		CCB	Iron	24.5	µg/L	6.125 mg/Kg

TABLE 13
Blank Contamination: Metals
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61814	CCB		CCB	Nickel	1.97	µg/L	0.4925 mg/Kg
61814	CCB		CCB	Beryllium	0.267	µg/L	0.06675 mg/Kg
61814	CCB		CCB	Calcium	18.3	µg/L	4.575 mg/Kg
61814	CCB		CCB	Cadmium	0.447	µg/L	0.11175 mg/Kg
61814	CCB		CCB	Thallium	31.4	µg/L	07.85 mg/Kg
61814	CCB		CCB	Aluminum	39.3	µg/L	9.825 mg/Kg
61814	CCB		CCB	Magnesium	46.3	µg/L	11.575 mg/Kg
61814	CCB		CCB	Copper	1.4	µg/L	0.35 mg/Kg
61814	CCB		CCB	Manganese	0.531	µg/L	0.13275 mg/Kg
61814	1200239567	1200239567	LB	Iron	0.364	mg/Kg	1.82 mg/Kg
61814	1200239567	1200239567	LB	Lead	0.128	mg/Kg	0.64 mg/Kg
61814	715EB001M1	61815001	EB	Aluminum	35.3	µg/L	8.825 mg/Kg
61814	715EB001M1	61815001	EB	Barium	12.4	µg/L	3.1 mg/Kg
61814	715EB001M1	61815001	EB	Calcium	17000	µg/L	4250 mg/Kg
61814	715EB001M1	61815001	EB	Iron	18.9	µg/L	6.125 mg/Kg
61814	715EB001M1	61815001	EB	Magnesium	2250	µg/L	562.5 mg/Kg
61814	715EB001M1	61815001	EB	Manganese	1.69	µg/L	0.4225 mg/Kg
61814	715EB001M1	61815001	EB	Nickel	8.96	µg/L	2.24 mg/Kg
61814	715EB001M1	61815001	EB	Potassium	24.70	µg/L	617.5 mg/Kg
61814	715EB001M1	61815001	EB	Sodium	22000	µg/L	5500 mg/Kg
61814	715EB001M1	61815001	EB	Vanadium	1.07	µg/L	0.2675 mg/Kg
61814	715EB001M1	61815001	EB	Zinc	2.46	µg/L	0.615 mg/Kg

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

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

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

Recoveries - MS/MSD and LCS

All Matrix Spike (MS), Matrix Spike Duplicate (MSD), and Laboratory Control Sample (LCS) recoveries were within acceptable quality control limits, except as noted in Table 14 below.

TABLE 14
MS/MSD, and LCS Recoveries and RPDs Out of QC Limits: Metals
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

61677	716VAOS1M1 MS/MSD	Antimony	71.8* / 62.5*	80-120			61677001	Detects-J, non-detects-UJ
		Potassium	68.5* / 38.2*	80-120				
		Selenium	85.7 / 72.9*	80-120				
		Barium	193.4* / 136.2*	80-120			61677001	Detects only - J
		Nickel	198.8* / 178.3*	80-120				
		Chromium	89.6 / 125.3*	80-120				
		Mercury	143.8* / 128.3*	80-120				
61813	718SB00102 MS/MSD	Antimony	66.3* / 68.4*	80-120			61813 – All 61814 - All	Detects-J, non-detects-UJ
		Zinc	749.1* / 74.0*	80-120	139.2*	35		
		Chromium	91.6 / 67.4*	80-120				
		Manganese	89.1 / 70.8*	80-120				
		Nickel	84.2 / 70.1*	80-120				
		Potassium	93.7 / 61.1*	80-120				
		Lead	132.4* / 91.8	80-120			61813 – All 61814 - All	Detects only - J
		Sodium	122.5* / 100	80-120				
		Mercury	137.5* / 137.7*	80-120				

- out of control limits

Field Duplicate Samples

All Field Duplicate Samples were within acceptable quality control limits, except as noted in Table 15 below. No flags are applied due to Field Duplicate precision.

TABLE 15
Field Duplicate RPDs Out of QC Limits: Metals
Charleston Naval Complex, Zone I, AOCs 711, 715, and 718, Charleston, SC

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
61813	718SB00202/ 718CB00202	Arsenic	3.960 mg/Kg	2.640 mg/Kg	40.0*	35
		Calcium	72800 mg/Kg	47500 mg/Kg	42.1*	35
		Copper	11.1 mg/Kg	7.6 mg/Kg	37.4*	35
		Lead	19.8 mg/Kg	12.2 mg/Kg	47.5*	35
* - out of control limits						

ICP Serial Dilution

All Serial Dilution recoveries were within acceptable quality control limits, except as noted below.

- The serial dilution on sample 718SB00102 in SDG 61813 had a 10.6 percent difference for Iron with a limit of 10 percent. All samples in SDG's 61813 and 61814 were associated with this serial dilution. All positive results were qualified "J" and all non-detects were qualified "UJ".

Rejected Data

All of the rejected data listed in Attachment 1 were associated with re-runs and dilutions (you can only have a single valid result per parameter per sample). No other data was rejected such that there is not a valid result for that parameter in each sample.

Conclusion

A review of the analytical data submitted regarding the investigation of Zone I, AOCs 711, 715, and 718 at the Charleston Naval Complex, Charleston, South Carolina by CH2M HILL has been completed. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures have been adequately completed, and that the analytical results should be considered usable as qualified.

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

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 711, 715, 718 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	ANTIMONY	4.79	U	4.79	UJ	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	BARIUM	22.1	B	22.1	J	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	CHROMIUM, TOTAL	4.43	B	4.43	J	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	COPPER	7.85	B	7.85	J	ug/L	IB
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	MAGNESIUM	1450	B	1450	J	ug/L	IB
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	NICKEL	1.25	B	1.25	J	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	POTASSIUM	1960	B	1960	J	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	SELENIUM	2.67	U	2.67	UJ	ug/L	MS
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	SODIUM	4260	B	4260	J	ug/L	IB
61677	711ZAOWSM1	61677001	WG	METAL	SW6010B	VANADIUM	3.02	B	3.02	J	ug/L	IB
61677	711ZAOWSM1	61677001	WG	PEST	SW8081A	HEPTACHLOR	0.039	U	0.039	UJ	ug/L	BS
61677	711ZAOWSM1	61677001	WG	PEST	SW8081A	METHOXYCHLOR	0.37	U	0.37	UJ	ug/L	IC
61677	711ZAOWSM1	61677001	WG	SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	1.9	J	1.9	J	ug/L	CC
61677	711ZAOWSM1	61677001	WG	VOA	SW8260B	2-Chloroethyl vinyl ether	5	U	5	UJ	ug/L	CC
61677	711ZAOWSM1	61677001	WG	VOA	SW8260B	Vinyl acetate	10	U	10	UJ	ug/L	CC
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	BARIUM	27	BN	27	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	BERYLLIUM	0.191	B	0.191	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	CADMIUM	0.856	B	0.856	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	COBALT	4.98	B	4.98	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	MAGNESIUM	932	BN*	932	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW7471A	MERCURY	0.01	BN	0.01	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	NICKEL	7.26	BN	7.26	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	POTASSIUM	378	BN	378	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	METAL	SW6010B	SODIUM	448	B	448	J	mg/kg	IB
61678	711VAOWSM1	61678001	SO	PEST	SW8081A	ENDOSULFAN SULFATE	1.6	JP	1.6	J	ug/kg	CC
61678	711VAOWSM1	61678001	SO	PEST	SW8081A	p,p'-DDE	2.6	JP	2.6	J	ug/kg	2C
61678	711VAOWSM1	61678001	SO	PEST	SW8081A	p,p'-DDT	17.2	JP	17.2	J	ug/kg	CC, 2C
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	2-NITROPHENOL	473	U	473	UJ	ug/kg	IC
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	3-NITROANILINE	2290	U	2290	U	ug/kg	CC
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	BENZO(a)PYRENE	173	J	173	J	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	BENZO(b)FLUORANTHENE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	BENZO(g,h,i)PERYLENE	473	U	473	UJ	ug/kg	IS

SDG	Sample ID	Lab Sample ID	Matrix	Analytical Group	Analytical Method	Analyte	Result	Qual	Final Result	Final Qual	Units	Validation Level
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	BENZO(k)FLUORANTHENE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	CARBAZOLE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	DIBENZ(a,h)ANTHRACENE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	DI-n-OCTYLPHTHALATE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	INDENO(1,2,3-c,d)PYRENE	473	U	473	UJ	ug/kg	IS
61678	711VAOWSM1	61678001	SO	SVOA	SW8270C	NAPHTHALENE	473	U	473	UJ	ug/kg	IC
61813	718CB00202	61813003	SO	METAL	SW6010B	ANTIMONY	0.48	UN	0.48	UJ	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	ANTIMONY	0.541	UN	0.541	UJ	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	ANTIMONY	0.513	UN	0.513	UJ	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	BARIUM	10.8	B	10.8	J	mg/kg	IB
61813	718SB00102	61813001	SO	METAL	SW6010B	BARIUM	14	B	14	J	mg/kg	IB
61813	718SB00202	61813002	SO	METAL	SW6010B	BARIUM	15	B	15	J	mg/kg	IB
61813	718CB00202	61813003	SO	METAL	SW6010B	BERYLLIUM	0.179	B	0.179	J	mg/kg	IB
61813	718SB00102	61813001	SO	METAL	SW6010B	BERYLLIUM	0.28	B	0.28	J	mg/kg	IB
61813	718SB00202	61813002	SO	METAL	SW6010B	BERYLLIUM	0.241	B	0.241	J	mg/kg	IB
61813	718CB00202	61813003	SO	METAL	SW6010B	CADMIUM	0.25	B	0.25	J	mg/kg	IB
61813	718SB00102	61813001	SO	METAL	SW6010B	CADMIUM	0.286	B	0.286	J	mg/kg	IB
61813	718SB00202	61813002	SO	METAL	SW6010B	CADMIUM	0.342	B	0.342	J	mg/kg	IB
61813	718CB00202	61813003	SO	METAL	SW6010B	CHROMIUM, TOTAL	23.5	N	23.5	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	CHROMIUM, TOTAL	33.7	N	33.7	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	CHROMIUM, TOTAL	23.8	N	23.8	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	COBALT	0.658	B	0.658	J	mg/kg	IB
61813	718SB00102	61813001	SO	METAL	SW6010B	COBALT	0.92	B	0.92	J	mg/kg	IB
61813	718SB00202	61813002	SO	METAL	SW6010B	COBALT	0.896	B	0.896	J	mg/kg	IB
61813	718CB00202	61813003	SO	METAL	SW6010B	IRON	3290	E	3290	J	mg/kg	SD
61813	718SB00102	61813001	SO	METAL	SW6010B	IRON	5220	E	5220	J	mg/kg	SD
61813	718SB00202	61813002	SO	METAL	SW6010B	IRON	4450	E	4450	J	mg/kg	SD
61813	718CB00202	61813003	SO	METAL	SW6010B	LEAD	12.2	N*	12.2	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	LEAD	6.76	N*	6.76	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	LEAD	19.8	N*	19.8	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	MANGANESE	39.8	N	39.8	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	MANGANESE	74.4	N	74.4	J	mg/kg	MS

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 711, 715, 718 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
61813	718SB00202	61813002	SO	METAL	SW6010B	MANGANESE	55.9	N	55.9	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW7471A	MERCURY	0.011	BN	0.011	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW7471A	MERCURY	0.011	BN	0.011	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW7471A	MERCURY	0.01	BN	0.01	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	NICKEL	7.63	BN	7.63	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	NICKEL	14.8	N	14.8	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	NICKEL	11.2	N	11.2	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	POTASSIUM	372	BN	372	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	POTASSIUM	683	BN	683	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	POTASSIUM	518	BN	518	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	SELENIUM	0.376	B	0.376	J	mg/kg	IB
61813	718SB00202	61813002	SO	METAL	SW6010B	SELENIUM	0.417	B	0.417	J	mg/kg	IB
61813	718CB00202	61813003	SO	METAL	SW6010B	SODIUM	211	B	211	J	mg/kg	MS
61813	718SB00102	61813001	SO	METAL	SW6010B	SODIUM	391	B	391	J	mg/kg	MS
61813	718SB00202	61813002	SO	METAL	SW6010B	SODIUM	340	B	340	J	mg/kg	MS
61813	718CB00202	61813003	SO	METAL	SW6010B	THALLIUM	1.1	B	1.1	U	mg/kg	BL
61813	718SB00102	61813001	SO	METAL	SW6010B	THALLIUM	2.22	B	2.22	U	mg/kg	BL
61813	718SB00202	61813002	SO	METAL	SW6010B	THALLIUM	1.91	B	1.91	U	mg/kg	BL
61813	718CB00202	61813003	SO	METAL	SW6010B	ZINC	30.2	N*	30.2	J	mg/kg	MS,MD
61813	718SB00102	61813001	SO	METAL	SW6010B	ZINC	30.5	N*	30.5	J	mg/kg	MS, MD
61813	718SB00202	61813002	SO	METAL	SW6010B	ZINC	43.1	N*	43.1	J	mg/kg	MS,MD
61813	718CB00202	61813003	SO	PEST	SW8081A	ALDRIN	14.2	U	14.2	UJ	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	ALDRIN	7.5	U	7.5	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	ALDRIN	14.2	U	14.2	UJ	ug/kg	CC
61813	718CB00202	61813003	SO	PEST	SW8081A	ALPHA-CHLORDANE	7.1	JP	7.1	J	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	ALPHA-CHLORDANE	1.1	JP	1.1	J	ug/kg	CC,2C
61813	718SB00202	61813002	SO	PEST	SW8081A	ALPHA-CHLORDANE	3.1	JP	3.1	J	ug/kg	CC,2C
61813	718CB00202	61813003	SO	PEST	SW8081A	Chlordane	212	P	212	J	ug/kg	2C
61813	718SB00202	61813002	SO	PEST	SW8081A	Chlordane	136	JP	136	J	ug/kg	2C
61813	718CB00202	61813003	SO	PEST	SW8081A	ENDOSULFAN I	14.2	U	14.2	UJ	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	ENDOSULFAN I	7.5	U	7.5	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	ENDOSULFAN I	14.2	U	14.2	UJ	ug/kg	CC

SDG	Sample ID	Base Sample ID	Matrix	Parameter Group	Analytical Method	Analyte	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reason Code
61813	718CB00202	61813003	SO	PEST	SW8081A	ENDOSULFAN II	27.3	U	27.3	UJ	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	ENDOSULFAN II	14.4	U	14.4	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	ENDOSULFAN II	27.3	U	27.3	UJ	ug/kg	CC
61813	718CB00202	61813003	SO	PEST	SW8081A	ENDOSULFAN SULFATE	27.3	U	27.3	UJ	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	ENDOSULFAN SULFATE	14.4	U	14.4	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	ENDOSULFAN SULFATE	27.3	U	27.3	UJ	ug/kg	CC
61813	718CB00202	61813003	SO	PEST	SW8081A	GAMMA-CHLORDANE	21.4	P	21.4	J	ug/kg	CC,2C
61813	718SB00102	61813001	SO	PEST	SW8081A	GAMMA-CHLORDANE	4.9	JP	4.9	J	ug/kg	CC,2C
61813	718SB00202	61813002	SO	PEST	SW8081A	GAMMA-CHLORDANE	13.6	JP	13.6	J	ug/kg	CC,2C
61813	718CB00202	61813003	SO	PEST	SW8081A	HEPTACHLOR EPOXIDE	13.8	JP	13.8	J	ug/kg	CC,2C
61813	718SB00102	61813001	SO	PEST	SW8081A	HEPTACHLOR EPOXIDE	7.5	U	7.5	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	HEPTACHLOR EPOXIDE	4	J	4	J	ug/kg	CC
61813	718CB00202	61813003	SO	PEST	SW8081A	METHOXYCHLOR	142	U	142	UJ	ug/kg	CC
61813	718SB00102	61813001	SO	PEST	SW8081A	METHOXYCHLOR	74.7	U	74.7	UJ	ug/kg	CC
61813	718SB00202	61813002	SO	PEST	SW8081A	METHOXYCHLOR	142	U	142	UJ	ug/kg	CC
61813	718CB00202	61813003	SO	PEST	SW8081A	p,p'-DDD	27.3	U	27.3	UJ	ug/kg	PD
61813	718SB00102	61813001	SO	PEST	SW8081A	p,p'-DDD	3.2	J	3.2	J	ug/kg	PD
61813	718SB00202	61813002	SO	PEST	SW8081A	p,p'-DDD	27.3	U	27.3	UJ	ug/kg	PD
61813	718CB00202	61813003	SO	PEST	SW8081A	p,p'-DDE	5.2	JP	5.2	J	ug/kg	CC,2C,PD
61813	718SB00102	61813001	SO	PEST	SW8081A	p,p'-DDE	4.3	J	4.3	J	ug/kg	CC,PD
61813	718SB00202	61813002	SO	PEST	SW8081A	p,p'-DDE	27.3	U	27.3	UJ	ug/kg	CC,PD
61813	718CB00202	61813003	SO	PEST	SW8081A	p,p'-DDT	27.3	U	27.3	UJ	ug/kg	CC,PD
61813	718SB00102	61813001	SO	PEST	SW8081A	p,p'-DDT	14.4	U	14.4	UJ	ug/kg	CC,PD
61813	718SB00202	61813002	SO	PEST	SW8081A	p,p'-DDT	27.3	U	27.3	UJ	ug/kg	CC,PD
61813	718CB00202	61813003	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1750	U	1750	UJ	ug/kg	IC
61813	718SB00102	61813001	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1840	U	1840	UJ	ug/kg	IC
61813	718SB00202	61813002	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1750	U	1750	UJ	ug/kg	IC
61813	718CB00202	61813003	SO	SVOA	SW8270C	BENZO(g,h,i)PERYLENE	35	J	35	J	ug/kg	CC
61813	718CB00202	61813003	SO	SVOA	SW8270C	Benzoic acid	1750	U	1750	UJ	ug/kg	IC
61813	718SB00102	61813001	SO	SVOA	SW8270C	Benzoic acid	1840	U	1840	UJ	ug/kg	IC
61813	718SB00202	61813002	SO	SVOA	SW8270C	Benzoic acid	1750	U	1750	UJ	ug/kg	IC
61813	718CB00202	61813003	SO	SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	42	J	42	J	ug/kg	CC

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 711, 715, 718 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
61813	718SB00202	61813002	SO	SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	264	J	264	J	ug/kg	CC
61813	718CB00202	61813003	SO	VOA	SW8260B	TOLUENE	1.6	J	4.5	U	ug/kg	BL
61813	718SB00102	61813001	SO	VOA	SW8260B	TOLUENE	2.4	J	5.1	U	ug/kg	BL
61813	718SB00202	61813002	SO	VOA	SW8260B	TOLUENE	2.6	J	4.8	U	ug/kg	BL
61813	718CB00202	61813003	SO	VOA	SW8260B	Vinyl acetate	8.9	U	8.9	UJ	ug/kg	BS
61813	718SB00102	61813001	SO	VOA	SW8260B	Vinyl acetate	10.3	U	10.3	UJ	ug/kg	BS
61813	718SB00202	61813002	SO	VOA	SW8260B	Vinyl acetate	9.6	U	9.6	UJ	ug/kg	BS
61814	715CB00102	61814002	SO	METAL	SW6010B	ANTIMONY	0.516	UN	0.516	UJ	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW6010B	ANTIMONY	0.507	UN	0.507	UJ	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW6010B	ANTIMONY	0.502	UN	0.502	UJ	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW6010B	ANTIMONY	0.521	UN	0.521	UJ	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW6010B	BARIUM	20.4	B	20.4	J	mg/kg	IB
61814	715SB00102	61814001	SO	METAL	SW6010B	BARIUM	20.1	B	20.1	J	mg/kg	IB
61814	715SB00202	61814003	SO	METAL	SW6010B	BARIUM	16.8	B	16.8	J	mg/kg	IB
61814	715SB00302	61814004	SO	METAL	SW6010B	BARIUM	20.6	B	20.6	J	mg/kg	IB
61814	715CB00102	61814002	SO	METAL	SW6010B	BERYLLIUM	0.107	B	0.107	J	mg/kg	IB
61814	715SB00102	61814001	SO	METAL	SW6010B	BERYLLIUM	0.108	B	0.108	J	mg/kg	IB
61814	715SB00202	61814003	SO	METAL	SW6010B	BERYLLIUM	0.103	B	0.103	J	mg/kg	IB
61814	715SB00302	61814004	SO	METAL	SW6010B	BERYLLIUM	0.137	B	0.137	J	mg/kg	IB
61814	715CB00102	61814002	SO	METAL	SW6010B	CADMIUM	0.028	B	0.028	U	mg/kg	BL
61814	715SB00102	61814001	SO	METAL	SW6010B	CADMIUM	0.045	B	0.045	U	mg/kg	BL
61814	715SB00302	61814004	SO	METAL	SW6010B	CADMIUM	0.095	B	0.095	U	mg/kg	BL
61814	715CB00102	61814002	SO	METAL	SW6010B	CALCIUM	538	B	538	U	mg/kg	BL
61814	715SB00102	61814001	SO	METAL	SW6010B	CALCIUM	552	B	552	U	mg/kg	BL
61814	715SB00202	61814003	SO	METAL	SW6010B	CALCIUM	542	B	542	U	mg/kg	BL
61814	715SB00302	61814004	SO	METAL	SW6010B	CALCIUM	888	B	888	U	mg/kg	BL
61814	715CB00102	61814002	SO	METAL	SW6010B	CHROMIUM, TOTAL	12.3	N	12.3	J	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW6010B	CHROMIUM, TOTAL	11.8	N	11.8	J	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW6010B	CHROMIUM, TOTAL	11.3	N	11.3	J	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW6010B	CHROMIUM, TOTAL	17.7	N	17.7	J	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW6010B	COBALT	0.834	B	0.834	J	mg/kg	IB
61814	715SB00102	61814001	SO	METAL	SW6010B	COBALT	0.79	B	0.79	J	mg/kg	IB

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Test	Analytical Method	Analyte	Old Result	Old Qual	New Result	New Qual	Units	Reason
61814	715SB00202	61814003	SO	METAL	SW6010B	COBALT	0.705	B	0.705	J	mg/kg	IB
61814	715SB00302	61814004	SO	METAL	SW6010B	COBALT	0.856	B	0.856	J	mg/kg	IB
61814	715CB00102	61814002	SO	METAL	SW6010B	COPPER	2.26	B	2.26	J	mg/kg	IB
61814	715SB00102	61814001	SO	METAL	SW6010B	COPPER	1.74	B	1.74	J	mg/kg	IB
61814	715SB00202	61814003	SO	METAL	SW6010B	COPPER	2.39	B	2.39	J	mg/kg	IB
61814	715CB00102	61814002	SO	METAL	SW6010B	IRON	6300	E	6300	J	mg/kg	SD
61814	715SB00102	61814001	SO	METAL	SW6010B	IRON	6580	E	6580	J	mg/kg	SD
61814	715SB00202	61814003	SO	METAL	SW6010B	IRON	6630	E	6630	J	mg/kg	SD
61814	715SB00302	61814004	SO	METAL	SW6010B	IRON	8760	E	8760	J	mg/kg	SD
61814	715CB00102	61814002	SO	METAL	SW6010B	LEAD	6.13	N*	6.13	J	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW6010B	LEAD	5.97	N*	5.97	J	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW6010B	LEAD	5.39	N*	5.39	J	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW6010B	LEAD	14.4	N*	14.4	J	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW6010B	MAGNESIUM	408	B	408	U	mg/kg	BL
61814	715SB00102	61814001	SO	METAL	SW6010B	MAGNESIUM	397	B	397	U	mg/kg	BL
61814	715SB00202	61814003	SO	METAL	SW6010B	MAGNESIUM	370	B	370	U	mg/kg	BL
61814	715SB00302	61814004	SO	METAL	SW6010B	MAGNESIUM	436	B	436	U	mg/kg	BL
61814	715CB00102	61814002	SO	METAL	SW6010B	MANGANESE	10.8	N	10.8	J	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW6010B	MANGANESE	10.1	N	10.1	J	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW6010B	MANGANESE	9.39	N	9.39	J	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW6010B	MANGANESE	11.7	N	11.7	J	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW7471A	MERCURY	0.008	BN	0.008	J	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW7471A	MERCURY	0.007	BN	0.007	J	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW7471A	MERCURY	0.011	BN	0.011	J	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW7471A	MERCURY	0.072	BN	0.072	J	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW6010B	NICKEL	4.01	BN	4.01	J	mg/kg	MS
61814	715SB00102	61814001	SO	METAL	SW6010B	NICKEL	3.8	BN	3.8	J	mg/kg	MS
61814	715SB00202	61814003	SO	METAL	SW6010B	NICKEL	3.5	BN	3.5	J	mg/kg	MS
61814	715SB00302	61814004	SO	METAL	SW6010B	NICKEL	5.17	BN	5.17	J	mg/kg	MS
61814	715CB00102	61814002	SO	METAL	SW6010B	POTASSIUM	247	BN	247	UJ	mg/kg	BL,MS
61814	715SB00102	61814001	SO	METAL	SW6010B	POTASSIUM	244	BN	244	UJ	mg/kg	BL,MS
61814	715SB00202	61814003	SO	METAL	SW6010B	POTASSIUM	225	BN	225	UJ	mg/kg	BL,MS

Attachment 1 - Changed Qualifiers and Results
Zone I, AOC 711, 715, 718 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
61814	715SB00302	61814004	SO	METAL	SW6010B	POTASSIUM	294	BN	294	UJ	mg/kg	BL,MS
61814	715SB00302	61814004	SO	METAL	SW6010B	SELENIUM	0.413	B	0.413	J	mg/kg	IB
61814	715CB00102	61814002	SO	METAL	SW6010B	SODIUM	27.2	B	27.2	U	mg/kg	BL
61814	715SB00102	61814001	SO	METAL	SW6010B	SODIUM	26.5	B	26.5	U	mg/kg	BL
61814	715SB00202	61814003	SO	METAL	SW6010B	SODIUM	23.3	B	23.3	U	mg/kg	BL
61814	715SB00302	61814004	SO	METAL	SW6010B	SODIUM	26.9	B	26.9	U	mg/kg	BL
61814	715CB00102	61814002	SO	METAL	SW6010B	ZINC	9	N*	9	J	mg/kg	MS,MD
61814	715SB00102	61814001	SO	METAL	SW6010B	ZINC	8.51	N*	8.51	J	mg/kg	MS,MD
61814	715SB00202	61814003	SO	METAL	SW6010B	ZINC	8	N*	8	J	mg/kg	MS,MD
61814	715SB00302	61814004	SO	METAL	SW6010B	ZINC	25.5	N*	25.5	J	mg/kg	MS,MD
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1016 (AROCHLOR 1016)	35.9	U	35.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1221 (AROCHLOR 1221)	35.9	U	35.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1232 (AROCHLOR 1232)	35.9	U	35.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1242 (AROCHLOR 1242)	35.9	U	35.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1248 (AROCHLOR 1248)	35.9	U	35.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1254 (AROCHLOR 1254)	72.9	U	72.9	R	ug/kg	RE
61814	715SB00302RE	61814004	SO	PCB	SW8082	PCB-1260 (AROCHLOR 1260)	5.7	J	5.7	R	ug/kg	RE
61814	715CB00102	61814002	SO	PEST	SW8081A	ALDRIN	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	ALDRIN	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	ALDRIN	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	ALDRIN	1.4	U	1.4	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	ALPHA BHC	0.55	JP	0.55	J	ug/kg	2C
61814	715CB00102	61814002	SO	PEST	SW8081A	ALPHA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	ALPHA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	ALPHA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	ALPHA-CHLORDANE	3.7	P	3.7	J	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	BETA BHC	1	JP	1	J	ug/kg	2C
61814	715SB00302	61814004	SO	PEST	SW8081A	DELTA BHC	1.2	JP	1.2	J	ug/kg	2C
61814	715CB00102	61814002	SO	PEST	SW8081A	ENDOSULFAN I	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	ENDOSULFAN I	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	ENDOSULFAN I	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	ENDOSULFAN I	1.4	U	1.4	UJ	ug/kg	CC

SDG	Sample ID	Lab Sample ID	Matrix	Analytical Group	Analytical Method	Analyte	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reason
61814	715CB00102	61814002	SO	PEST	SW8081A	ENDOSULFAN II	2.9	U	2.9	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	ENDOSULFAN II	2.9	U	2.9	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	ENDOSULFAN II	2.8	U	2.8	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	ENDOSULFAN II	2.7	U	2.7	UJ	ug/kg	CC
61814	715CB00102	61814002	SO	PEST	SW8081A	GAMMA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	GAMMA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	GAMMA-CHLORDANE	1.5	U	1.5	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	GAMMA-CHLORDANE	10.4	P	10.4	J	ug/kg	2C,CC
61814	715CB00102	61814002	SO	PEST	SW8081A	METHOXYCHLOR	14.9	U	14.9	UJ	ug/kg	CC
61814	715SB00102	61814001	SO	PEST	SW8081A	METHOXYCHLOR	15.1	U	15.1	UJ	ug/kg	CC
61814	715SB00202	61814003	SO	PEST	SW8081A	METHOXYCHLOR	14.7	U	14.7	UJ	ug/kg	CC
61814	715SB00302	61814004	SO	PEST	SW8081A	METHOXYCHLOR	14.1	U	14.1	UJ	ug/kg	CC
61814	715CB00102	61814002	SO	PEST	SW8081A	p,p'-DDD	1.9	J	1.9	J	ug/kg	PD
61814	715SB00102	61814001	SO	PEST	SW8081A	p,p'-DDD	2.1	J	2.1	J	ug/kg	PD
61814	715SB00202	61814003	SO	PEST	SW8081A	p,p'-DDD	0.52	J	0.52	J	ug/kg	PD
61814	715SB00302	61814004	SO	PEST	SW8081A	p,p'-DDD	22.3	P	22.3	J	ug/kg	2C,PD
61814	715CB00102	61814002	SO	PEST	SW8081A	p,p'-DDE	2.9	U	2.9	UJ	ug/kg	PD,CC
61814	715SB00102	61814001	SO	PEST	SW8081A	p,p'-DDE	0.85	JP	0.85	J	ug/kg	2C,PD,CC
61814	715SB00202	61814003	SO	PEST	SW8081A	p,p'-DDE	2.8	U	2.8	UJ	ug/kg	PD,CC
61814	715SB00302	61814004	SO	PEST	SW8081A	p,p'-DDE	6.8	P	6.8	J	ug/kg	2C,PD,CC
61814	715CB00102	61814002	SO	PEST	SW8081A	p,p'-DDT	2.9	U	2.9	UJ	ug/kg	PD,CC
61814	715SB00102	61814001	SO	PEST	SW8081A	p,p'-DDT	2.9	U	2.9	UJ	ug/kg	PD,CC
61814	715SB00202	61814003	SO	PEST	SW8081A	p,p'-DDT	1.3	JP	1.3	J	ug/kg	2C,PD,CC
61814	715SB00302	61814004	SO	PEST	SW8081A	p,p'-DDT	36.5	P	36.5	J	ug/kg	PD,CC
61814	715CB00102	61814002	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1840	U	1840	UJ	ug/kg	IC
61814	715SB00102	61814001	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1860	U	1860	UJ	ug/kg	IC
61814	715SB00202	61814003	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1810	U	1810	UJ	ug/kg	IC
61814	715SB00302	61814004	SO	SVOA	SW8270C	2,4-DINITROPHENOL	1740	U	1740	UJ	ug/kg	IC
61814	715CB00102	61814002	SO	SVOA	SW8270C	Benzoic acid	1840	U	1840	UJ	ug/kg	IC
61814	715SB00102	61814001	SO	SVOA	SW8270C	Benzoic acid	1860	U	1860	UJ	ug/kg	IC
61814	715SB00202	61814003	SO	SVOA	SW8270C	Benzoic acid	1810	U	1810	UJ	ug/kg	IC
61814	715SB00302	61814004	SO	SVOA	SW8270C	Benzoic acid	1740	U	1740	UJ	ug/kg	IC

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Zone I, AOC 711, 715, 718 - Data Validation

SDG	Sample ID	Lab Sample ID	Matrix	Parameter Class	Analytical Method	Parameter	Lab Result	Lab Qual	Final Result	Final Qual	Units	Reasons
61814	715CB00102	61814002	SO	VOA	SW8260B	TOLUENE	1.9	J	5.2	U	ug/kg	BL
61814	715SB00202	61814003	SO	VOA	SW8260B	TOLUENE	1.8	J	5.3	U	ug/kg	BL
61814	715SB00302	61814004	SO	VOA	SW8260B	TOLUENE	2.5	J	6.3	U	ug/kg	BL
61814	715CB00102	61814002	SO	VOA	SW8260B	Vinyl acetate	10.5	U	10.5	UJ	ug/kg	BS
61814	715SB00202	61814003	SO	VOA	SW8260B	Vinyl acetate	10.7	U	10.7	UJ	ug/kg	BS
61814	715SB00302	61814004	SO	VOA	SW8260B	Vinyl acetate	12.6	U	12.6	UJ	ug/kg	BS
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1016 (AROCHLOR 1016)	4.9	U	4.9	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1221 (AROCHLOR 1221)	4.9	U	4.9	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1232 (AROCHLOR 1232)	4.9	U	4.9	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1242 (AROCHLOR 1242)	4.9	U	4.9	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1248 (AROCHLOR 1248)	4.9	U	4.9	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1254 (AROCHLOR 1254)	9.8	U	9.8	UJ	ug/L	DL
62385	715GP001M2	62385001	WG	PCB	SW8082	PCB-1260 (AROCHLOR 1260)	0.34	J	0.34	J	ug/L	DL
62385	715GP001M2	62385001	WG	PEST	SW8081A	ALDRIN	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ALPHA BHC	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ALPHA-CHLORDANE	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	BETA BHC	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	Chlordane	0.4	U	0.4	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	DELTA BHC	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	DIELDRIN	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDOSULFAN I	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDOSULFAN II	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDOSULFAN SULFATE	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDRIN	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDRIN ALDEHYDE	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	ENDRIN KETONE	0.079	U	0.079	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	GAMMA BHC (LINDANE)	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	GAMMA-CHLORDANE	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	HEPTACHLOR	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	HEPTACHLOR EPOXIDE	0.04	U	0.04	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	METHOXYCHLOR	0.38	U	0.38	UJ	ug/L	SS
62385	715GP001M2	62385001	WG	PEST	SW8081A	p,p'-DDD	0.079	U	0.079	UJ	ug/L	SS

Sample ID	Lab Sample ID	Matrix	Analytical Method								
2385	715GP001M2	62385001	WG	PEST	SW8081A	p,p'-DDE	0.079	U	0.079	UJ	ug/L	SS
2385	715GP001M2	62385001	WG	PEST	SW8081A	p,p'-DDT	0.079	U	0.079	UJ	ug/L	SS
2385	715GP001M2	62385001	WG	PEST	SW8081A	TOXAPHENE	2.5	U	2.5	UJ	ug/L	SS
2385	715GP001M2	62385001	WG	SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	2.1	JB	9.7	U	ug/L	BL
2386	711GP001M2	62386001	WG	PEST	SW8081A	ALDRIN	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ALPHA BHC	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ALPHA-CHLORDANE	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	BETA BHC	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	Chlordane	0.4	U	0.4	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	DELTA BHC	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	DIELDRIN	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDOSULFAN I	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDOSULFAN II	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDOSULFAN SULFATE	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDRIN	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDRIN ALDEHYDE	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	ENDRIN KETONE	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	GAMMA BHC (LINDANE)	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	GAMMA-CHLORDANE	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	HEPTACHLOR	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	HEPTACHLOR EPOXIDE	0.04	U	0.04	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	METHOXYCHLOR	0.38	U	0.38	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	p,p'-DDD	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	p,p'-DDE	0.081	U	0.081	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	p,p'-DDT	0.007	J	0.007	J	ug/L	SS
2386	711GP001M2	62386001	WG	PEST	SW8081A	TOXAPHENE	2.5	U	2.5	UJ	ug/L	SS
2386	711GP001M2	62386001	WG	SVOA	SW8270C	2,4-DINITROPHENOL	51	U	51	UJ	ug/L	CC
2386	711GP001M2	62386001	WG	SVOA	SW8270C	bis(2-ETHYLHEXYL) PHTHALATE	2.1	JB	10.2	U	ug/L	BL
3281	711VAOWSM3	63281001	SO	VOA	SW8260B	2-Chloroethyl vinyl ether	14.7	U	14.7	UJ	ug/kg	IC, CC
3281	711VAOWSM3	63281001	SO	VOA	SW8260B	ACETONE	33.1	=	33.1	J	ug/kg	CC
3281	711VAOWSM3	63281001	SO	VOA	SW8260B	Vinyl acetate	14.7	U	14.7	UJ	ug/kg	CC, BS

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZI711-050102-01** page 1 of 2

Laboratory:	GEL
Project Name:	Charleston Navy Complex
Site Name:	Zone I, AOC 711
Project Number:	158814.PM.04
TAT:	standard
Project Manager:	Tom Beisel
QA Level:	level 3
Address:	GNV: 3011 SW Williston Rd., Gainesville, FL 32605
	ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278
Send Report To:	see last page of COC
EDD:	CNC format
Lab Batch/SDG:	

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) 3 - 5g Encore & 1 - 2oz jar	SVOCs (SW8270C) 1 - 4 ounce jar	Pesticides/PCBs (SW8081A/8082) 1 - 4 ounce jar	Metals * (SW6010B/ 7000 series) 1 - 4 ounce jar	VOCs (SW8260B) 3 - 40mL vial, HCl	SVOCs (SW8270C) 2 - 1L amber	Pesticides/PCBs (SW8081A/8082) 2 - 1L amber	Metals * (SW6010B/ 7000 series) 1 - 0.5L HDPE, HNO3			Comments
61677-WATER	61678-SOIL																	
711ZAOWSM1	I711ZAOWS	OWS water			6-6-02 @ 0855		7					X	X	X	X			RCRA Site
711VAOWSM1	I711VAOWS	OWS sediment			6-6-02 @ 0905		7	X	X	X	X							
																		This Site is complete

Sampled By: Stan Eller Stan Eller Date/Time: 6-6-02 @ 0905

Relinquished by: Stan Eller Stan Eller Date/Time: 6-6-02 @ 1835

Additional Samplers: Kevin Tosh

Received By Lab: [illegible] Date/Time: 6-6-02 1836

Relinquished by: Date/Time

Received By: Date/Time

Shipped Via: UPS FedEx Hand Other Tracking#:

Remarks: Temperature:

Receipt Exceptions:

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZI715-050102-01** page . of 2

Laboratory:	GEL
Project Name:	Charleston Navy Complex
Site Name:	Zone I, AOC 715
Project Number:	158814.PM.04
TAT:	standard
Project Manager:	Tom Beisel
QA Level:	level 3
Address:	GNV: 3011 SW Williston Rd., Gainesville, FL 32605
	ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278
Send Report To:	see last page of COC
EDD:	CNC format

Lab Batch/SDG: 618147./618157.

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) (3 - 5g Encore & 1 - 2oz jar)	SVOCs (SW8270C) (1 - 4 ounce jar)	Pesticides/PCBs (SW8081A/8082) (1 - 4 ounce jar)	Metals * (SW6010B/ 7000 series) (1 - 4 ounce jar)	VOCs (SW8260B) (3 - 40mL vial, HCl)	SVOCs (SW8270C) (3 - 1L amber)	Pesticides/PCBs (SW8081A/8082) (3 - 1L amber)	Metals * (SW6010B/ 7000 series) (1 - 0.5L HDPE, HNO3)			Comments
715SB00102	I715SB001		3	5	6-10-02@1425	SO	7	X	X	X	X							RCRA Site
715CB00102	I715SB001		3	5	6-10-02@1430	SO	7	X	X	X	X							
715SB00202	I715SB002		3	5	6-10-02@1420	SO	7	X	X	X	X							
715SB00302	I715SB003		3	5	6-10-02@1435	SO	7	X	X	X	X							
715ZAOS1M1	I715ZAOS1	OWS water			~~6-10-02@1545~~	WW						X	X	X	X			No access to OWS
715VAOS1M1	I715VAOS1	OWS sediment				SO		X	X	X	X							
715EB001M1	I715EB001				6-10-02@1402	SQ	7					X	X	X	X			soil EB
715TB001M1	I715TB001				N/A	SQ						X						TB
																		Completed Station

Sampled By Stan Eller Stan Eller Date/Time 6-10-02@1602

Relinquished by: Stan Eller Date/Time 6-10-02@1828

Additional Samplers: Kevin Tosh

Received By Lab: Derek Sawyer Date/Time 6-10-02@1830

Relinquished by: Date/Time

Received By: Date/Time

Shipped Via: UPS FedEx Hand Other Tracking#:

Receipt Exceptions:

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZI718-050102-01** page 1 of 2

Laboratory:	STL
Project Name:	Charleston Navy Complex
Site Name:	Zone I, AOC 718
Project Number:	158814.PM.04
TAT:	standard
Project Manager:	Tom Beisel
QA Level:	level 3
Address:	GNV: 3011 SW Williston Rd., Gainesville, FL 32605
	ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278
Send Report To:	see last page of COC
EDD:	CNC format

Lab Batch/SDG: 618812/618813

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) 3 - 5g Encore & 1 - 2oz jar	SVOCs (SW8270C) 1 - 4 ounce jar	Pesticides/PCBs (SW8081A/8082) 1 - 4 ounce jar	Metals * (SW6010B/ 7000 series) 1 - 4 ounce jar	VOCs (SW8260B) 3 - 40mL vial, HCl	SVOCs (SW8270C) 3 - 1L amber	Pesticides/PCBs (SW8081A/8082)	Metals * (SW6010B/ 7000 series) 1 - 0.5L HDPE, HNO3			Comments
718SB00102	F718SB001		3	5	6-10-02 @ 1710	SO	7	X	X	X	X							RCRA Site
718SB00202	F718SB002		3	5	6-10-02 @ 1720	SO	7	X	X	X	X							
718CB00202	F718SB002		3	5	6-10-02 @ 1725	SO	7	X	X	X	X							
718EB001M1	F718EB001					SQ						X	X	X	X			soil EB
718TB001M1	F718TB001				6-10-02 @ 1730	SQ	3					X						TB
																		completed Station

Sampled By: Stan Eller Stan Eller Date/Time: 6-10-02 @ 1730 Relinquished by: Stan Eller Date/Time: 6-10-02 @ 1828

Additional Samplers: Kevin Tosh

Received By Lab: Derek Sawyer Date/Time: 6-10-02 @ 1830 Relinquished by: Date/Time

Received By: Date/Time

Shipped Via: UPS FedEx Hand Other Tracking#:

Remarks: Temperature:

Receipt Exceptions:

CH2M L Chain of Custody/ Laboratory Analysis Form COC Tracking #: **ZG720-061002-01** pa of 2

Laboratory:	GEL		
Project Name:	Charleston Navy Complex	**Site Name:**	Zone I, AOC 711
Project Number:	158814.PM.04	**TAT:**	standard
Project Manager:	Tom Beisel	**QA Level:**	level 3
Address:	GNV: 3011 SW Williston Rd., Gainesville, FL 32605		
	ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278		
Send Report To:	see last page of COC	**EDD:**	CNC format

Lab Batch/SDG:

62386%

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) 3 - 5g Encore & 1 - 2oz jar	SVOCs (SW8270C) 1 - 4 ounce jar	Pesticides/PCBs (SW8081A/8082) 1 - 4 ounce jar	Metals * (SW6010B/ 7000 series) 1 - 4 ounce jar	VOCs (SW8260B) 3 - 40mL vial, HCl	SVOCs (SW8270C) 3 - 1L amber	Pesticides/PCBs (SW8081A/8082)	Metals * (SW6010B/ 7000 series) 1 - 0.5L HDPE, HNO3			Comments
711GP001M2	I711GP001	DPT sample	8	12	6-17-02/1425	WG	5					X	X	X				
711EP001M2	I711EP001					WQ						X	X	X				EB

Sampled By [signature] Date/Time 6-17-02/ns water Relinquished by: [signature] Date/Time 6-19-02/

Additional Samplers:

Received By Lab: [signature] Date/Time 6/19/02 1720 Relinquished by: Date/Time

Received By: TB 001 w/ AOC720 Date/Time Shipped Via: UPS FedEx Hand Other Tracking#:

Remarks: ER BLANK collect @ AOC 715 on same date. Temperature:

Receipt Exceptions:

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZI715-061002-01** page 1 of 2

Laboratory:	GEL
Project Name:	Charleston Navy Complex
Site Name:	Zone I, AOC 715
Project Number:	158814.PM.04
TAT:	standard
Project Manager:	Tom Beisel
QA Level:	level 3
Address:	GNV: 3011 SW Williston Rd., Gainesville, FL 32605
	ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278
Send Report To:	see last page of COC
EDD:	CNC format

Lab Batch/SDG:

62385

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) (3 - 5g Encore & 1 - 2oz jar)	SVOCs (SW8270C) (1 - 4 ounce jar)	Pesticides/PCBs (SW8081A/8082) (1 - 4 ounce jar)	Metals * (SW6010B/ 7000 series) (1 - 4 ounce jar)	VOCs (SW8260B) (3 - 40mL vial, HCl)	SVOCs (SW8270C) (3 - 1L amber)	Pesticides/PCBs (SW8081A/8082) (3 - 1L amber)	Metals * (SW6010B/ 7000 series) (1 - 0.5L HDPE, HNO3)			Comments
715GP001M2	I715GP001	DPT GW	8	12	6-17-02/1650	WG	6					X	X	X				
715EP001M2	I715EP001				6-17-02/1600	WQ	6					X	X	X				EB

Sampled By: [signature] Date/Time: 6-17-02/1AS Notes

Relinquished by: [signature] Date/Time: 6-19-02/

Additional Samplers:

Received By Lab: [signature] Date/Time: 6/19/02 1720

Relinquished by: Date/Time

Received By: Date/Time

Shipped Via: UPS FedEx Hand Other Tracking#:

Remarks: TB ~1 AOC 720

Temperature:

Rec: Exceptions:

CH2M HILL Chain of Custody/ Laboratory Analysis Form

COC Tracking #: **ZZMSL-070502-01** page 2

Laboratory: GEL

Project Name: Charleston Navy Complex

Site Name: Zone E, F & I, multiple sites

Project Number: 158814.PM.04 **TAT:** 7 day

Project Manager: Tom Beisel **QA Level:** level 3

Address: GNV: 3011 SW Williston Rd., Gainesville, FL 32605

ATL: 115 Perimeter Center Place NE, Suite 700, Atlanta, GA 30346-1278

Send Report To: see last page of COC **EDD:** CNC format

Lab Batch/SDG: 63281%, 63282%

Sample ID	Station ID	Sample Description	Depth Begin	Depth End	Date & Time Collected	Matrix	# of containers	VOCs (SW8260B) 3 - 5g Encore & 1 - 2oz jar	SVOCs (SW8270C) 1 - 4 ounce jar	Pesticides/PCBs (SW8081A/8082) 1 - 4 ounce jar	Metals * (SW6010B/ 7000 series) 1 - 4 ounce jar	VOCs (SW8260B) 3 - 40mL vial, HCl	SVOCs (SW8270C) 2 - 1L amber	Pesticides/PCBs (SW8081A/8082) 2 - 1L amber	Metals * (SW6010B/ 7000 series) 1 - 0.5L HDPE, HNO3			Comments
711VAOWSM3	I711VAOWS	OWS sediment			7-9-02 / 1435	SO	4	X										
712VA0S1M3	F712VA0S1	OWS sediment			7-9-02 / 1410	SO	4	X										
~~712SB00403~~	~~F712SB004~~	resample F712SB001	4	6		SO		X										
~~712SB00503~~	~~F712SB005~~	resample F712SB002	4	6		SO		X										
~~712SB00603~~	~~F712SB006~~	resample F712SB003	4	6		SO		X										
713VA0S1M3	F713VA0S1	OWS sediment			7-9-02 / 1300	SO	4	X										
~~713SB00403~~	~~F713SB004~~	resample F713SB004	4	6		SO		X										
~~713SB00503~~	~~F713SB005~~	resample F713SB005	4	6		SO		X										
~~713SB00603~~	~~F713SB006~~	resample F713SB006	4	6		SO		X										
~~714SB00403~~	~~F714SB004~~	resample F714SB004	4	6		SO		X										
~~714CB00403~~	~~F714SB004~~	resample F714SB004	4	6		SO		X										
~~714SB00503~~	~~F714SB005~~	resample F714SB005	4	6		SO		X										
~~714SB00603~~	~~F714SB006~~	resample F714SB006	4	6		SO		X										
~~717SB00403~~	~~F717SB004~~	resample F717SB004	4	6		SO		X										
~~717SB00503~~	~~F717SB005~~	resample F717SB005	4	6		SO		X										
~~717SB00603~~	~~F717SB006~~	resample F717SB006	4	6		SO		X										
~~717SB00603MS~~	~~F717SB006~~	resample F717SB006	4	6		SO		X										MS
~~717SB00603SD~~	~~F717SB006~~	resample F717SB006	4	6		SO		X										MSD
716VA0S1M3	E716VA0S1	OWS sediment			7-9-02 / 1335	SO	4	X										
712EB001M3	E712EB001				7-9-02 / 1500	SQ	3					X						EB
712TB001M3	E712TB001				7-9-02 / 1505	SQ	3					X						TB

Sampled By Darryl Gates / Stan Eller Date/Time 7-9-02 / as noted

Relinquished by: Stan Eller Stan Eller Date/Time 7-9-02@ 1725

Additional Samplers:

Received By Lab: Jackie Robinson Date/Time 7-9-02 1725

Relinquished by: Date/Time

Received By: Date/Time

Shipped Via: UPS FedEx Hand Other Tracking#:

Receipt Exceptions:

CH2MHILL

PROJECT NUMBER	DPT NUMBER
158814.	page 1 of 2

DPT GROUNDWATER SAMPLE LOG

PROJECT : Charleston Naval Complex, Charleston, SC **LOCATION :** Charleston, SC **NORTHING:**

ELEVATION : NA **DRILLING CONTRACTOR :** Prosonic Corporation License # 1435 **EASTING:**

DRILLING METHOD AND EQUIPMENT USED : Geoprobe Direct-Push Sampling, 4 - ft screen

START : **END:** **LOGGER :** D. Gates/NVR

DEPTH BELOW SURFACE (FT)	SAMPLING DEPTH SCREEN INTERVAL	COMMENTS ABANDONMENT METHOD TESTS, INSTRUMENTATION SOIL DESCRIPTION, IF VISIBLE
5		
10		
15		
20		
25		
30		

CH2MHILL

PROJECT NUMBER	DPT NUMBER	
158814	I711GP001	page 1 of 1

DPT GROUNDWATER SAMPLE LOG

PROJECT : Charleston Naval Complex, Charleston, SC **LOCATION :** Charleston, SC **NORTHING:** 371435.9

ELEVATION : NA **DRILLING CONTRACTOR :** Prosonic Corporation License # 1435 **EASTING:** 2325064.5

DRILLING METHOD AND EQUIPMENT USED : Geoprobe Direct-Push Sampling, 4 ft screen

START : 06/17/2002 **END:** 06/17/2002 **LOGGER :** D. Gates/NVR

DEPTH BELOW SURFACE (FT)	SAMPLING DEPTH SCREEN INTERVAL	COMMENTS ABANDONMENT METHOD TESTS, INSTRUMENTATION SOIL DESCRIPTION, IF VISIBLE
5		
	Top of Sampling Interval	
10		
	Bottom of Sampling Interval	After sampling the boring was pressure grouted from bottom to top with Type 1 Portland Cement
15		
20		
25		
30		

CH2MHILL

PROJECT NUMBER	DPT NUMBER	
158814	I715GP001	page 1 of 1

DPT GROUNDWATER SAMPLE LOG

PROJECT : Charleston Naval Complex, Charleston, SC **LOCATION :** Charleston, SC **NORTHING:** 370783.3

ELEVATION : NA **DRILLING CONTRACTOR :** Prosonic Corporation License # 1435 **EASTING:** 2326685.6

DRILLING METHOD AND EQUIPMENT USED : Geoprobe Direct-Push Sampling, 4 ft screen

START : 06/17/2002 **END:** 06/17/2002 **LOGGER :** D. Gates/NVR

DEPTH BELOW SURFACE (FT)	SAMPLING DEPTH SCREEN INTERVAL	COMMENTS ABANDONMENT METHOD TESTS, INSTRUMENTATION SOIL DESCRIPTION, IF VISIBLE
5		
	Top of Sampling Interval	
10		
	Bottom of Sampling Interval	After sampling the boring was pressure grouted from bottom to top with Type 1 Portland Cement
15		
20		
25		
30		

Metals, Subsurface Soil	StationID	I715SB001		I715SB001		I715SB001		I715SB001	
AOC 715	SampleID	715CB00102 (3-5ft)		715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00102 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/24/2002		6/25/2002		6/24/2002		6/25/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Aluminum	mg/kg			12700	=			12700	=
Antimony	mg/kg			0.516	UJ			0.507	UJ
Arsenic	mg/kg			2.42	=			2.51	=
Barium	mg/kg			20.4	J			20.1	J
Beryllium	mg/kg			0.107	J			0.108	J
Cadmium	mg/kg			0.028	U			0.045	U
Calcium	mg/kg			538	U			552	U
Chromium, Total	mg/kg			12.3	J			11.8	J
Cobalt	mg/kg			0.834	J			0.79	J
Copper	mg/kg			2.26	J			1.74	J
Iron	mg/kg			6300	J			6580	J
Lead	mg/kg			6.13	J			5.97	J
Magnesium	mg/kg			408	U			397	U
Manganese	mg/kg			10.8	J			10.1	J
Nickel	mg/kg			4.01	J			3.8	J
Potassium	mg/kg			247	UJ			244	UJ
Selenium	mg/kg			0.287	U			0.282	U
Silver	mg/kg			0.124	U			0.121	U
Sodium	mg/kg			27.2	U			26.5	U
Thallium	mg/kg			0.537	U			0.527	U
Vanadium	mg/kg			16	=			15.2	=
Zinc	mg/kg			9	J			8.51	J
Mercury	mg/kg	0.008	J			0.007	J		

Metals, Subsurface Soil	StationID	I715SB002		I715SB002		I715SB003		I715SB003	
AOC 715	SampleID	715SB00202 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/24/2002		6/25/2002		6/24/2002		6/25/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Aluminum	mg/kg			11200	=			13900	=
Antimony	mg/kg			0.502	UJ			0.521	UJ
Arsenic	mg/kg			2.25	=			3.87	=
Barium	mg/kg			16.8	J			20.6	J
Beryllium	mg/kg			0.103	J			0.137	J
Cadmium	mg/kg			0.022	U			0.095	U
Calcium	mg/kg			542	U			888	U
Chromium, Total	mg/kg			11.3	J			17.7	J
Cobalt	mg/kg			0.705	J			0.856	J
Copper	mg/kg			2.39	J			18.5	=
Iron	mg/kg			6630	J			8760	J
Lead	mg/kg			5.39	J			14.4	J
Magnesium	mg/kg			370	U			436	U
Manganese	mg/kg			9.39	J			11.7	J
Nickel	mg/kg			3.5	J			5.17	J
Potassium	mg/kg			225	UJ			294	UJ
Selenium	mg/kg			0.28	U			0.413	J
Silver	mg/kg			0.12	U			0.125	U
Sodium	mg/kg			23.3	U			26.9	U
Thallium	mg/kg			0.523	U			0.542	U
Vanadium	mg/kg			15.7	=			22.4	=
Zinc	mg/kg			8	J			25.5	J
Mercury	mg/kg	0.011	J			0.072	J		

PCBs, Subsurface Soil	StationID	I715SB001		I715SB001		I715SB002		I715SB003		I715SB003	
AOC 715	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)		715SB00302RE (2-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/14/2002		6/14/2002		6/14/2002		6/14/2002		7/2/2002	
	DateAnalyzed	6/18/2002		6/18/2002		6/18/2002		6/18/2002		7/3/2002	
	SDGNumber	61814		61814		61814		61814		61814	
Parameter	**Units**										
PCB-1016 (Arochlor 1016)	ug/kg	38	U	38.4	U	37.4	U	35.9	U	35.9	R
PCB-1221 (Arochlor 1221)	ug/kg	38	U	38.4	U	37.4	U	35.9	U	35.9	R
PCB-1232 (Arochlor 1232)	ug/kg	38	U	38.4	U	37.4	U	35.9	U	35.9	R
PCB-1242 (Arochlor 1242)	ug/kg	38	U	38.4	U	37.4	U	35.9	U	35.9	R
PCB-1248 (Arochlor 1248)	ug/kg	38	U	38.4	U	37.4	U	35.9	U	35.9	R
PCB-1254 (Arochlor 1254)	ug/kg	77.2	U	77.9	U	75.8	U	72.9	U	72.9	R
PCB-1260 (Arochlor 1260)	ug/kg	77.2	U	77.9	U	75.8	U	6.5	J	5.7	R

Pesticides, Subsurface Soil
AOC 715

	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/22/2002		6/22/2002		6/22/2002		6/22/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Aldrin	ug/kg	1.5	UJ	1.5	UJ	1.5	UJ	1.4	UJ
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	1.5	U	1.5	U	1.5	U	0.55	J
Alpha-chlordane	ug/kg	1.5	UJ	1.5	UJ	1.5	UJ	3.7	J
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	1.5	U	1.5	U	1.5	U	1	J
Chlordane	ug/kg	14.9	U	15.1	U	14.7	U	61.7	=
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	1.5	U	1.5	U	1.5	U	1.2	J
Dieldrin	ug/kg	2.9	U	2.9	U	2.8	U	2.7	U
Endosulfan I	ug/kg	1.5	UJ	1.5	UJ	1.5	UJ	1.4	UJ
Endosulfan II	ug/kg	2.9	UJ	2.9	UJ	2.8	UJ	2.7	UJ
Endosulfan Sulfate	ug/kg	2.9	U	2.9	U	2.8	U	2.7	U
Endrin Aldehyde	ug/kg	2.9	U	2.9	U	2.8	U	2.7	U
Endrin Ketone	ug/kg	2.9	U	2.9	U	2.8	U	2.7	U
Endrin	ug/kg	2.9	U	2.9	U	2.8	U	2.7	U
Gamma BHC (Lindane)	ug/kg	1.5	U	1.5	U	1.5	U	3.6	=
Gamma-chlordane	ug/kg	1.5	UJ	1.5	UJ	1.5	UJ	10.4	J
Heptachlor Epoxide	ug/kg	1.5	U	1.5	U	1.5	U	1.4	U
Heptachlor	ug/kg	1.5	U	1.5	U	1.5	U	0.77	J
Methoxychlor	ug/kg	14.9	UJ	15.1	UJ	14.7	UJ	14.1	UJ
p,p'-DDD	ug/kg	1.9	J	2.1	J	0.52	J	22.3	J
p,p'-DDE	ug/kg	2.9	UJ	0.85	J	2.8	UJ	6.8	J
p,p'-DDT	ug/kg	2.9	UJ	2.9	UJ	1.3	J	36.5	J
Toxaphene	ug/kg	95.5	U	96.3	U	93.8	U	90.2	U

SVOCs, Subsurface Soil AOC 715	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Benzo(g,h,i)Perylene	ug/kg	381	U	384	U	374	U	360	U
Phenol	ug/kg	381	U	384	U	374	U	360	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	381	U	384	U	374	U	360	U
Bis(2-Chloroisopropyl)Ether	ug/kg	381	U	384	U	374	U	360	U
2-Chlorophenol	ug/kg	381	U	384	U	374	U	360	U
1,4-Dichlorobenzene	ug/kg	381	U	384	U	374	U	360	U
Benzyl alcohol	ug/kg	381	U	384	U	374	U	360	U
1,2-Dichlorobenzene	ug/kg	381	U	384	U	374	U	360	U
1,3-Dichlorobenzene	ug/kg	381	U	384	U	374	U	360	U
2-Methylphenol (o-Cresol)	ug/kg	381	U	384	U	374	U	360	U
N-Nitrosodi-n-propylamine	ug/kg	381	U	384	U	374	U	360	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	381	U	384	U	374	U	360	U
Hexachloroethane	ug/kg	381	U	384	U	374	U	360	U
Nitrobenzene	ug/kg	381	U	384	U	374	U	360	U
Isophorone	ug/kg	381	U	384	U	374	U	360	U
2-Nitrophenol	ug/kg	381	U	384	U	374	U	360	U
2,4-Dimethylphenol	ug/kg	381	U	384	U	374	U	360	U
bis(2-Chloroethoxy) Methane	ug/kg	381	U	384	U	374	U	360	U
2,4-Dichlorophenol	ug/kg	381	U	384	U	374	U	360	U
Benzoic acid	ug/kg	1840	UJ	1860	UJ	1810	UJ	1740	UJ
1,2,4-Trichlorobenzene	ug/kg	381	U	384	U	374	U	360	U
Naphthalene	ug/kg	381	U	384	U	374	U	360	U
4-Chloroaniline	ug/kg	381	U	384	U	374	U	360	U
Hexachlorobutadiene	ug/kg	381	U	384	U	374	U	360	U
4-Chloro-3-methylphenol	ug/kg	346	U	349	U	340	U	327	U
2-Methylnaphthalene	ug/kg	381	U	384	U	374	U	360	U
Hexachlorocyclopentadiene	ug/kg	381	U	384	U	374	U	360	U
2,4,6-Trichlorophenol	ug/kg	381	U	384	U	374	U	360	U
2,4,5-Trichlorophenol	ug/kg	1840	U	1860	U	1810	U	1740	U
2-Chloronaphthalene	ug/kg	381	U	384	U	374	U	360	U

SVOCs, Subsurface Soil
AOC 715

	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
2-Nitroaniline	ug/kg	381	U	384	U	374	U	360	U
3-Nitroaniline	ug/kg	1840	U	1860	U	1810	U	1740	U
Dimethyl Phthalate	ug/kg	381	U	384	U	374	U	360	U
2,6-Dinitrotoluene	ug/kg	381	U	384	U	374	U	360	U
Acenaphthylene	ug/kg	381	U	384	U	374	U	360	U
Acenaphthene	ug/kg	346	U	349	U	340	U	327	U
2,4-Dinitrophenol	ug/kg	1840	UJ	1860	UJ	1810	UJ	1740	UJ
Dibenzofuran	ug/kg	381	U	384	U	374	U	360	U
2,4-Dinitrotoluene	ug/kg	346	U	349	U	340	U	327	U
Diethyl Phthalate	ug/kg	381	U	384	U	374	U	360	U
4-Nitrophenol	ug/kg	1840	U	1860	U	1810	U	1740	U
Fluorene	ug/kg	381	U	384	U	374	U	360	U
4-Chlorophenyl Phenyl Ether	ug/kg	381	U	384	U	374	U	360	U
4,6-Dinitro-2-methylphenol	ug/kg	1840	U	1860	U	1810	U	1740	U
4-Nitroaniline	ug/kg	1840	U	1860	U	1810	U	1740	U
Diphenylamine	ug/kg	381	U	384	U	374	U	360	U
4-Bromophenyl Phenyl Ether	ug/kg	381	U	384	U	374	U	360	U
Hexachlorobenzene	ug/kg	381	U	384	U	374	U	360	U
Pentachlorophenol	ug/kg	1840	U	1860	U	1810	U	1740	U
Phenanthrene	ug/kg	381	U	384	U	374	U	360	U
Anthracene	ug/kg	381	U	384	U	374	U	360	U
Di-n-butyl Phthalate	ug/kg	381	U	384	U	374	U	360	U
Fluoranthene	ug/kg	381	U	384	U	374	U	360	U
Pyrene	ug/kg	381	U	384	U	374	U	360	U
Benzyl Butyl Phthalate	ug/kg	381	U	384	U	374	U	360	U
Benzo(a)Anthracene	ug/kg	381	U	384	U	374	U	360	U
3,3'-Dichlorobenzidine	ug/kg	761	U	767	U	747	U	718	U
Chrysene	ug/kg	381	U	384	U	374	U	360	U
bis(2-Ethylhexyl) Phthalate	ug/kg	381	U	384	U	374	U	360	U
Di-n-octylphthalate	ug/kg	381	U	384	U	374	U	360	U

SVOCs, Subsurface Soil
AOC 715

	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Benzo(b)Fluoranthene	ug/kg	381	U	384	U	374	U	360	U
Benzo(k)Fluoranthene	ug/kg	381	U	384	U	374	U	360	U
Benzo(a)Pyrene	ug/kg	381	U	384	U	374	U	360	U
Indeno(1,2,3-c,d)pyrene	ug/kg	381	U	384	U	374	U	360	U
Dibenz(a,h)anthracene	ug/kg	381	U	384	U	374	U	360	U
Carbazole	ug/kg	381	U	384	U	374	U	360	U

VOCs, Subsurface Soil
AOC 715

	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Chloromethane	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
Vinyl chloride	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
Bromomethane	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
Chloroethane	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
1,1-Dichloroethene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Acetone	ug/kg	6.6	J	5.8	J	5.1	J	7.4	J
Carbon Disulfide	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Methylene Chloride	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
trans-1,2-Dichloroethene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,1-Dichloroethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Vinyl acetate	ug/kg	10.5	UJ	10.4	U	10.7	UJ	12.6	UJ
Methyl ethyl ketone (2-Butanone)	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
cis-1,2-Dichloroethylene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2-Dichloroethene (total)	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Chloroform	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,1,1-Trichloroethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Carbon Tetrachloride	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2-Dichloroethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Benzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Trichloroethylene (TCE)	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2-Dichloropropane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Bromodichloromethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
2-Chloroethyl vinyl ether	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
cis-1,3-Dichloropropene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Toluene	ug/kg	5.2	U	2.2	J	5.3	U	6.3	U
trans-1,3-Dichloropropene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,1,2-Trichloroethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
2-Hexanone	ug/kg	10.5	U	10.4	U	10.7	U	12.6	U
Tetrachloroethylene (PCE)	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U

VOCs, Subsurface Soil
AOC 715

	StationID	I715SB001		I715SB001		I715SB002		I715SB003	
	SampleID	715CB00102 (3-5ft)		715SB00102 (3-5ft)		715SB00202 (3-5ft)		715SB00302 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	SDGNumber	61814		61814		61814		61814	
Parameter	**Units**								
Dibromochloromethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Chlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
Ethylbenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
m+p Xylene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
o-Xylene	ug/kg	5.2	U	0.47	J	5.3	U	6.3	U
Xylenes, Total	ug/kg	5.2	U	0.47	J	5.3	U	6.3	U
Styrene	ug/kg	0.54	J	0.62	J	0.47	J	0.71	J
Bromoform	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,1,2,2-Tetrachloroethane	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,3-Dichlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,4-Dichlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2-Dichlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2,4-Trichlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U
1,2,3-Trichlorobenzene	ug/kg	5.2	U	5.2	U	5.3	U	6.3	U

PCBs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/22/2002	
	DateAnalyzed	7/4/2002	
	SDGNumber	62385	
Parameter	**Units**		
PCB-1016 (Arochlor 1016)	ug/L	4.9	UJ
PCB-1221 (Arochlor 1221)	ug/L	4.9	UJ
PCB-1232 (Arochlor 1232)	ug/L	4.9	UJ
PCB-1242 (Arochlor 1242)	ug/L	4.9	UJ
PCB-1248 (Arochlor 1248)	ug/L	4.9	UJ
PCB-1254 (Arochlor 1254)	ug/L	9.8	UJ
PCB-1260 (Arochlor 1260)	ug/L	0.34	J

Pesticides, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/25/2002	
	DateAnalyzed	6/28/2002	
	SDGNumber	62385	
Parameter	**Units**		
Aldrin	ug/L	0.04	UJ
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/L	0.04	UJ
Alpha-chlordane	ug/L	0.04	UJ
Beta BHC (Beta Hexachlorocyclohexane)	ug/L	0.04	UJ
Chlordane	ug/L	0.4	UJ
Delta BHC (Delta Hexachlorocyclohexane)	ug/L	0.04	UJ
Dieldrin	ug/L	0.079	UJ
Endosulfan I	ug/L	0.04	UJ
Endosulfan II	ug/L	0.079	UJ
Endosulfan Sulfate	ug/L	0.079	UJ
Endrin Aldehyde	ug/L	0.079	UJ
Endrin Ketone	ug/L	0.079	UJ
Endrin	ug/L	0.079	UJ
Gamma BHC (Lindane)	ug/L	0.04	UJ
Gamma-chlordane	ug/L	0.04	UJ
Heptachlor Epoxide	ug/L	0.04	UJ
Heptachlor	ug/L	0.04	UJ
Methoxychlor	ug/L	0.38	UJ
p,p'-DDD	ug/L	0.079	UJ
p,p'-DDE	ug/L	0.079	UJ
p,p'-DDT	ug/L	0.079	UJ
Toxaphene	ug/L	2.5	UJ

SVOCs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/24/2002	
	DateAnalyzed	6/29/2002	
	SDGNumber	62385	
Parameter	**Units**		
Phenol	ug/L	9.7	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/L	9.7	U
2-Chlorophenol	ug/L	9.7	U
1,3-Dichlorobenzene	ug/L	9.7	U
1,4-Dichlorobenzene	ug/L	9.7	U
Benzyl alcohol	ug/L	9.7	U
1,2-Dichlorobenzene	ug/L	9.7	U
Bis(2-Chloroisopropyl)Ether	ug/L	9.7	U
2-Methylphenol (o-Cresol)	ug/L	9.7	U
N-Nitrosodi-n-propylamine	ug/L	9.7	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/L	9.7	U
Hexachloroethane	ug/L	9.7	U
Nitrobenzene	ug/L	9.7	U
Isophorone	ug/L	9.7	U
2-Nitrophenol	ug/L	9.7	U
2,4-Dimethylphenol	ug/L	9.7	U
bis(2-Chloroethoxy) Methane	ug/L	9.7	U
2,4-Dichlorophenol	ug/L	9.7	U
Benzoic acid	ug/L	48.5	U
1,2,4-Trichlorobenzene	ug/L	9.7	U
Naphthalene	ug/L	9.7	U
4-Chloroaniline	ug/L	9.7	U
Hexachlorobutadiene	ug/L	9.7	U
4-Chloro-3-methylphenol	ug/L	9.7	U
2-Methylnaphthalene	ug/L	9.7	U
Hexachlorocyclopentadiene	ug/L	9.7	U
2,4,6-Trichlorophenol	ug/L	9.7	U
2,4,5-Trichlorophenol	ug/L	48.5	U
2-Chloronaphthalene	ug/L	9.7	U
2-Nitroaniline	ug/L	48.5	U

SVOCs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/24/2002	
	DateAnalyzed	6/29/2002	
	SDGNumber	62385	
Parameter	**Units**		
3-Nitroaniline	ug/L	48.5	U
Dimethyl Phthalate	ug/L	9.7	U
2,6-Dinitrotoluene	ug/L	9.7	U
Acenaphthylene	ug/L	9.7	U
Acenaphthene	ug/L	9.7	U
2,4-Dinitrophenol	ug/L	48.5	U
Dibenzofuran	ug/L	9.7	U
2,4-Dinitrotoluene	ug/L	9.7	U
Diethyl Phthalate	ug/L	9.7	U
4-Nitrophenol	ug/L	48.5	U
Fluorene	ug/L	9.7	U
4-Chlorophenyl Phenyl Ether	ug/L	9.7	U
4,6-Dinitro-2-methylphenol	ug/L	48.5	U
4-Nitroaniline	ug/L	48.5	U
Diphenylamine	ug/L	9.7	U
4-Bromophenyl Phenyl Ether	ug/L	9.7	U
Hexachlorobenzene	ug/L	9.7	U
Pentachlorophenol	ug/L	48.5	U
Phenanthrene	ug/L	9.7	U
Anthracene	ug/L	9.7	U
Di-n-butyl Phthalate	ug/L	9.7	U
Fluoranthene	ug/L	9.7	U
Pyrene	ug/L	9.7	U
Benzyl Butyl Phthalate	ug/L	9.7	U
Benzo(a)Anthracene	ug/L	9.7	U
3,3'-Dichlorobenzidine	ug/L	19.4	U
Chrysene	ug/L	9.7	U
bis(2-Ethylhexyl) Phthalate	ug/L	9.7	U
Di-n-octylphthalate	ug/L	9.7	U
Benzo(b)Fluoranthene	ug/L	9.7	U

SVOCs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/24/2002	
	DateAnalyzed	6/29/2002	
	SDGNumber	62385	
Parameter	**Units**		
Benzo(k)Fluoranthene	ug/L	9.7	U
Benzo(a)Pyrene	ug/L	0.97	U
Indeno(1,2,3-c,d)pyrene	ug/L	9.7	U
Dibenz(a,h)anthracene	ug/L	9.7	U
Benzo(g,h,i)Perylene	ug/L	9.7	U
Carbazole	ug/L	9.7	U

VOCs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/24/2002	
	DateAnalyzed	6/24/2002	
	SDGNumber	62385	
Parameter	**Units**		
Chloromethane	ug/L	10	U
Vinyl chloride	ug/L	10	U
Bromomethane	ug/L	10	U
Chloroethane	ug/L	10	U
1,1-Dichloroethene	ug/L	5	U
Acetone	ug/L	3.6	J
Carbon Disulfide	ug/L	5	U
Methylene Chloride	ug/L	5	U
trans-1,2-Dichloroethene	ug/L	5	U
1,1-Dichloroethane	ug/L	5	U
Vinyl acetate	ug/L	10	U
Methyl ethyl ketone (2-Butanone)	ug/L	10	U
cis-1,2-Dichloroethylene	ug/L	5	U
1,2-Dichloroethene (total)	ug/L	5	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
Benzene	ug/L	5	U
Trichloroethylene (TCE)	ug/L	5	U
1,2-Dichloropropane	ug/L	5	U
Bromodichloromethane	ug/L	5	U
2-Chloroethyl vinyl ether	ug/L	5	U
cis-1,3-Dichloropropene	ug/L	5	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/L	10	U
Toluene	ug/L	0.43	J
trans-1,3-Dichloropropene	ug/L	5	U
1,1,2-Trichloroethane	ug/L	5	U
2-Hexanone	ug/L	10	U
Tetrachloroethylene (PCE)	ug/L	5	U

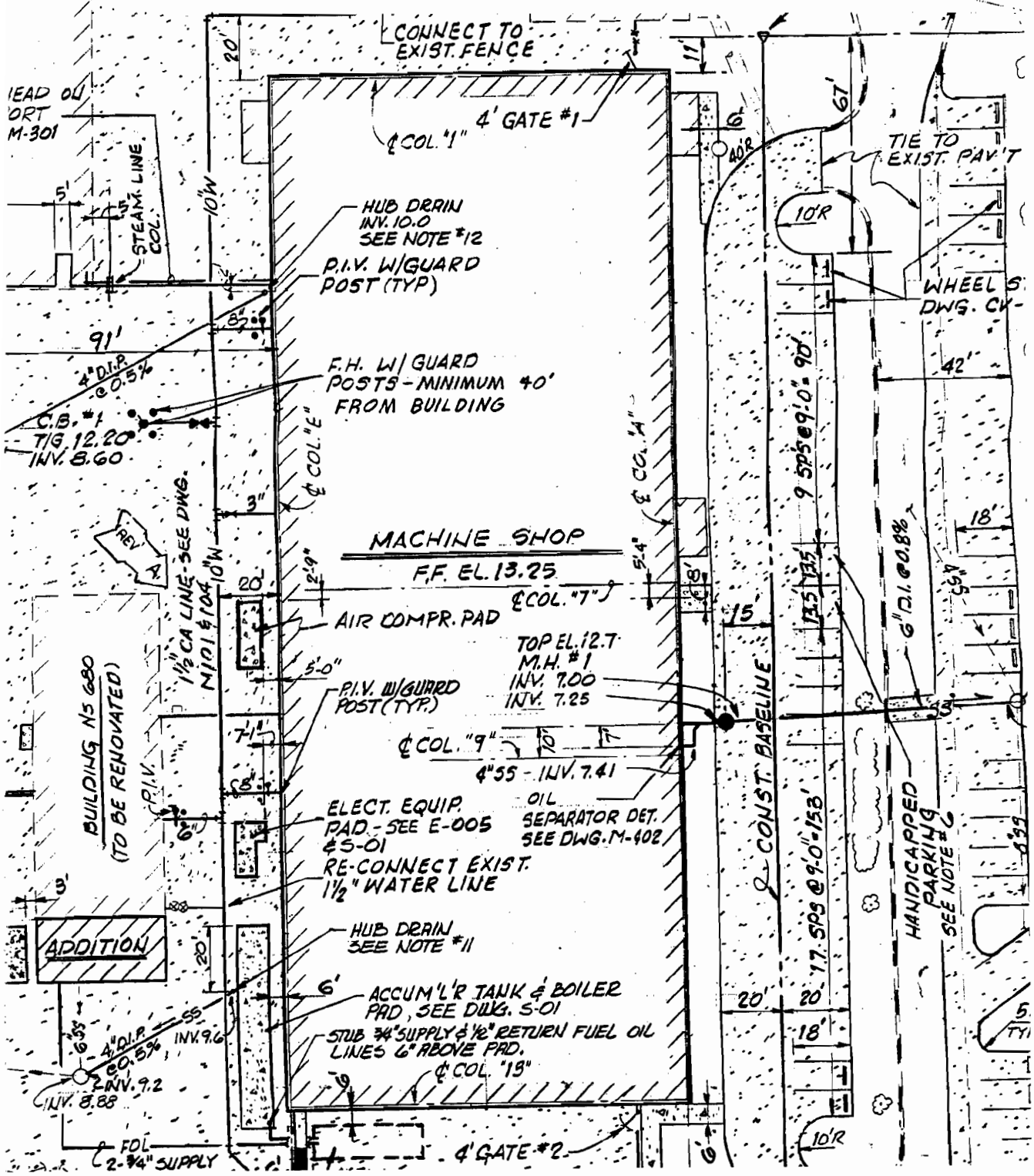
VOCs, Groundwater
AOC 715

	StationID	I715GP001	
	SampleID	715GP001M2	
	DateCollected	6/17/2002	
	DateExtracted	6/24/2002	
	DateAnalyzed	6/24/2002	
	SDGNumber	62385	
Parameter	**Units**		
Dibromochloromethane	ug/L	5	U
Chlorobenzene	ug/L	5	U
Ethylbenzene	ug/L	5	U
m+p Xylene	ug/L	5	U
o-Xylene	ug/L	5	U
Xylenes, Total	ug/L	5	U
Styrene	ug/L	5	U
Bromoform	ug/L	5	U
1,1,2,2-Tetrachloroethane	ug/L	5	U
1,3-Dichlorobenzene	ug/L	5	U
1,4-Dichlorobenzene	ug/L	5	U
1,2-Dichlorobenzene	ug/L	5	U
1,2,4-Trichlorobenzene	ug/L	5	U
1,2,3-Trichlorobenzene	ug/L	5	U

As-built 11-5-85

LOCKWOOD GREENE ENGINEERS, INC. ARCHITECTS-ENGINEERS SPARTANBURG, S. C.	DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND **SOUTHERN DIVISION** CHARLESTON, S. C.
DSGN Jordan DR Sweat CHK Gordon SUPV JOHNSTON CH ENGR COX SUBMITTED BY DATE 1/20/81 FIRM MEMBER (TITLE) SOUTHERN DIV—DESIGN DIVISION PDE DIR	NAVAL STATION CHARLESTON, S. C. S I M A SITE LAYOUT & OUTSIDE PIPING PLAN - CIVIL
APPROVED DATE OFFICER IN CHARGE APPROVED DATE 2-26-81 EFD FOR COMMANDER, NAVFAC	SIZE F · CODE IDENT NO. 80091 · NAVFAC DRAWING NO. 5077120 CONSTR CONTR NO. N62467-79-C-0028 SCALE AS NOTED · SPEC 06-79-0028 · SHEET 4 OF

NS681-7

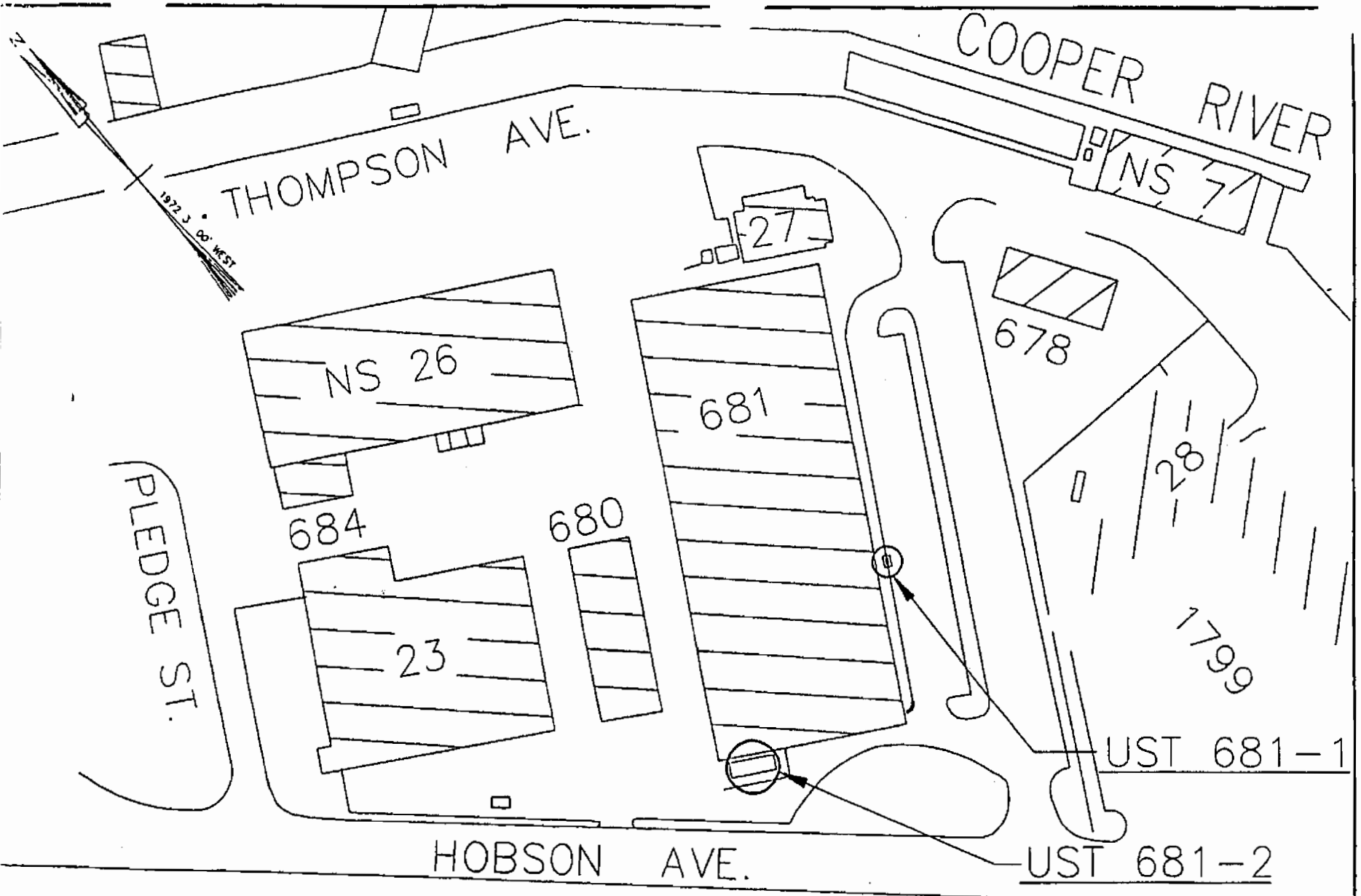


VII. BRIEF SITE DESCRIPTION AND HISTORY

Building 681 is a former Shore Intermediate Maintenance Activity (SIMA) shop and administration building that now serves as a Vessel Support Facility for the US Coast Guard. Underground storage tanks 681-1 and 681-2 were installed in 1985 when the building was constructed, but they had not been used since 1991 or earlier.

UST 681-1 was an unregulated, 100 gallon, waste oil tank on the south side of Building 681. Only piping within the tank excavation was removed due to sewer and gas line obstructions. The remaining drain and vent piping were capped.

UST 681-2 was an unregulated, 20,000 gallon, fuel oil tank for the boilers of Buildings 680 and 681. Despite the very good condition of the tank, groundwater sample SPORT 0267-1, taken from the tank excavation, required increased detection and reporting levels (DL and RL), as well as ethyl benzene above the Soil Screening Level (SSL). The supply and return piping to Building 680 was initially air tested to determine if the piping was sound and could be capped and left in place. The piping would not hold pressure, therefore approximately 90 feet of asphalt was cut to remove the piping. Corrosion, pitting, and several holes were found in one 30 foot section of piping (see Site Map 4), but the soil surrounding the piping was free of petroleum staining and odors and the samples were relatively free of contaminants. The worst sample in the pipe excavation was taken at the last fitting next to Building 680. The sample registered elevated naphthalene and raised DLs/RLs.



150' 0 150'

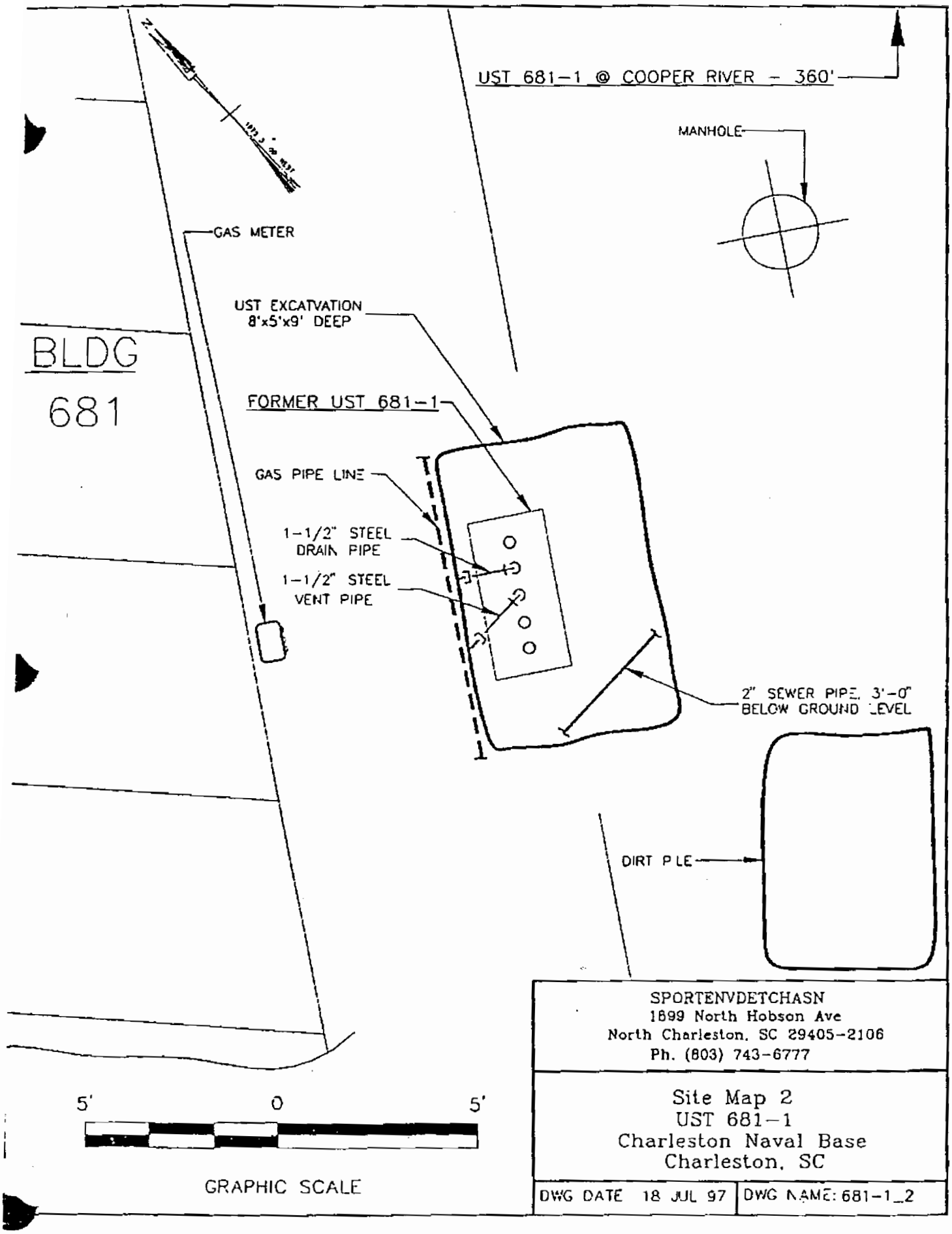
GRAPHIC SCALE

SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC
29405-2106
Ph. (803) 743-6777

Site Map 1
UST's 681-1 & 681-2
Charleston Naval Base
Charleston, SC

DWG DATE. 14 JUL 97

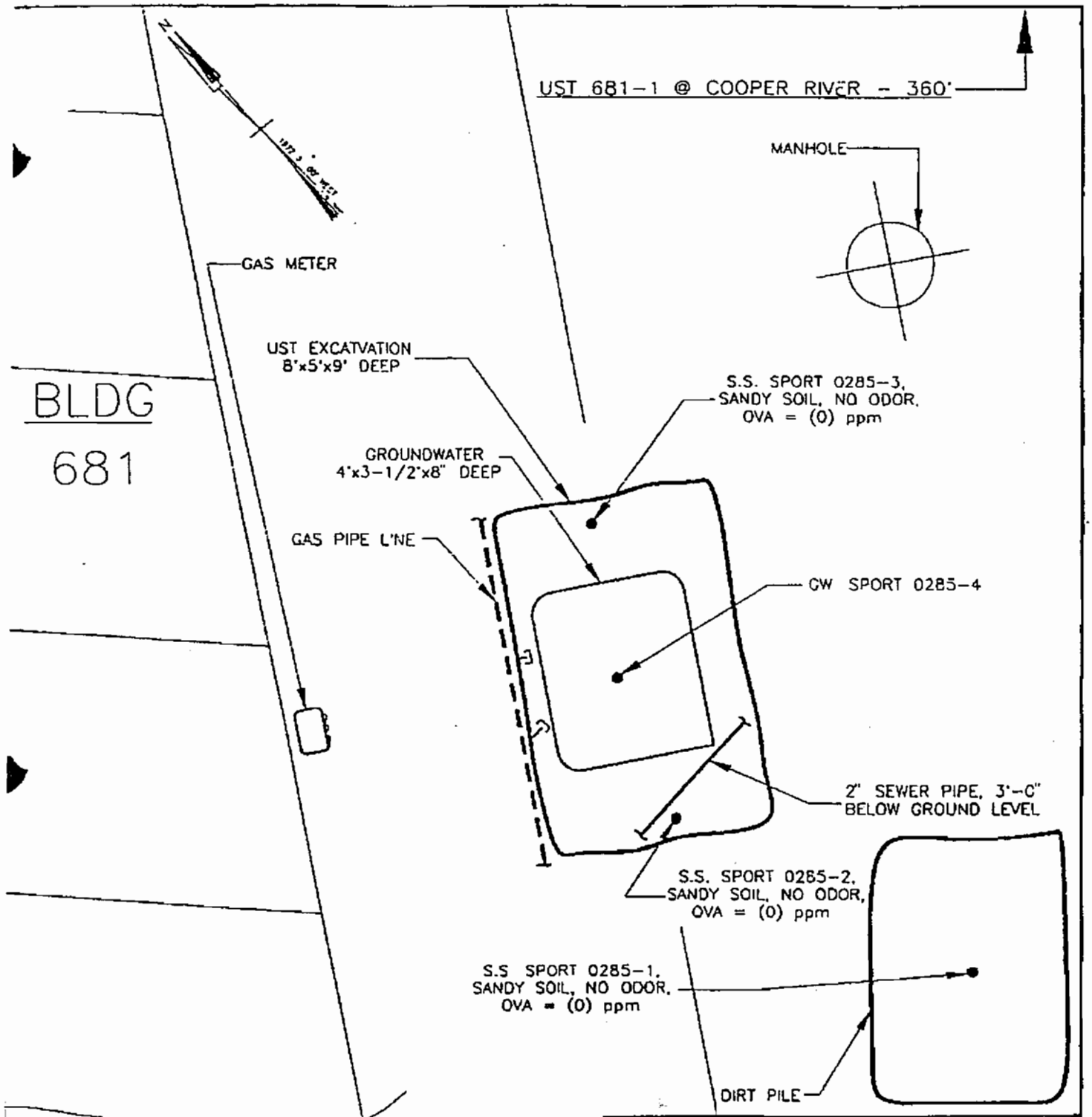
DWG NAME: NS681_1



SPORTENVDETCHASN
1899 North Hobson Ave
North Charleston, SC 29405-2106
Ph. (803) 743-6777

Site Map 2
UST 681-1
Charleston Naval Base
Charleston, SC

DWG DATE 18 JUL 97 | DWG NAME: 681-1_2



LEGEND

GW. - GROUNDWATER
S.S. - SOIL SAMPLE

5' 0 5'

GRAPHIC SCALE

SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC 29405-2106
Ph. (803) 743-6777

Site Map 3
UST 681-1
Charleston Naval Base
Charleston, SC

DWG DATE: 21 JUL 97 | DWG NAME: 681-1_3

681-1

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LABORATORY DIVISION
CHARLESTON NAVAL SHIPYARD
CODE 134, BLDG 13
CHARLESTON, S.C. 29408-6100

GENERAL LABORATORY REPORT

Date: 11 August 1995

To: Code 300C.9, Bldg.8

Subj: ANALYSIS OF WASTE OIL / USTNS 022 (LO) (681-1)

Ref: (a) Job Order: 71-002-16002
(b) Report NO: 95CH00923 : REM- 333
(c) ECP #2

1. As authorized by reference (a) and requested by reference (b), one (1) sample of WASTE OIL / USTNS 022 (LO) was analyzed per reference (c).

2. The results follow :

TEST	RESULT
Arsenic, mg/l	< 1
Chromium, mg/l	46 10
Cadmium, mg/l	1.8
Lead, mg/l	95
PCB's, ppm	< 2
Flash Point, °F	> 230
Total Halogens, ppm	41
pH	7.18

8/11/95 — 8-11-95

Analyst — Head, LABORATORY DIVISION

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631-1
B2B

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87451
NC	233	
SC	10120	10302
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: January 16, 1997

Sample ID : SPORT0285-1
Lab ID : 9701105-01
Matrix : Soil
Date Collected : 01/07/97
Date Received : 01/08/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	01/10/97	1256	96016	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	328	656	ug/kg	2.0	BDG	01/10/97	2246	95994	2
Acenaphthylene	U	0.00	328	656	ug/kg	2.0					
Anthracene	U	0.00	328	656	ug/kg	2.0					
Benzo(a)anthracene	U	0.00	328	656	ug/kg	2.0					
Benzo(a)pyrene	U	0.00	328	656	ug/kg	2.0					
Benzo(b)fluoranthene	U	0.00	328	656	ug/kg	2.0					
Benzo(ghi)perylene	U	0.00	328	656	ug/kg	2.0					
Benzo(k)fluoranthene	U	0.00	328	656	ug/kg	2.0					
Chrysene	U	0.00	328	656	ug/kg	2.0					
Dibenzo(a,h)anthracene	U	0.00	328	656	ug/kg	2.0					
Fluoranthene	U	0.00	328	656	ug/kg	2.0					
Fluorene	U	0.00	328	656	ug/kg	2.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	328	656	ug/kg	2.0					
Naphthalene	U	0.00	328	656	ug/kg	2.0					
Phenanthrene	U	0.00	328	656	ug/kg	2.0					
Pyrene	U	0.00	328	656	ug/kg	2.0					
Metals Analysis											
Mercury	J	0.0111	0.00234	0.200	mg/kg	1.0	RMJ	01/15/97	1004	96172	N
Silver	U	-10.5	40.0	944	ug/kg	2.0	NRM	01/10/97	1233	96023	3
Arsenic		1970	260	944	ug/kg	2.0					

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9701105-01

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87184	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02834

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		10300	23.3	944	ug/kg	2.0					
Cadmium	J	307	19.7	472	ug/kg	2.0	NRM	01/10/97	1233	96023	3
Chromium		9920	58.6	944	ug/kg	2.0					
Lead		8870	129	472	ug/kg	2.0					
Selenium	J	440	215	472	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		160	10.0	50.0	mg/kg	1.0	SLR	01/10/97	1200	96038	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/09/97	1300	95994	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	FGD	01/09/97	1500	96023	7

Comments:
A dilution was required for Extractable Organics due to matrix interference. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	109.	(30.0 - 115.)
Nitrobenzene-d5	M610	88.0	(23.0 - 120.)
p-Terphenyl-d14	M610	113.	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	119.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	90.8	(63.4 - 136.)
Toluene-d8	BTEX-8260	100.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	119.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	90.8	(63.4 - 136.)
Toluene-d8	NAP-8260	100.	(72.1 - 137.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87451
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-1

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

otes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* Indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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

Karen Blakeney
Reviewed By

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: January 16, 1997 |

Sample ID	: SPORT0285-2
Lab ID	: 9701105-02
Matrix	: Soil
Date Collected	: 01/07/97
Date Received	: 01/08/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
TEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	01/10/97	1326	96016	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	326	652	ug/kg	2.0	BDG	01/10/97	2319	95994	2
Acenaphthylene	U	0.00	326	652	ug/kg	2.0					
Anthracene	U	0.00	326	652	ug/kg	2.0					
Benzo(a)anthracene	U	0.00	326	652	ug/kg	2.0					
Benzo(a)pyrene	U	0.00	326	652	ug/kg	2.0					
Benzo(b)fluoranthene	U	0.00	326	652	ug/kg	2.0					
Benzo(ghi)perylene	U	0.00	326	652	ug/kg	2.0					
Benzo(k)fluoranthene	U	0.00	326	652	ug/kg	2.0					
Chrysene	U	0.00	326	652	ug/kg	2.0					
Dibenzo(a,h)anthracene	U	0.00	326	652	ug/kg	2.0					
Fluoranthene	U	0.00	326	652	ug/kg	2.0					
Fluorene	U	0.00	326	652	ug/kg	2.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	326	652	ug/kg	2.0					
Naphthalene	U	0.00	326	652	ug/kg	2.0					
Phenanthrene	U	0.00	326	652	ug/kg	2.0					
Pyrene	U	0.00	326	652	ug/kg	2.0					
Metals Analysis											
Mercury	U	-0.0159	0.00235	0.200	mg/kg	1.0	RMJ	01/15/97	1007	96172	N
Silver	U	-60.0	40.0	944	ug/kg	2.0	NRM	01/10/97	1238	96023	3
Arsenic		3560	260	944	ug/kg	2.0					

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87204	E81472/87458
NC	231	
SC	10120	10512
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		10100	23.3	944	ug/kg	2.0					
Cadmium	U	9.97	19.7	472	ug/kg	2.0	NRM	01/10/97	1238	96023	3
Chromium		18000	58.6	944	ug/kg	2.0					
Lead		5850	129	472	ug/kg	2.0					
Selenium		681	215	472	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	0.00	10.0	50.0	mg/kg	1.0	SLR	01/10/97	1200	96038	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/09/97	1300	95994	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	FGD	01/09/97	1500	96023	7

Comments:
A dilution was required for Extractable Organics due to matrix interference. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	88.7	(30.0 - 115.)
Nitrobenzene-d5	M610	71.5	(23.0 - 120.)
p-Terphenyl-d14	M610	89.5	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	128.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	102.	(63.4 - 136.)
Toluene-d8	BTEX-8260	108.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	128.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	102.	(63.4 - 136.)
Toluene-d8	NAP-8260	108.	(72.1 - 137.)

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	KPI
FL	E87156/87294	E87472/87459
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-2

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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

Karen Blakeney
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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-3
Lab ID : 9701105-03
Matrix : Soil
Date Collected : 01/07/97
Date Received : 01/08/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	01/09/97	1744	96016	1
Ethylbenzene		4.90	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)		32.4	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	163	330	ug/kg	1.0	BDO	01/10/97	2352	95994	2
Acenaphthylene	U	0.00	163	330	ug/kg	1.0					
Anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	163	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	163	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Chrysene	U	0.00	163	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	163	330	ug/kg	1.0					
Fluoranthene	U	0.00	163	330	ug/kg	1.0					
Fluorene	U	0.00	163	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	163	330	ug/kg	1.0					
Naphthalene	U	0.00	163	330	ug/kg	1.0					
Phenanthrene	U	0.00	163	330	ug/kg	1.0					
Pyrene	U	0.00	163	330	ug/kg	1.0					
Metals Analysis											
Mercury	J	0.0167	0.00225	0.200	mg/kg	1.0	RMJ	01/15/97	1009	96172	N
Silver	U	-69.5	40.0	944	ug/kg	2.0	NRM	01/10/97	1244	96023	3
Arsenic	J	271	260	944	ug/kg	2.0					

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium	J	853	23.3	944	ug/kg	2.0					
Cadmium	U	-7.53	19.7	472	ug/kg	2.0	NRM	01/10/97	1244	96023	3
Chromium		1120	58.6	944	ug/kg	2.0					
Lead	J	472	129	472	ug/kg	2.0					
Selenium	J	254	215	472	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	10.0	10.0	50.0	mg/kg	1.0	SLR	01/10/97	1200	96038	4

.e following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/09/97	1300	95994	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	FGD	01/09/97	1500	96023	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	91.3	(30.0 - 115.)
Nitrobenzene-d5	M610	87.3	(23.0 - 120.)
p-Terphenyl-d14	M610	89.9	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	99.6	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	106.	(63.4 - 136.)
Toluene-d8	BTEX-8260	100.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	99.6	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	106.	(63.4 - 136.)
Toluene-d8	NAP-8260	100.	(72.1 - 137.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 6010A
M4	EPA 9071
M5	EPA 3550

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NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-3

M = Method	Method-Description
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
' indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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Reviewed By

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Laboratory Certifications

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FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10512
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: January 17, 1997

Sample ID	: SPORT0285-4
Lab ID	: 9701105-04
Matrix	: GroundH2O
Date Collected	: 01/07/97
Date Received	: 01/08/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	JGS	01/14/97	1557	96232	1
Ethylbenzene		11.8	1.00	2.00	ug/l	1.0					
Toluene	U	0.360	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)		89.2	1.00	4.00	ug/l	1.0					
Naphthalene		2.32	1.00	2.00	ug/l	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	5.00	10.0	ug/l	1.0	BDG	01/14/97	1851	96160	2
Acenaphthylene	U	0.00	5.00	10.0	ug/l	1.0					
Anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(a)anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(a)pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(b)fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(ghi)perylene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(k)fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Chrysene	U	0.00	5.00	10.0	ug/l	1.0					
Dibenzo(a,h)anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Fluorene	U	0.00	5.00	10.0	ug/l	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Naphthalene	U	0.00	5.00	10.0	ug/l	1.0					
Phenanthrene	U	0.00	5.00	10.0	ug/l	1.0					
Pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Metals Analysis											
Mercury	J	0.0880	0.0148	0.500	ug/l	1.0	RMJ	01/15/97	1406	96184	N
Silver	U	-0.231	0.424	10.0	ug/l	1.0	NRM	01/13/97	1927	95902	3
Arsenic	U	-0.306	2.76	10.0	ug/l	1.0					

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STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hicks

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 17, 1997

Sample ID : SPORTU285-4

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		18.7	0.247	10.0	ug/l	1.0					
Cadmium	U	0.112	0.209	5.00	ug/l	1.0	NRM	01/13/97	1927	95902	3
Chromium	J	1.87	0.621	10.0	ug/l	1.0					
Lead	J	1.92	1.36	5.00	ug/l	1.0					
Selenium	U	0.682	2.25	5.00	ug/l	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	0.340	2.00	2.00	mg/l	1.0	SLR	01/10/97	1200	96037	4

c following prep procedures were performed:

GC/MS Base/Neutral Compounds	HDB	01/13/97	1300	96160	5
Mercury	RMJ	01/14/97	1700	96184	6
TRACE	CRB	01/10/97	1400	95902	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	68.6	(43.0 - 108.)
Nitrobenzene-d5	M610	61.2	(35.0 - 111.)
p-Terphenyl-d14	M610	69.6	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	116.	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	124.	(63.9 - 139.)
Toluene-d8	BTEX-8260	115.	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	116.	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	124.	(63.9 - 139.)
Toluene-d8	NAP-8260	115.	(77.1 - 121.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9070A
M 5	EPA 3510

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87254	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 17, 1997

Sample ID : SPORT0285-4

M = Method	Method-Description
M 6	EPA 7470
M 7	EPA 3005

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

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: January 16, 1997 |

Sample ID	: SPORT0285-5
Lab ID	: 9701105-05
Matrix	: GroundH2O
Date Collected	: 01/07/97
Date Received	: 01/08/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	JGS	01/14/97	1628	96232	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.00	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	118.	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	125.	(63.9 - 139.)
Toluene-d8	BTEX-8260	115.	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	118.	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	125.	(63.9 - 139.)
Toluene-d8	NAP-8260	115.	(77.1 - 121.)

M = Method	Method-Description
M 1	EPA 8260

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: January 16, 1997 |

Sample ID : SPORT0285-5

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
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indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	235	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: January 16, 1997 |

Sample ID : SPORT0285-6
Lab ID : 9701105-06
Matrix : Soil
Date Collected : 01/07/97
Date Received : 01/08/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	01/09/97	1814	96016	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	95.6	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	95.2	(63.4 - 136.)
Toluene-d8	BTEX-8260	98.0	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	95.6	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	95.2	(63.4 - 136.)
Toluene-d8	NAP-8260	98.0	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87451
NC	233	
SC	10120	10582
TN	02934	02934

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

Contact: Mr. Bill Hicks

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 16, 1997

Sample ID : SPORT0285-6

M = Method Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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Karen Blakeney
Reviewed By

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Page 1 of 1

CHAIN OF CUS.ODY RECORD

9701105

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

SAMPLE ANALYSIS REQUIRED (a) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 25056

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	RCRA METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	TPH	Cyanide	Coliform - specify type	BTEX + NAPTHALENE	PAH	Remarks	
-01	SPORTϕ285-1	1/7/97	14ϕϕ		X		X	4							X						X			X	X	UST 681-1-1 soil	.1
-02	SPORTϕ285-2	1/7/97	141ϕ		X		X	4							X						X			X	X	UST 681-1-2 soil	.1
-03	SPORTϕ285-3	1/7/97	142ϕ		X		X	4							X						X			X	X	UST 681-1-3 soil	.1
-04	SPORTϕ285-4	1/7/97	143ϕ				X	8							X						X			X	X	UST 681-1-4 GW	.2
-05	SPORTϕ285-5	1/7/97	133ϕ				X	3																X		UST 681-1 VOA TRIP BLANK	.3
-06	SPORTϕ285-6	1/7/97	133ϕ		X			1																X		UST 681-1 VOA SOIL TRIP BLANK	.4

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	1/8/97	1054	W.R. Hiers, Jr	W.R. Hiers, Jr	1/8/97	1423	Michael Patton

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
Michael Patton	1/8/97	1430	Dionne Francis	1-8-97		

White = sample collector Yellow = file Pink = with report

Metals, Subsurface Soil	StationID	I718SB001		I718SB001		I718SB002		I718SB002	
AOC 718	SampleID	718SB00102 (3-5ft)		718SB00102 (3-5ft)		718CB00202 (3-5ft)		718CB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/24/2002		6/25/2002		6/24/2002		6/25/2002	
	SDGNumber	61813		61813		61813		61813	
Parameter	**Units**								
Aluminum	mg/kg			7870	=			5430	=
Antimony	mg/kg			0.541	UJ			0.48	UJ
Arsenic	mg/kg			4.36	=			2.64	=
Barium	mg/kg			14	J			10.8	J
Beryllium	mg/kg			0.28	J			0.179	J
Cadmium	mg/kg			0.286	J			0.25	J
Calcium	mg/kg			86700	=			47500	=
Chromium, Total	mg/kg			33.7	J			23.5	J
Cobalt	mg/kg			0.92	J			0.658	J
Copper	mg/kg			6.14	=			7.6	=
Iron	mg/kg			5220	J			3290	J
Lead	mg/kg			6.76	J			12.2	J
Magnesium	mg/kg			3350	=			1700	=
Manganese	mg/kg			74.4	J			39.8	J
Nickel	mg/kg			14.8	J			7.63	J
Potassium	mg/kg			683	J			372	J
Selenium	mg/kg			0.376	J			0.267	U
Silver	mg/kg			0.13	U			0.115	U
Sodium	mg/kg			391	J			211	J
Thallium	mg/kg			2.22	U			1.1	U
Vanadium	mg/kg			19.7	=			13	=
Zinc	mg/kg			30.5	J			30.2	J
Mercury	mg/kg	0.011	J			0.011	J		

Metals, Subsurface Soil	StationID	I718SB002		I718SB002	
AOC 718	SampleID	718SB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002	
	DateAnalyzed	6/24/2002		6/25/2002	
	SDGNumber	61813		61813	
Parameter	Units				
Aluminum	mg/kg			7240	=
Antimony	mg/kg			0.513	UJ
Arsenic	mg/kg			3.96	=
Barium	mg/kg			15	J
Beryllium	mg/kg			0.241	J
Cadmium	mg/kg			0.342	J
Calcium	mg/kg			72800	=
Chromium, Total	mg/kg			23.8	J
Cobalt	mg/kg			0.896	J
Copper	mg/kg			11.1	=
Iron	mg/kg			4450	J
Lead	mg/kg			19.8	J
Magnesium	mg/kg			2170	=
Manganese	mg/kg			55.9	J
Nickel	mg/kg			11.2	J
Potassium	mg/kg			518	J
Selenium	mg/kg			0.417	J
Silver	mg/kg			0.123	U
Sodium	mg/kg			340	J
Thallium	mg/kg			1.91	U
Vanadium	mg/kg			16.3	=
Zinc	mg/kg			43.1	J
Mercury	mg/kg	0.01	J		

PCBs, Subsurface Soil AOC 718	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/14/2002		6/14/2002		6/14/2002	
	DateAnalyzed	6/18/2002		6/18/2002		6/18/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
PCB-1016 (Arochlor 1016)	ug/kg	38	U	360	U	361	U
PCB-1221 (Arochlor 1221)	ug/kg	38	U	360	U	361	U
PCB-1232 (Arochlor 1232)	ug/kg	38	U	360	U	361	U
PCB-1242 (Arochlor 1242)	ug/kg	38	U	360	U	361	U
PCB-1248 (Arochlor 1248)	ug/kg	38	U	360	U	361	U
PCB-1254 (Arochlor 1254)	ug/kg	77.2	U	731	U	732	U
PCB-1260 (Arochlor 1260)	ug/kg	77.2	U	731	U	732	U

Pesticides, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/22/2002		6/22/2002		6/22/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
Aldrin	ug/kg	7.5	UJ	14.2	UJ	14.2	UJ
Alpha BHC (Alpha Hexachlorocyclohexane)	ug/kg	7.5	U	14.2	U	14.2	U
Alpha-chlordane	ug/kg	1.1	J	7.1	J	3.1	J
Beta BHC (Beta Hexachlorocyclohexane)	ug/kg	7.5	U	14.2	U	14.2	U
Chlordane	ug/kg	74.7	U	212	J	136	J
Delta BHC (Delta Hexachlorocyclohexane)	ug/kg	7.5	U	14.2	U	14.2	U
Dieldrin	ug/kg	14.4	U	27.3	U	27.3	U
Endosulfan I	ug/kg	7.5	UJ	14.2	UJ	14.2	UJ
Endosulfan II	ug/kg	14.4	UJ	27.3	UJ	27.3	UJ
Endosulfan Sulfate	ug/kg	14.4	UJ	27.3	UJ	27.3	UJ
Endrin Aldehyde	ug/kg	14.4	U	27.3	U	27.3	U
Endrin Ketone	ug/kg	14.4	U	27.3	U	27.3	U
Endrin	ug/kg	14.4	U	27.3	U	27.3	U
Gamma BHC (Lindane)	ug/kg	7.5	U	14.2	U	14.2	U
Gamma-chlordane	ug/kg	4.9	J	21.4	J	13.6	J
Heptachlor Epoxide	ug/kg	7.5	UJ	13.8	J	4	J
Heptachlor	ug/kg	7.5	U	14.2	U	14.2	U
Methoxychlor	ug/kg	74.7	UJ	142	UJ	142	UJ
p,p'-DDD	ug/kg	3.2	J	27.3	UJ	27.3	UJ
p,p'-DDE	ug/kg	4.3	J	5.2	J	27.3	UJ
p,p'-DDT	ug/kg	14.4	UJ	27.3	UJ	27.3	UJ
Toxaphene	ug/kg	477	U	904	U	905	U

SVOCs, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
Benzo(g,h,i)Perylene	ug/kg	380	U	35	J	361	U
Phenol	ug/kg	380	U	360	U	361	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/kg	380	U	360	U	361	U
Bis(2-Chloroisopropyl)Ether	ug/kg	380	U	360	U	361	U
2-Chlorophenol	ug/kg	380	U	360	U	361	U
1,4-Dichlorobenzene	ug/kg	380	U	360	U	361	U
Benzyl alcohol	ug/kg	380	U	360	U	361	U
1,2-Dichlorobenzene	ug/kg	380	U	360	U	361	U
1,3-Dichlorobenzene	ug/kg	380	U	360	U	361	U
2-Methylphenol (o-Cresol)	ug/kg	380	U	360	U	361	U
N-Nitrosodi-n-propylamine	ug/kg	380	U	360	U	361	U
3-Methylphenol/4-Methylphenol (mp-Cresol)	ug/kg	380	U	360	U	361	U
Hexachloroethane	ug/kg	380	U	360	U	361	U
Nitrobenzene	ug/kg	380	U	360	U	361	U
Isophorone	ug/kg	380	U	360	U	361	U
2-Nitrophenol	ug/kg	380	U	360	U	361	U
2,4-Dimethylphenol	ug/kg	380	U	360	U	361	U
bis(2-Chloroethoxy) Methane	ug/kg	380	U	360	U	361	U
2,4-Dichlorophenol	ug/kg	380	U	360	U	361	U
Benzoic acid	ug/kg	1840	UJ	1750	UJ	1750	UJ
1,2,4-Trichlorobenzene	ug/kg	380	U	360	U	361	U
Naphthalene	ug/kg	380	U	360	U	361	U
4-Chloroaniline	ug/kg	380	U	360	U	361	U
Hexachlorobutadiene	ug/kg	380	U	360	U	361	U
4-Chloro-3-methylphenol	ug/kg	346	U	328	U	328	U
2-Methylnaphthalene	ug/kg	380	U	360	U	361	U
Hexachlorocyclopentadiene	ug/kg	380	U	360	U	361	U
2,4,6-Trichlorophenol	ug/kg	380	U	360	U	361	U
2,4,5-Trichlorophenol	ug/kg	1840	U	1750	U	1750	U
2-Chloronaphthalene	ug/kg	380	U	360	U	361	U

SVOCs, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
2-Nitroaniline	ug/kg	380	U	360	U	361	U
3-Nitroaniline	ug/kg	1840	U	1750	U	1750	U
Dimethyl Phthalate	ug/kg	380	U	360	U	361	U
2,6-Dinitrotoluene	ug/kg	380	U	360	U	361	U
Acenaphthylene	ug/kg	380	U	360	U	361	U
Acenaphthene	ug/kg	346	U	328	U	328	U
2,4-Dinitrophenol	ug/kg	1840	UJ	1750	UJ	1750	UJ
Dibenzofuran	ug/kg	380	U	360	U	361	U
2,4-Dinitrotoluene	ug/kg	346	U	328	U	328	U
Diethyl Phthalate	ug/kg	380	U	360	U	361	U
4-Nitrophenol	ug/kg	1840	U	1750	U	1750	U
Fluorene	ug/kg	380	U	360	U	361	U
4-Chlorophenyl Phenyl Ether	ug/kg	380	U	360	U	361	U
4,6-Dinitro-2-methylphenol	ug/kg	1840	U	1750	U	1750	U
4-Nitroaniline	ug/kg	1840	U	1750	U	1750	U
Diphenylamine	ug/kg	380	U	360	U	361	U
4-Bromophenyl Phenyl Ether	ug/kg	380	U	360	U	361	U
Hexachlorobenzene	ug/kg	380	U	360	U	361	U
Pentachlorophenol	ug/kg	1840	U	1750	U	1750	U
Phenanthrene	ug/kg	380	U	59.5	J	41.6	J
Anthracene	ug/kg	380	U	360	U	361	U
Di-n-butyl Phthalate	ug/kg	380	U	360	U	361	U
Fluoranthene	ug/kg	380	U	66.3	J	66.1	J
Pyrene	ug/kg	380	U	48.5	J	49.5	J
Benzyl Butyl Phthalate	ug/kg	380	U	360	U	361	U
Benzo(a)Anthracene	ug/kg	380	U	360	U	361	U
3,3'-Dichlorobenzidine	ug/kg	760	U	720	U	721	U
Chrysene	ug/kg	380	U	55.1	J	47.8	J
bis(2-Ethylhexyl) Phthalate	ug/kg	380	U	42	J	264	J
Di-n-octylphthalate	ug/kg	380	U	360	U	361	U

SVOCs, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/13/2002		6/13/2002		6/13/2002	
	DateAnalyzed	6/17/2002		6/17/2002		6/17/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
Benzo(b)Fluoranthene	ug/kg	380	U	360	U	361	U
Benzo(k)Fluoranthene	ug/kg	380	U	360	U	361	U
Benzo(a)Pyrene	ug/kg	380	U	24.3	J	27.6	J
Indeno(1,2,3-c,d)pyrene	ug/kg	380	U	360	U	361	U
Dibenz(a,h)anthracene	ug/kg	380	U	360	U	361	U
Carbazole	ug/kg	380	U	360	U	361	U

VOCs, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/21/2002		6/21/2002		6/21/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
Chloromethane	ug/kg	10.3	U	8.9	U	9.6	U
Vinyl chloride	ug/kg	10.3	U	8.9	U	9.6	U
Bromomethane	ug/kg	10.3	U	8.9	U	9.6	U
Chloroethane	ug/kg	10.3	U	8.9	U	9.6	U
1,1-Dichloroethene	ug/kg	5.1	U	4.5	U	4.8	U
Acetone	ug/kg	6.3	J	4.6	J	6.5	J
Carbon Disulfide	ug/kg	5.1	U	4.5	U	4.8	U
Methylene Chloride	ug/kg	5.1	U	4.5	U	4.8	U
trans-1,2-Dichloroethene	ug/kg	5.1	U	4.5	U	4.8	U
1,1-Dichloroethane	ug/kg	5.1	U	4.5	U	4.8	U
Vinyl acetate	ug/kg	10.3	UJ	8.9	UJ	9.6	UJ
Methyl ethyl ketone (2-Butanone)	ug/kg	10.3	U	8.9	U	9.6	U
cis-1,2-Dichloroethylene	ug/kg	5.1	U	4.5	U	4.8	U
1,2-Dichloroethene (total)	ug/kg	5.1	U	4.5	U	4.8	U
Chloroform	ug/kg	5.1	U	4.5	U	4.8	U
1,1,1-Trichloroethane	ug/kg	5.1	U	4.5	U	4.8	U
Carbon Tetrachloride	ug/kg	5.1	U	4.5	U	4.8	U
1,2-Dichloroethane	ug/kg	5.1	U	4.5	U	4.8	U
Benzene	ug/kg	5.1	U	4.5	U	4.8	U
Trichloroethylene (TCE)	ug/kg	5.1	U	4.5	U	4.8	U
1,2-Dichloropropane	ug/kg	5.1	U	4.5	U	4.8	U
Bromodichloromethane	ug/kg	5.1	U	4.5	U	4.8	U
2-Chloroethyl vinyl ether	ug/kg	10.3	U	8.9	U	9.6	U
cis-1,3-Dichloropropene	ug/kg	5.1	U	4.5	U	4.8	U
Methyl isobutyl ketone (4-Methyl-2-pentanone)	ug/kg	5.1	U	4.5	U	4.8	U
Toluene	ug/kg	5.1	U	4.5	U	4.8	U
trans-1,3-Dichloropropene	ug/kg	5.1	U	4.5	U	4.8	U
1,1,2-Trichloroethane	ug/kg	5.1	U	4.5	U	4.8	U
2-Hexanone	ug/kg	10.3	U	8.9	U	9.6	U
Tetrachloroethylene (PCE)	ug/kg	5.1	U	4.5	U	4.8	U

VOCs, Subsurface Soil
AOC 718

	StationID	I718SB001		I718SB002		I718SB002	
	SampleID	718SB00102 (3-5ft)		718CB00202 (3-5ft)		718SB00202 (3-5ft)	
	DateCollected	6/10/2002		6/10/2002		6/10/2002	
	DateExtracted	6/21/2002		6/21/2002		6/21/2002	
	DateAnalyzed	6/21/2002		6/21/2002		6/21/2002	
	SDGNumber	61813		61813		61813	
Parameter	**Units**						
Dibromochloromethane	ug/kg	5.1	U	4.5	U	4.8	U
Chlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U
Ethylbenzene	ug/kg	5.1	U	4.5	U	4.8	U
m+p Xylene	ug/kg	5.1	U	4.5	U	4.8	U
o-Xylene	ug/kg	5.1	U	4.5	U	0.44	J
Xylenes, Total	ug/kg	5.1	U	4.5	U	0.44	J
Styrene	ug/kg	0.55	J	0.44	J	0.66	J
Bromoform	ug/kg	5.1	U	4.5	U	4.8	U
1,1,2,2-Tetrachloroethane	ug/kg	5.1	U	4.5	U	4.8	U
1,3-Dichlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U
1,4-Dichlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U
1,2-Dichlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U
1,2,4-Trichlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U
1,2,3-Trichlorobenzene	ug/kg	5.1	U	4.5	U	4.8	U

	StationID	FIELDQC		FIELDQC		LABQC		LABQC	
	SampleID	680EW00205		680FW00205		BLK0N01301		BLK0N01304	
	DateCollected	10/19/1998		10/19/1998		10/26/1998		11/23/1998	
	DateExtracted	10/26/1998		10/26/1998		10/26/1998		11/23/1998	
	DateAnalyzed	11/19/1998		11/19/1998		11/05/1998		11/29/1998	
	SDGNumber	EN013		EN013		EN013		EN013	
Parameter	**Units**								
2,2'-Oxybis(1-chloro)propane	ug/L	5	U	5	U	5	U	5	U
4-Methylphenol (p-Cresol)	ug/L	5	U	5	U	5	U	5	U
N-Nitrosodiphenylamine	ug/L	5	U	5	U	5	U	5	U
Phenol	ug/L	5	U	5	U	5	U	5	U
bis(2-Chloroethyl) ether (2-Chloroethyl Ether)	ug/L	5	U	5	U	5	U	5	U
2-Chlorophenol	ug/L	5	U	5	U	5	U	5	U
1,3-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
1,4-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
Benzyl alcohol	ug/L	5	U	5	U	5	U	5	U
1,2-Dichlorobenzene	ug/L	5	U	5	U	5	U	5	U
2-Methylphenol (o-Cresol)	ug/L	5	U	5	U	5	U	5	U
N-Nitrosodi-n-propylamine	ug/L	5	U	5	U	5	U	5	U
Hexachloroethane	ug/L	5	U	5	U	5	U	5	U
Nitrobenzene	ug/L	5	U	5	U	5	U	5	U
Isophorone	ug/L	5	U	5	U	5	U	5	U
2-Nitrophenol	ug/L	5	U	5	U	5	U	5	U
2,4-Dimethylphenol	ug/L	5	U	5	U	5	U	5	U
bis(2-Chloroethoxy) Methane	ug/L	5	U	5	U	5	U	5	U
2,4-Dichlorophenol	ug/L	5	U	5	U	5	U	5	U
Benzoic acid	ug/L	25	U	25	U	25	U	25	U
Naphthalene	ug/L	5	U	5	U	5	U	5	U
4-Chloroaniline	ug/L	5	U	5	U	5	U	5	U
Hexachlorobutadiene	ug/L	5	U	5	U	5	U	5	U
4-Chloro-3-methylphenol	ug/L	5	U	5	U	5	U	5	U
2-Methylnaphthalene	ug/L	5	U	5	U	5	U	5	U
Hexachlorocyclopentadiene	ug/L	5	U	5	U	5	U	5	U
2,4,6-Trichlorophenol	ug/L	5	U	5	U	5	U	5	U
2,4,5-Trichlorophenol	ug/L	5	U	5	U	5	U	5	U
2-Chloronaphthalene	ug/L	5	U	5	U	5	U	5	U
2-Nitroaniline	ug/L	5	U	5	U	5	U	5	U
3-Nitroaniline	ug/L	5	U	5	U	5	U	5	U
Dimethyl Phthalate	ug/L	5	U	5	U	5	U	5	U
2,6-Dinitrotoluene	ug/L	5	U	5	U	5	U	5	U
Acenaphthylene	ug/L	5	U	5	U	5	U	5	U
Acenaphthene	ug/L	5	U	5	U	5	U	5	U

	StationID	FIELDQC		FIELDQC		LABQC		LABQC	
	SampleID	680EW00205		680FW00205		BLK0N01301		BLK0N01304	
	DateCollected	10/19/1998		10/19/1998		10/26/1998		11/23/1998	
	DateExtracted	10/26/1998		10/26/1998		10/26/1998		11/23/1998	
	DateAnalyzed	11/19/1998		11/19/1998		11/05/1998		11/29/1998	
	SDGNumber	EN013		EN013		EN013		EN013	
Parameter	**Units**								
2,4-Dinitrophenol	ug/L	10	U	10	U	10	U	10	U
Dibenzofuran	ug/L	5	U	5	U	5	U	5	U
2,4-Dinitrotoluene	ug/L	5	U	5	U	5	U	5	U
Diethyl Phthalate	ug/L	5	U	5	U	5	U	5	U
4-Nitrophenol	ug/L	10	U	10	U	10	U	10	U
Fluorene	ug/L	5	U	5	U	5	U	5	U
4-Chlorophenyl Phenyl Ether	ug/L	5	U	5	U	5	U	5	U
4,6-Dinitro-2-methylphenol	ug/L	10	U	10	U	10	U	10	U
4-Nitroaniline	ug/L	5	U	5	U	5	U	5	U
4-Bromophenyl Phenyl Ether	ug/L	5	U	5	U	5	U	5	U
Hexachlorobenzene	ug/L	5	U	5	U	5	U	5	U
Pentachlorophenol	ug/L	10	U	10	U	10	U	10	U
Phenanthrene	ug/L	5	U	5	U	5	U	5	U
Anthracene	ug/L	5	U	5	U	5	U	5	U
Di-n-butyl Phthalate	ug/L	5	U	5	U	5	U	5	U
Fluoranthene	ug/L	5	U	5	U	5	U	5	U
Pyrene	ug/L	5	U	5	U	5	U	5	U
Benzyl Butyl Phthalate	ug/L	5	U	5	U	5	U	5	U
Benzo(a)Anthracene	ug/L	5	U	5	U	5	U	5	U
3,3'-Dichlorobenzidine	ug/L	5	U	5	U	5	U	5	U
Chrysene	ug/L	5	U	5	U	5	U	5	U
bis(2-Ethylhexyl) Phthalate	ug/L	5	U	5	U	5	U	1	J
Di-n-octylphthalate	ug/L	5	U	5	U	5	U	5	U
Benzo(b)Fluoranthene	ug/L	5	U	5	U	5	U	5	U
Benzo(k)Fluoranthene	ug/L	5	U	5	U	5	U	5	U
Benzo(a)Pyrene	ug/L	5	U	5	U	5	U	5	U
Indeno(1,2,3-c,d)pyrene	ug/L	5	U	5	U	5	U	5	U
Dibenz(a,h)anthracene	ug/L	5	U	5	U	5	U	5	U
Benzo(g,h,i)Perylene	ug/L	5	U	5	U	5	U	5	U

2.0 PHYSICAL SETTING

2.1 Geology

2.1.1 Regional Physiographic and Geologic Setting

The regional physiographic and geologic setting for the CNC area is described in Section 2.1.1 of the *Draft Zone A RFI Report*. Local topography is presented in Figure 2.1. Regional geologic relationships across a regional plan view map (Figure 2.2) are shown in cross sections in Figure 2.3.

2.1.2 Regional Hydrology and Hydrogeology

The regional hydrology and hydrogeology for the CNC area is described in Section 2.2.1 of the *Draft Zone A RFI Report*. Major surface water features are presented on Figure 2.1.

2.2 Zone I Geologic Investigation

Geologic and hydrogeologic information has been obtained from soil and monitoring well borings installed during the Zone I RFI. Because Zones I and H share a common boundary, much of the geologic information from the Zone H RFI is necessary for interpreting Zone I geology. The geologic cross sections presented in this report have been refined slightly from those in the *Final Zone H RFI Report* (E/A&H, 1996c) to reflect the increased understanding of CNC geology from previous Zone RFIs. Lithologic samples acquired using hollow-stem auger, wet rotary, and rotasonic drilling methods were classified and logged by an E/A&H geologist as described in the *Final Comprehensive Sampling and Analysis Plan (CSAP) RCRA Facility Investigation* (E/A&H, 1996d).

2.2.1 Monitoring Wells

RFI activities in Zone I included installation of 65 monitoring wells and one deep soil boring (see Figure 2.4). Deep and shallow well pairs were installed at 19 nonbiased (grid-based) locations. Twenty-seven shallow monitoring wells were installed at biased (AOC/SWMU) locations. Stratigraphic information in Zone I is limited to 75 feet below ground surface (feet bgs), which is the depth of the deepest well boring NBCIGDI15D. Table 2.1 lists the monitoring wells and

summarizes well construction data. Monitoring well boring stratigraphy and well construction logs are presented in Appendix A.

2.2.2 Geotechnical

Shelby tube samples were collected as part of the RFI drilling program and analyzed for porosity, bulk density, grain size distribution, specific gravity, percent moisture, and vertical permeability. Thin-walled steel Shelby tubes were pushed into undisturbed soil with a truck-mounted drill rig. The steel tubes were recovered, sealed, labeled, and retained onsite until transported to the laboratory for analysis. Samples were collected in plastic bags from two additional deep well locations to provide supplemental porosity and grain size data for deeper sediments.

Shelby tube sample laboratory data reports are presented in Appendix B. Table 2.2 summarizes Zone I Shelby tube data. These data, discussed in Section 2.2.3, are sorted on the basis of stratigraphic units which have been delineated in subsequent zone RFIs completed to date.

2.2.3 Zone I Geology

All Zone I deep well borings were drilled to the top of the Cooper Formation for the purpose of monitoring the deeper portions of the surficial aquifer (Figure 2.3). As a result, only Quaternary and Tertiary- age sediments were encountered during this investigation. The lowermost stratigraphic unit identified in Zone I is the Ashley Formation (Ta) of the Mid-Tertiary-age Cooper Group. Overlying the Ta are younger Upper Tertiary and Quaternary-age stratigraphic units. Stratigraphic units encountered during the RFI are discussed in the following sections in ascending order.

Table 2.1
Monitoring Well Construction Data

		Stateplane Coordinates				Construction Depths (ft bgs)				
Well Identifier	Date Installed	Northing	Easting	TOC elev (ft msl)	Ground elev (ft msl)	TOS	BOS	BOW	DTW * (ft TOC)	GW elev (ft msl)
NBCI012001	4/10/95	366357.11	2325579.24	8.09	5.9	2.5	12.0	12.5	4.23	3.86
NBCI012002	4/10/95	366345.97	2325708.89	8.71	6.5	3.0	12.5	13.0	4.30	4.41
NBCI012003	4/10/95	366253.93	2325756.38	8.31	6.2	2.5	12.0	12.5	4.41	3.90
NBCI177001	3/17/98	371613.50	2324646.43	5.57	5.9	2.5	12.0	12.5	3.39	2.18
NBCI177002	3/17/98	371549.09	2324677.13	6.82	7.0	2.5	12.0	12.5	4.04	2.78
NBCI671001	4/3/95	371544.78	2323968.34	8.43	8.5	3.0	12.5	13.0	5.90	2.53
NBCI671002	4/3/05	371609.01	2324020.33	7.81	7.9	2.5	12.0	12.5	5.61	2.20
NBCI671003	4/4/95	371546.95	2324230.42	8.76	8.8	2.5	12.0	12.5	5.54	3.22
NBCI671004	4/4/95	371468.61	2324203.46	8.73	8.8	2.5	12.0	12.5	5.44	3.29
NBCI675001	4/4/95	371316.15	2325605.91	10.90	8.0	2.5	12.0	12.5	6.72	4.18
NBCI675002	4/11/95	371253.96	2325568.42	11.52	8.8	2.5	12.0	12.5	11.30	0.22
NBCI676001	4/4/95	371236.90	2325607.59	10.98	8.1	2.5	12.0	12.5	8.55	2.43
NBCI677002	4/11/95	371351.98	2325655.28	7.53	7.8	2.5	12.0	12.5	3.95	3.58
NBCI678001	4/11/95	371200.50	2325925.44	8.81	8.7	2.5	12.0	12.5	5.58	3.23
NBCI678002	4/11/95	371252.86	2326067.82	8.10	8.0	2.5	12.0	12.5	5.07	3.03
NBCI679001	9/23/98	371077.64	2325710.93	12.04	9.2	4.0	13.5	14.0	8.02	1.18
NBCI680001	3/16/98	370851.04	2326375.40	9.47	9.6	3.0	12.5	13.0	5.61	3.86
NBCI680002	3/17/98	371002.10	2326415.20	9.32	9.6	3.0	12.5	13.0	5.96	3.36
NBCI680003	3/16/98	370948.37	2326520.20	9.32	9.6	2.5	12.0	12.5	5.72	3.60
NBCI680004	9/24/98	371024.71	2326378.12	9.22	9.4	4.0	13.5	14.0	5.55	3.67
NBCI681001	9/24/98	370701.87	2326441.98	9.54	9.8	4.0	13.5	14.0	5.12	4.42
NBCI681002	9/24/98	370606.35	2326573.09	9.83	9.9	4.0	13.5	14.0	5.82	4.01

Table 2.1
Monitoring Well Construction Data

Well Identifier	Date Installed	Stateplane Coordinates Northing	Stateplane Coordinates Easting	TOC elev (ft msl)	Ground elev (ft msl)	Construction Depths (ft bgs) TOS	BOS	BOW	DTW * (ft TOC)	GW elev (ft msl)
NBCI681003	9/23/98	370780.31	2326690.61	9.72	9.9	4.0	13.5	14.0	5.48	4.24
NBCI687001	4/12/95	367902.37	2326568.37	12.07	9.8	2.5	12.0	12.5	8.12	3.95
NBCI687002	4/12/95	367896.60	2326611.55	11.99	9.8	2.5	12.0	12.5	7.85	4.14
NBCI687003	4/12/95	367767.52	2326587.97	11.99	9.5	2.5	12.0	12.5	7.92	4.07
NBCI687004	4/12/95	367775.10	2326544.48	11.32	8.[illegible]	2.2	11.9	12.4	7.42	3.90
NBCIGDI001	3/13/95	367397.60	2324652.29	8.58	6.2	2.4	12.0	12.5	4.90	3.68
NBCIGDI01D	4/11/95	367391.37	2324656.68	8.74	6.4	44	53.5	54	3.90	4.84
NBCIGDI002	3/14/95	366909.47	2325177.18	11.69	9.4	2.9	12.4	12.9	7.73	3.96
NBCIGDI02D	4/12/95	366901.12	2325183.06	11.77	9.8	59.0	68.5	69.0	9.95	1.82
NBCIGDI003	3/16/95	366260.57	2325571.56	8.87	6.6	2.5	12.0	12.5	5.14	3.73
NBCIGDI03D	4/12/95	366254.69	2325574.65	9.13	6.3	52.0	61.5	62.0	2.55	6.58
NBCIGDI004	3/20/95	365450.88	2326164.49	8.62	6.2	2.5	12.0	12.5	4.76	3.86
NBCIGDI04D	4/13/95	365459.92	2326159.26	8.68	5.8	35.0	44.5	45.0	1.70	6.98
NBCIGDI005	3/27/95	366009.24	2326382.90	6.40	4.3	2.6	12.1	12.6	3.40	3.00
NBCIGDI05D	4/13/95	365995.70	2326380.40	6.62	4.0	57.0	66.5	67.0	1.83	4.79
NBCIGDI006	3/27/95	366555.27	2326452.29	7.73	5.5	2.5	12.0	12.5	3.99	3.74
NBCIGDI06D	4/14/95	366548.54	2326450.45	7.54	5	40.0	49.5	50.0	6.58	0.96
NBCIGDI007	3/21/95	367181.64	2326453.50	10.45	7.8	2.5	12.0	12.5	6.35	4.10
NBCIGDI07D	4/10/95	367191.97	2326453.46	10.58	8.0	34.4	43.9	44.4	8.54	2.04
NBCIGDI008	3/21/95	367772.20	2326479.29	11.57	9.0	2.5	12.0	[illegible]	7.86	3.71
NBCIGDI08D	4/10/95	367776.42	2326486.78	11.73	9.0	42.0	52.5	53.0	10.30	1.43
NBCIGDI009	3/16/95	368419.81	2326505.09	11.30	8.7	3.5	13.0	13.5	5.41	5.89

Table 2.1
Monitoring Well Construction Data

Well Identifier	Date Installed	Stateplane Coordinates Northing	Stateplane Coordinates Easting	TOC elev (ft msl)	Ground elev (ft msl)	Construction Depths (ft bgs) TOS	BOS	BOW	DTW * (ft TOC)	GW elev (ft msl)
NBCIGDI09D	4/11/95	368414.46	2326508.88	11.38	8.7	47.0	56.5	57.0	8.69	2.69
NBCIGDI010	3/15/95	368729.36	2326743.35	8.06	5.01	2.0	11.5	12.0	5.06	3.00
NBCIGDI10D	4/13/95	368723.60	2326743.02	7.98	5.2	27.0	36.5	37.0	8.67	0.69
NBCIGDI011	3/21/95	369617.77	2326637.69	8.77	6.1	2.5	12.0	12.5	6.26	2.51
NBCIGDI11D	4/8/95	369617.05	2326646.86	8.93	6.2	33.0	41.5	42.0	3.95	4.98
NBCIGDI012	3/22/95	370206.26	2326720.53	10.91	8.2	2.5	12.0	12.5	10.88	0.03
NBCIGDI12D	4/8/95	370200.98	2326725.40	10.81	8.1	40.5	50.0	50.5	9.62	1.19
NBCIGDI013	3/22/95	370827.24	2326724.24	11.85	9.3	2.5	12.0	15.0	8.30	3.55
NBCIGDI13D	4/9/95	370815.77	2326727.69	11.86	9.3	29.0	38.5	39.0	12.59	-0.73
NBCIGDI014	3/23/95	371168.46	2326133.79	8.72	7.1	2.5	12.0	12.5	5.60	3.12
NBCIGDI14D	4/6/95	371164.81	2326139.09	8.53	8.9	27.5	37.0	37.5	7.02	1.51
NBCIGDI015	3/27/95	371203.07	2325532.77	10.96	8.3	2.5	12.0	12.5	8.41	2.55
NBCIGDI15D	4/4/95	371206.86	2325525.87	10.77	8.2	65.0	74.5	75.0	11.19	-0.42
NBCIGDI016	3/23/95	371480.21	2324903.31	5.99	6.1	3.0	12.5	13.0	3.44	2.55
NBCIGDI16D	4/8/95	371474.34	2324899.63	5.90	6.1	54.5	64.0	64.5	6.88	-0.98
NBCIGDI017	3/22/95	371634.45	2324125.25	10.14	7.6	2.5	12.0	12.5	7.05	3.09
NBCIGDI17D	4/6/95	371635.40	2324116.71	10.15	7.6	36.0	45.5	46.0	9.84	0.31
NBCIGDI018	3/14/95	371634.54	2323772.22	7.02	7.3	2.5	12.0	12.5	4.21	2.81
NBCIGDI18D	4/6/95	371647.96	2323769.94	7.00	7.2	34.0	43.5	44.0	6.01	0.99
NBCIGDI019	3/20/95	364743.29	2326255.55	8.76	6.2	2.5	12.0	12.5	5.37	3.39
NBCIGDI19D	4/9/95	364750.17	2326260.13	9.10	6.3	23.0	25.4	25.5	10.37	-1.27

Notes:

TOC	=	Top of well casing
msl	=	Mean sea level
bgs	=	Below ground surface
TOS	=	Top of screened interval
BOS	=	Bottom of screened interval
BOW	=	Bottom of well (end cap)
DTW	=	Depth to groundwater from TOC
*	=	The only comprehensive data set for all Zone I wells, collected 7/21/98, is presented above. These data are not used anywhere else in this report.

Table 2.2
Geotechnical Results from Shelby Tube Samples

Type	Location ID	Depth (ft bgs)	USCS	STRAT	n	SG (g/cm^3)	Vertical Permeability (cm/sec)	Vertical Permeability (ft/day)	% Moisture Content Composite*	% Moisture Content Range	Grain Size Distribution % sand	Grain Size Distribution % silt	Grain Size Distribution % clay
ST	NBCIGDI004	15-17	CH	Qm	55.5	2.66	9.87E-08	2.80E-04	105.1	65.7-133.3	2	56	42
ST	NBCIGDI007	15-17	CH/OH	Qm	74.4	2.65	2.41E-07	6.82E-04	106.5	91.9-114.8	4.5	54.5	41
ST	NBCIGDI016	15-17	OH	Qm	66.0	2.61	6.48E-08	1.84E-04	78.6	71.2-84.6	4	47	49
ST	NBCIGDI001	15-17	OH	Qm	84.7	2.54	4.50E-05	1.28E-01	138.6	89.9-219.9	3	59	38
ST	NBCIGDI005	15-17	OH	Qm	59.7	2.47	1.71E-07	4.85E-04	116.7	103.2-124.4	4	54	42
ST	NBCIGDI006	15-17	OH	Qm	73.9	2.55	1.97E-05	5.59E-02	107	97.8-115.1	17	44	39
ST	NBCIGDI008	15-17	OH	Qm	69.3	2.67	4.33E-07	1.23E-03	110.3	80.5-156.4	7	49	44
ST	NBCIGDI009	14-16	OH	Qm	47.5	2.66	1.48E-07	4.21E-04	110.2	95.4-137.2	9	52.5	38.5
ST	NBCIGDI010	15-17	OH	Qm	65.1	2.58	3.81E-07	1.08E-03	70.7	61-80.4	23	44	33
ST	NBCIGDI011	15-17	OH	Qm	76.9	2.60	2.14E-07	6.06E-04	107.9	85.2-126.9	1.5	49	49.5
ST	NBCIGDI012	15-17	OH	Qm	70.8	2.60	8.69E-08	2.46E-04	72.8	32.8-96.5	2.5	55.5	42
ST	NBCIGDI013	15-17	OH	Qm	52.2	2.69	9.72E-07	2.76E-03	47.6	21.7-95.5	36	39	25
ST	NBCIGDI014	20-22	OH	Qm	73.2	2.60	4.16E-07	1.18E-03	90.7	70.1-105	2	50	48
ST	NBCIGDI015	15-17	OH	Qm	73.1	2.60	7.90E-08	2.24E-04	98.3	86.5-113	3	51	46
ST	NBCIGDI017	15-17	OH	Qm	55.4	2.65	1.59E-05	4.50E-02	112.4	100-119.6	4	46	50
ST	NBCIGDI018	20-22	OH	Qm	69.9	2.59	8.27E-08	2.34E-04	83.3	70.9-93.1	27	38	35
ST	NBCIGDI019	15-17	OH	Qm	71.2	2.56	4.79E-07	1.36E-03	73.6	59.6-96.3	8	54	38
ST	NBCI012001	15-17	OH	Qm	74.7	2.56	1.81E-07	5.14E-04	119.2	101-128.4	4	67	29
ST	NBCI671004	13-15	OH	Qm	75.0	2.67	5.70E-07	1.62E-03	76.6	21.9-110.2	7	57	39
ST	NBCI678001	15-17	OH	Qm	72.6	2.58	1.00E-07	2.83E-04	108	103.2-114.9	4.5	67.5	28
bag	NBCIGDI08D	45-47	SP	Qs	—	—	—	—	—	—	92.5	3	4.5
bag	NBCIGDI15D	65-67	SP	Qs	—	—	—	—	—	—	96	1.5	2.5

Notes:

*	=	Composite value taken from two to three moisture content readings per Shelby tube sample. Values greater than 100% are due to presence of peat and high organic content.
n	=	Porosity (%)
SG	=	Specific gravity
ST	=	Shelby tube sample (undisturbed)
USCS	=	Unified Soil Classification System (visual from laboratory)
STRAT	=	CNC lithologic classification based in part on USCS description
Qm	=	Quaternary marsh clay
Qs	=	Quaternary sand
g/cm^3	=	grams per cubic centimeter
cm/sec	=	centimeters per second
ft/day	=	feet per day

CH =	High Plasticity inorganic clay
OH =	High Plasticity organic clay
bag =	Samples collected in Ziploc™ bags for grain-size analyses only.
SP =	Poorly-graded sand (well-sorted sand)

2.2.3.1 Tertiary-Age Sediments

Ashley Formation

The oldest sediments encountered during the Zone I RFI has been the Ta, the youngest member of the Eocene-Oligocene Cooper Group. The Ta was deposited in an open-marine shelf environment during a rise in sea level in the late Oligocene (Weems and Lemon, 1993).

Due to successive sea level transgression-regression (rise and fall) sequences during late Tertiary and early Quaternary time, extensive erosion has removed many of the marine and terrigenous deposits overlying the Ta (Weems and Lemon, 1993). The scoured nature of the upper Ta is plainly evident in Figure 2.5, which depicts surface contours of the unit based on deep well boring data throughout the southern tip of the base, and geologic cross sections (Figures 2.6 through 2.8). The Ta contact in Zone I ranges in elevation from -66 ft mean sea level (msl) at GDI15D to -19 ft msl at GDI19D, with a mean elevation of -47 ft msl.

The Ta penetrated in Zone I is a mustard-yellow to olive-brown, tight, slightly calcareous, clayey silt to silty clay with varying amounts of very fine-grained sand that decrease rapidly with depth. It is generally dry, stiff, and brittle and may contain fragments of oyster shells and clam molds and other microfossils. Field identification of the Ta is usually aided by the presence of a lag bed of phosphate nodules, phosphatic sand, and coarse-grained shell fragments that immediately overlies its contact.

2.2.3.2 Quaternary-Age Sediments

The Quaternary Period began 1.6 million years ago with the Pleistocene Epoch and continues with the Holocene (recent) Epoch from 65,000 years ago to the present. During Quaternary time, several sea transgressions-regressions resulted in a jumbled network of terrace complexes composed of varied depositional environments such as barrier islands, back barrier lagoons, tidal inlets, and shallow-marine shelf systems. Due to regional crustal uplift in the Charleston region during the

Quaternary, many barrier to back barrier deposits from high sea-level stands are preserved as terraces. However, succeeding transgressions reworked the shallow-marine shelf deposits on the seaward side of each older barrier ridge or island (Weems and Lemon, 1993). The result of this erosional and redepositional process of older sediments is that a subsequently younger sequence of deposits may exist on the seaward side, laterally adjacent to the previous (older) coastal deposit (Weems and Lemon, 1993). Although Weems and Lemon (1993) have identified and correlated several formations of Quaternary-age sediments, it can be difficult to determine discrete formational units within the Quaternary system. Field identification of these formational units is difficult since many characteristics may only be evident at the microscopic level.

Throughout Zone I, Quaternary-age sediments extend from the top of the Ta to just below ground surface. Based on the 19 deep well borings and one deep soil boring drilled in Zone I, these sediments range from approximately 75 feet thick at GDI15D to 25 feet thick at GDI19D, including anthropogenic deposits. These sediments primarily comprise the Pleistocene-age Wando Formation (deposited 70,000 to 130,000 years ago), which are in turn overlain by Holocene-age sand and clay deposits.

In general, the Wando deposition encompasses three distinct high sea-level stands in the late Pleistocene (Weems and Lemon, 1993). As a result, Wando composition consists of repeating sequences of clayey sand and clay deposits overlying barrier sand deposits which, in turn, overlie fossiliferous shelf-sand deposits. In Holocene time, rivers and streams have down-cut these sediment sequences, leaving scours that have filled with clay and silty sand deposits typical of low-energy environments. These younger deposits may resemble Wando deposits and further complicate the interpretation of local geology. Consequently, only two distinct Quaternary-age stratigraphic units have been correlated in the Zones H and I lithologic cross sections (Figures 2.6 through 2.8). These units, designated Qm (Quaternary marsh clay) and Qs (Quaternary sand), were selected because of their generally consistent lithologic characteristics throughout each zone

Quaternary Marsh Clay

The Qm is the most persistent and easily identified stratigraphic unit in Zones H and I. It is found in borings as a dark brown to black, fat, silty organic clay containing plant material, oyster shells, and thin sand lenses. It has a characteristic "rotten egg" odor signifying an oxygen-poor reducing condition.

Stratigraphically, the importance of the Qm unit is that it typically intervenes between an upper and a lower layer of Qs. The Qm unit, pervasive throughout the southeastern portion of CNC as marsh clay, was encountered in all but one of the deep well borings and the deep soil boring. However, at two deep well borings, sample recovery was limited due to drilling difficulties, so the presence of marsh clay is unknown. Where present, the Qm unit varied in thickness from approximately 9 feet at GDI13D to more than 45 feet at GDI05D, averaging 31 feet thick. The Qm is also present as small, discontinuous lenses throughout the shallow subsurface.

Twenty geotechnical samples of Qm were obtained during the Zone I RFI from depths of 13 to 20 feet bgs. These data were presented and designated as Qm lithologies in Table 2.2. Arithmetic averages were calculated for total porosity and grain size distribution as 68.1, and 8.7% sand, 51.7% silt and 39.8% clay. The geometric mean of the vertical permeabilities reported for these 20 samples was determined to be 4.3E-06 centimeters per second (cm/sec) (equivalent to 1.2E-02 ft per day).

Quaternary Sand

The Qs unit is typically found in the southern peninsula of CNC as a poorly defined shallow or upper Quaternary sand (Qs_U) layer overlying thick Qm deposits and a better defined basal or lower Quaternary sand (Qs_L) unit intervening between the Qm and Ta units. The ambiguity in delineating the Qs_U lies in the highly variable nature of the fill material that covers much of the southeastern

portion of the base. As a result, the Qs_U is intermixed with fill material such as gravel, inorganic clays and silts, and dredged spoils from the Cooper River (which often include clasts of Ta).

The Qs is best described as a green-gray, green to tan sand with a small percentage of fines. Grain size ranges from very fine to coarse, but is typically found as fine to medium. Shell fragments and oyster shells are found in varying percentages throughout the Qs as a whole, but tend to comprise higher percentages in the basal Qs_L. The Qs_L is easily identified in most deep well borings, but is not laterally consistent. Frequently, the Qs_L is interbedded with clay lenses and may even degrade to sandy laminae within Qm deposits that immediately overlie the Ta.

No undisturbed Shelby tube samples could be obtained from the Qs_U, but grain size data was obtained from two bagged samples taken from the Qs_L (Table 2.2). These samples had a mean grain-size distribution of 94.3% sand, 2.3% silt and 3.5%.

2.2.4 Soil

Surface soil at CNC has been extensively disturbed. Native soil was the fine-grained silt, silty sand, and clay typical of tidal marsh environments. Sand lenses present in localized areas are generally only a few feet thick. Much of CNC, particularly the southern portion, has been filled using dredged materials from the Cooper River and Shipyard Creek. The dredged materials consist of an unsorted mixture of sand, silt, and clay. Figure 2.9 indicates that most of the remainder of Zone I has been either filled or reworked for development. Along the Cooper River, enough dredge spoil deposition and alteration has occurred to assume that much of the upper and surficial sediment encountered during soil boring is not natural. Granite boulders, concrete slabs, and wood pilings were occasionally encountered, indicating former waterfront development had been covered and built upon.

2.3 Zone I Hydrogeology

Hydrogeology information was obtained from slug tests, specific capacity tests, and water level measurements conducted during the Zone H and I RFIs. Estimates of vertical permeability, grain size distribution, and porosity were obtained from analysis of Shelby tube samples collected during drilling (Table 2.2). Only data pertinent to the Quaternary and Tertiary Ta deposits are discussed since they were the only deposits encountered in Zone I.

2.3.1 Tertiary-Age Sediments

2.3.1.1 Ashley Formation

The Ta is important because of its role as a confining unit between the lower members of the Cooper Group and Eocene-age Santee Limestone, and the overlying water-bearing Quaternary-age sediments (Park, 1985). Lithologic cross sections presented by Weems and Lemon (1993) show the Ta as having a laterally consistent overall thickness. Samples from this unit at CNC have shown high clay and silt and varying sand contents depending greatly upon depth. Five Shelby tube samples, collected from the Ta during the Zone H RFI, averaged a very low vertical permeability of 1E-06 cm/sec (0.0027 ft/day) (E/A&H, 1996c). According to Fetter (1988), sediments with permeabilities of 1E-05 cm/sec (0.03 ft/day) or less can be considered confining units. All deep well borings in Zone I were terminated when the Ta was encountered.

2.3.2 Quaternary-Age Sediments

The hydrogelogic role of the Quaternary-age sediments is as a single surficial aquifer overlying the Ta. However, hydraulic conditions within the surficial aquifer vary significantly at the local scale. This is largely influenced by the range of stratigraphic units that comprise the Quaternary-age sediments, as previously discussed in Section 2.2.3.2.

The two distinct water-bearing units in the surficial aquifer are the Qs_U and the Qs_L. Several characteristics of the Qm – its high silt and clay content, laterally consistent overall thickness throughout Zones H and I, and its low vertical permeability – suggest that the Qm behaves as an

aquitard between the Qs_U and Qs_L units. An average vertical permeability for the Qm of 4.3E-06 cm/sec (1.2E-02 ft/day) was based on the 20 Shelby tube samples obtained in Zone I. Although no vertical permeability data for the Qs_U or Qs_L units were obtained during the Zone I RFI, a mean vertical permeability for the Qs unit as a whole in Zone A was reported as 5.7E-04 cm/sec (1.6 ft/day) (E/A&H, 1996a).

2.3.3 Groundwater Flow in the Surficial Aquifer

Although the surficial aquifer as a whole extends from the water table to the top of the Ta, groundwater primarily flows within the Qs_U and Qs_L units. These units will be discussed individually, as they are considered hydraulically separate.

2.3.3.1 Qs_U

The Qs_u is considered to act as an unconfined aquifer with its upper boundary as the water table surface and its bottom boundary roughly corresponding to the top of the Qm aquitard. Due to the presence of fill material, dredged spoils and other anthropogenic influences, flow direction and magnitude within the Qs_U are highly variable. In some cases, the presence of clayey and silty fill material may act to semi-confine portions of the Qs_U. An example of such a condition exists at shallow well location GDI005 where water levels are frequently above the top of the well casings because of artesian pressure, likely exerted from marsh clay deposits throughout the upper subsurface. In general, however, the water levels in all Zones I and H shallow wells are considered representative of the hydraulic conditions within the Qs_U unit.

Water levels range several feet within the Qs_U, but can generally average 4 to 6 feet bgs. Water level measurements, taken May 11, 1995 in a select subset of Zones H and I shallow monitoring wells, were used to develop a contour map of groundwater elevations in the Qs_U (Figure 2.10). Groundwater elevation highs exist in the central portion of the southeastern CNC peninsula, coinciding with much of Zone H and flow radially outwards toward Shipyard Creek and the Cooper River. Local groundwater highs in Zone I are found at GDI009 and GDI011 and reflect the heterogeneity of the Qs_U unit.

2.3.3.2 Qs_L

The Qs_L unit is considered semiconfined to confined by the overlying Qm unit because water levels in wells screened across the Qs_L rise above the top of the aquifer. The Qs_L is not laterally consistent in Zones H and I and was not evident in several deep well borings. In other cases, the unit is frequently interbedded with clay lenses or degrades to sandy laminae within the Qm immediately overlying the Ta. As a result, hydraulic head values from deep wells in Zones H and I may not be entirely indicative of the Qs_L unit, but represent hydraulic conditions coinciding with the top of the Ta.

Generally, potentiometric head levels in this unit are within 10 feet of ground surface. In one Zone I well, GDI05D, and several Zone H wells (00903D, 00905D, 00908D, and GDH05D) the potentiometric head level is above ground surface. Water level measurements, taken May 11, 1995 in a select subset of Zones H and I deep monitoring wells, were used to contour groundwater elevations in the Qs_L (Figure 2.11).

As the figure depicts, a groundwater elevation high exists in the center of Zone H and extends all the way east to GDI08D near the eastern boundary of the peninsula. South of this high, groundwater flows southwest toward Shipyard Creek. As the peninsula becomes thinner between GDI01D and GDI08D, the dominant flow direction gradually becomes southeast to south, although localized

groundwater highs are evident at GDI05D, and at GDI06D and GDI07D which have more easterly groundwater components. Groundwater north and east of the major groundwater high flows north to northeast to the Cooper River. Groundwater elevations in the Zone I deep wells along the northern portion of the peninsula tend to be lower than those along the peninsula's eastern and southwestern edge.

Additional water level data was collected from Zone I shallow and deep wells as part of a water level measurement event for the entire CNC southern peninsula in July, 1998. The intention of this event was to measure every well available or accessible instead of a select subset. Figures 2.12 and 2.13 are the resulting groundwater elevation contour maps for the Qs_U and Qs_L units, respectively. The primary difference evident when comparing Figures 2.12 and 2.10 is the sizes and shapes of the recharge zones within Zones H and I, resulting in some minor changes in groundwater flow direction. Although recharge zone morphology is influenced by seasonal fluctuations in the water table, it is likely that greater data coverage in the July 1998 event allowed for increased resolution of recharge zone morphology. Comparison of Figures 2.13 and 2.11 reveals no discernible differences in groundwater flow direction in the Qs_L.

2.3.4 Vertical Hydraulic Gradient

The vertical hydraulic gradient is a mathematical expression that indicates the potential for vertical groundwater flow. Vertical gradients were calculated by dividing the differences between shallow and deep water level elevations by the vertical distance between aquifers at each well pair. In cases where the upper sand layer was not present, the elevation of the bottom of the shallow-well screen was used. Similarly, if the lower sand was absent, the elevation of the top of the deep-well screen was used. Positive gradients indicate a downward potential for vertical flow whereas negative gradients indicate potential for upward flow.

Table 2.3 presents the calculated vertical hydraulic gradients between each of the shallow/deep well pairs in Zones I and H for water level data collected June 20, 1995. Figure 2.14 presents the distribution of vertical gradients across the site using the results presented in Table 2.3.

Most of the well pairs have a positive hydraulic gradient, indicating the potential for groundwater to flow downward from the Qs_U to Qs_L. This does not necessarily mean that the aquifers are hydraulically connected beneath the site, but it does indicate the direction of flow if a connection exists. However, no connection between the Qs_U and Qs_L was observed in any of the Zone H or I boreholes. At some lateral distance from Zones H and I, a connection between the two sands could exist in association with the Cooper River and/or Shipyard Creek.

Table 2.3
Vertical Hydraulic Gradients

Well Pair	Groundwater Elevation Difference (ft)	Vertical Distance (ft)	Vertical Hydraulic Gradient (ft/ft)
Zone I Monitoring Wells			
GDI001/GDI01D	-1.15	45.5	-0.025
GDI002/GDI02D	1.61	58.5	0.028
GDI003/GDI03D	-1.88	39	-0.048
GDI004/GDI04D	-3.66	26.5	-0.138
GDI005/GDI05D	0.16	44	0.0036
GDI006/GDI06D	1.81	27	0.067
GDI007/GDI07D	1.78	31	0.057
GDI008/GDI08D	2.58	41	0.063
GDI009/GDI09D	3.55	39	0.091
GDI010/GDI10D	3.95	20.5	0.193
GDI011/GDI11D	1.66	23	0.072
GDI012/GDI12D	-0.97	27.5	-0.035
GDI013/GDI13D	3.63	16	0.227
GDI014/GDI14D	1.62	19	0.085
GDI015/GDI15D	1.85	47	0.039
GDI016/GDI16D	2.98	36	0.083

Table 2.3
Vertical Hydraulic Gradients

Well Pair	Groundwater Elevation Difference (ft)	Vertical Distance (ft)	Vertical Hydraulic Gradient (ft/ft)
GDI017/GDI17D	1.61	26.5	0.061
GDI018/GDI18D	1.56	31	0.050
GDI019/GDI19D	3.49	12	0.291
Zone II Monitoring Wells			
009002/00902D	-1.32	29	-0.046
009003/00903D	[illegible]	29	-0.046
009004/00904D	0.24	18	0.013
009005/00905D	3.01	[illegible]	[illegible]
009006/00906D	-0.36	18	-0.020
009007/00907D	-0.81	48	-0.017
009008/00908D	>-3.82	41	>-0.093
009012/00912D	-1.12	35	-0.032
014001/01401D	0.07	21	0.003
014002/01402D	-0.59	34	-0.017
014003/01403D	0.09	20	0.004
014004/01404D	0.77	22	0.035
014005/01405D	0.78	11	0.071
GDH001/GDH01D	-3.28	41	-0.080
GDH002/GDH02D	-3.73	50	-0.075
GDH003/GDH03D	0.59	25	0.024
GDH004/GDH04D	1.59	39	0.041
GDH005/GDH05D	0.41	39	0.011
GDH006/GDH06D	1.38	20	0.069
GDH007/GDH07D	1.59	18	0.088
GDH008/GDH08D	0.79	25	0.032
GDH009/GDH09D	-2.43	25	-0.097
GDH010/GDH10D	-1.27	45	-0.028
GDH011/GDH11D	-4.24	36	-0.118

Notes:
— = Upward potential
ft/ft = feet per foot

Well pairs that exhibit negative vertical gradients indicate a potential for upward vertical flow between the Qs_L and Qs_U. Most of these well pairs are along the southwestern shore of the peninsula near Shipyard Creek. This area roughly corresponds with one of the erosional surface lows indicated on the paleogeologic map of the Ta (Figure 2.5).

2.3.5 Horizontal Hydraulic Gradient

The horizontal hydraulic gradient (*i*) is a measurement of the change in hydraulic head (_h) (i.e., change in groundwater elevation) of two points over the distance between the points (_x). It is a dimensionless value generally used to quantitatively determine the magnitude of groundwater flow in a given region. Groundwater contour maps for the surficial aquifer (Figures 2.10 and 2.11) were examined to find groundwater flowpaths exhibiting a range of gradients throughout Zones H and I.

Because monitoring well placement during the Zone I RFI was based solely on AOC and SWMU locations and historical land uses at CNC, it is coincidental when monitoring wells are aligned with one another along a groundwater flowpath. Since groundwater flowpath lines must be perpendicular to groundwater contours or equipotential lines (lines of equal hydraulic head), the contour pattern of hydraulic head dictates the orientation of groundwater flowpaths.

Table 2.4 presents horizontal hydraulic gradients for specific groundwater flowpaths shown on Figures 2.10 and 2.11. Generally, the well pairs were selected to show the maximum and minimum horizontal gradients measured perpendicular to the groundwater elevation contours.

Table 2.4
Horizontal Hydraulic Gradients in the Qs_U and Qs_L Units

Shallow Aquifer	Groundwater Flowpath	Δh (ft)	Δx (ft)	i (ft/ft)
[illegible]	GDI009 to 1 ft contour adjacent to Cooper River	6.71 - 5.71 = 1.00	340	0.0168
	63000 to GDI012	6.87 - (-0.05) = 6.92	2600	0.0027
	GDI005 to 3 ft contour near GDI010	6.70 - 3.00 = 3.70	800	0.0046
	GDI004 to 1 ft contour adjacent to Shipyard Creek	2.84 - 1.00 = 1.84	360	0.0051
	00909 to 2 ft contour to west	11.51 - 2.00 = 9.51	2000	0.0047
	00914 to 3 ft contour south of GDI018	5.67 - 3.00 = 2.67	1320	0.0020
Qs_L	00903D to 00912D	9.38 - 2.88 = 6.50	520	0.0125
	GDI09D to GDI10D	2.49 - 0.54 = 1.95	400	0.0049
	00908D to 00904D	7.85 - 2.58 = 5.27	500	0.0105
	00905D to GDI16D	10.03 - 0.09 = 9.94	2420	0.0041

Notes:
_h (ft) = Hydraulic head difference
_x (ft) = Distance between points
i = Horizontal hydraulic gradient

2.3.6 Hydraulic Conductivity

Slug tests were used to evaluate the horizontal hydraulic conductivity of an aquifer at a single point. A slug test is initiated by inserting a 1-7/8" diameter Teflon cylinder below the static water level in the well, creating an instantaneous change in the water level. The change in water level over time is monitored as the aquifer attempts to reach equilibrium in response to the perturbation. This procedure is known as a falling head slug test since the water level (hydraulic head) declines back to its original static level. Once equilibrium is re-established, the slug is quickly removed, dropping the static water level. This procedure is a rising head slug test since the water level in the well rises back to its original static level as the test progresses.

Data from the slug tests were first compiled using the computer program AQTESOLV (Aquifer Test Solver) ver. 1.1 by Geraghty and Miller Modeling Group (1989). Rising and falling head slug test data were evaluated using the Bouwer and Rice Method (1976), which provided the best curve fits for both the shallow and deep wells. For this solution, elapsed time versus displacement (change in water levels) was plotted on a semilogarithmic graph. Horizontal hydraulic conductivity (K_h) was computed by the program using a straight-line of best fit. The Bouwer and Rice Method was developed for unconfined, semiconfined, and leaky aquifers. It is ideal for use in tests from wells that partially penetrate unconfined aquifers (i.e., the well does not fully screen the saturated interval). The method assumes that the aquifer is homogeneous, isotropic (vertical hydraulic conductivity equals horizontal hydraulic conductivity), in steady-state equilibrium, and that flow into the well is solely through the well screen. While this analysis results in a more reliable estimate of the aquifer's true hydraulic conductivity, it is important to recognize that these values are estimates of aquifer characteristics only at that specific well location and depth, and should be used carefully in discussing the overall aquifer characteristics. Some data sets did not provide adequate responses for evaluation, and thus were not used in the slug test analyses.

Hydraulic conductivities for the shallow and deep wells are presented in Tables 2.5 and 2.6, respectively. Stratigraphic units that are considered responsible for the test response are included. Aquifer characterization plots for groundwater in Zone I are included as Appendix C.

Because hydraulic conductivity data are lognormally distributed, the geometric mean is the best measure of central tendency. Therefore, the average hydraulic conductivity for each well is presented as the geometric mean of the falling and rising head values.

A rising head test was not conducted on GDI03D and GDI14D because falling head recovery of the well lasted more than 12 hours.

Table 2.5
Shallow-Well Slug Test Hydraulic Conductivity Results in feet/day

Well ID	Stratigraphic Unit	Falling Head	Rising Head	Geometric Mean*
GDI001	Qs_U/Qm	0.42	0.29	[illegible]
GDI003	Qs_U	1.46	1.69	1.57
GDI007	Fill/Qm	1.96	0.62	1.10
GDI010	Fill/Qs_U	1.13	1.40	1.26
GDI014	Qs_U	7.94	6.07	[illegible]
GDI015	Qs_U/Qm	0.91	1.07	0.99
GDI018	Fill	0.79	0.70	[illegible]
GDI019	Qs_U	1.37	1.70	1.53
677004	[illegible]	3.53	6.21	[illegible]
677002	Fill	0.019	0.023	0.021
687002	[illegible]	0.082	0.091	[illegible]

Note:
* = Average of falling and rising head values.
Qm = Quaternary marsh clay
Qs_U = Upper Quaternary sand

Table 2.6
Deep-Well Slug Test Hydraulic Conductivity Results in feet/day

Well ID	Stratigraphic Unit	Falling Head	Rising Head	Geometric Mean*
GDI01D	Qs_L	3.81	3.31	3.55
GDI03D	Qm	0.0012	Ã	0.0012
GDI07D	Qs_L	0.42	0.39	0.40
GDI10D	Qs_L	3.93	4.34	4.13
GDI14D	Qm	0.0029	Ã	0.0029
GDI15D	Qs_L	3.58	10.61	6.16
GDI18D	Qs_L/Qm	0.42	0.39	0.40
GDI19D	Qs_L	3.21	2.85	3.02

Note:
* = Average of falling and rising head values.
Qm = Quaternary marsh clay.
Qs_L = Lower Quaternary sand

Hydraulic conductivities in Zone I shallow wells ranged from 0.021 to 6.94 ft/day. These values further reinforce the finding that the shallow sediments are highly heterogeneous both naturally and anthropogenically. The geometric mean for the slug-tested Zone I shallow wells is 0.76 ft/day.

Hydraulic conductivities in Zone I deep wells ranged between 0.0012 and 6.16 feet/day, with a geometric mean of 0.33 ft/day. This range reflects the interbedded nature of much of the Qs_L deposits as well as the prevalence of Qm overlying the Ta.

The mean hydraulic conductivities from Tables 2.5 and 2.6 were plotted next to their respective wells on Figure 2.15 to show the areal distribution of hydraulic conductivity in the surficial aquifer.

2.3.7 Horizontal Groundwater Velocity

To estimate the rate at which groundwater and possibly dissolved contaminants are migrating, groundwater velocity was calculated using the following formula:

$$V = \frac{K_h * i}{n_e}$$

Where:

V = horizontal groundwater velocity (ft/day)

K_h = hydraulic conductivity (ft/day)

i = horizontal hydraulic gradient (unitless)

n_e = effective porosity (unitless)

An estimated average sand porosity of 35% was used as the effective porosity in the equation for both the Qs_U and Qs_L units. To provide a more conservative estimate of groundwater velocity, the four highest hydraulic conductivity estimates from Qs_U and Qs_L slug tests were used to calculate a geometric mean for each unit. These mean K_h values were found to be 3.0 and 4.1 ft/day for the Qs_U and Qs_L units, respectively. Horizontal groundwater velocity was calculated along each of the groundwater flowpaths presented in Table 2.7.

Table 2.7
Horizontal Groundwater Velocity Results in feet/day

Shallow Aquifer	Flowpath	K_h	i	v
Qs_U	GDI009 to 1 ft contour adjacent to Cooper River	3.0	0.0168	0.144
	656001 to GDI012	3.0	0.0027	0.023
	GDH005 to 3 ft contour near GDI010	3.0	0.0046	0.039
	GDI004 to 1 ft contour adjacent to Shipyard Creek	3.0	0.0051	0.044
	009009 to 2 ft contour to west	3.0	0.0047	0.040
	009011 to 3 ft contour south of GDI018	3.0	0.0020	0.017
Qs_L	00903D to 00912D	4.1	0.0125	0.146
	GDI09D to GDI10D	4.1	0.0049	0.057
	00908D to 00904D	4.1	0.0105	0.123
	00905D to GDI16D	4.1	0.0041	0.048

Notes:
K_h = Hydraulic conductivity (ft/day)
i = Horizontal hydraulic gradient
v = Horizontal groundwater velocity (ft/day)

2.4 Climatology

Regional climate in the CNC area is described in Section 2.3 of the *Draft Zone A RFI Report.*

CH2MHILL TRANSMITTAL

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

From: Louise Palmer/CH2M-Jones

Date: January 23, 2003

Re: CH2M-Jones' Responses to Comments by SCDHEC regarding the *Confirmatory Sampling Investigation Report, Areas of Concern 711, 715, and 718, Zone I, Charleston Naval Complex* (Revision 0)

Quantity	Description
4	CH2M-Jones' Responses to Comments by SCDHEC regarding the *Confirmatory Sampling Investigation Report, Areas of Concern 711, 715, and 718, Zone I, Charleston Naval Complex* (Revision 0) – Originally Submitted on September 19, 2002

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

Remarks:

Copy To:

Dann Spariosu/USEPA, w/att
Rob Harrell/Navy, w/att
Gary Foster/CH2M-Jones, w/att

SCDHEC General Engineering Comments Prepared by Jerry Stamps:

1. **General Comment:**
The Department maintains that a professional engineer certified in the state of South Carolina must certify that the integrity of the OWSs and the ancillary piping remains in tact. This certification and supporting analytical data is especially important for units that remain in place which have potential future use by subsequent landowners. Please note that this requirement is being applied consistently to all facilities regulated under RCRA Subtitle C administered by the Corrective Action Engineering Section.

   CH2M-Jones Response:
   CH2M-Jones understands the Department's concerns about the potential for releases from these OWSs in the event that they continue to be operated in the future. CH2M-Jones and the Navy believe it is the responsibility of any future owner or operator who chooses to operate these units to conduct the required integrity assessment. We suggest that we work together with SCDHEC to find a manner to address this issue that is acceptable to all parties.

2. **General Comment:**
The figures seem to indicate that the soil samples were collected 10 feet or more from the units under investigation. However, the Department understands that the icon used to represent the OWS may not necessarily represent the actual size of the unit. Consequently, the Navy must verify that the samples locations are indeed adjacent to the respective units. If so, the text should be revised to clarify this fact.

   Furthermore, the Navy must verify that the subsurface soil samples were collected at sufficient depth corresponding to the depth of the OWS. If so, the text should be revised to clarify this fact.

   CH2M-Jones Response:
   The samples were collected as indicated in the approved work plan, including additional samples recommended by SCDHEC during their work plan review. The sample location figures will be revised as suggested, showing the actual unit size where known. Soil sample locations were designed to intersect potential releases from the base, inlet, and outlet piping. The text states that the subsurface soil samples were collected at 3 to 5 ft below grade. Some units may have bases below the groundwater table, where it is not practical to collect soil samples. The location and depth of the soil samples will be further clarified in the text.

SCDHEC Specific Engineering Comments Prepared by Jerry Stamps:

1. **AOC 711:**
According to the GIS, there appears to be only 2 subsurface soil samples (LI037SB008 and LI037SB005) within the vicinity of the OWS, of which LI037SB005 is located approximately 10 feet away from the unit and would not necessarily represent a release from the unit. Therefore, it does not appear as though the current sample locations are representative to determine if a release has occurred from AOC 711.

   CH2M-Jones Response:
   Groundwater probe sample I711GP001 evaluated subsurface conditions near location LI037SB006 and adjacent to the OWS; no impacts were identified from that sample. LI037SB005 is located approximately 7 ft away from the unit, to avoid a sanitary sewer. The sewer also obstructed a third subsurface soil sample from location LI037SB006. Figure 2-2 will be revised showing the actual size of the OWS. We believe that the sampling locations are as representative as possible, given the site setting and presence of underground utilities that impact sample location accessibility.

2. **Table 2-4**
The "S" qualifier is periodically used in this table. According to the footnote, this qualifier identifies the data to be used for "screening purposes only". The meaning of this definition is not entirely clear to the Department. Please elaborate on this definition including how the Department should interpret these results.

   CH2M-Jones Response:
   For some locations, the laboratory accidentally analyzed the screening samples instead of the Encore samples which accompanied them. These data were rejected as insufficient for making decisions on a RCRA site, although the detected parameters do provide some useful information. Therefore, we have presented them in the report, qualified as "screening only." Each of the affected locations were resampled after discovery of the laboratory error and appropriate reanalyses were conducted in accordance with applicable QC procedures. The Data Validation Report (Appendix C) discusses the applicability of the "S" data.

SCDHEC General Hydrogeology Comments Prepared by Mansour Malik:

1. **General Comment:**
This CSI Report failed to present any information about the geology and the soil type in and around the OWSs' locations. The document also lacks the potentiometric map for AOC 711 that is necessary to determine both the shallow and deep groundwater setting. Please revise and include maps.

   CH2M-Jones Response:
   The requested information has been presented in the Zone I RFI Report, which is referenced in Section 1.2 of this report. An excerpt of this information will be appended to the CSI report. Potentiometric surface maps of the deep and shallow groundwater will be added to Section 1.0.

2. **General Comment:**
The "Sampling and Analysis Plan for Oil/Water Separator AOC 711 through 720, Charleston Naval Complex" dated April 30, 2002 stated that *"The OWS 711 was investigated as part of the Zone L Sanitary Sewer RFI"* and that *"RFI samples were collected in 1997. Zone L soil and groundwater samples have been collected in close proximity to the unit"*. Neither the workplan nor the CSI Report indicates the actual sample locations and how close they are to the OWS. The figures provided in the Report do not show the actual as-built-in design of the OWS nor the depth where those samples were collected. Please provide pertinent information with clear illustrating figures.

   CH2M-Jones Response:
   The figures show the sample locations in the work plan approved by SCDHEC. The actual samples were collected in the locations planned, with additional groundwater samples as suggested in SCDHEC's comments to the work plan. The report figure will be revised to show the actual dimensions and location of the OWS for AOC 711. As-built drawings are not available for any of the OWS units in this CSI report. Field-measured dimensions are described in section 2.1 for AOC 711. For AOCs 715 and 718 the OWS units are not accessible for measuring.

   All sample locations are presented in their surveyed positions in the report figures. We will revise and enlarge the sample location figures to better show the approximate locations of the units with respect to the actual surveyed sample locations. Subsurface soil samples were collected from 3-5 ft bls, as designated in the data tables. These were intended to coincide with the actual depth of the OWS at AOC 711 and the anticipated depths of the OWSs at AOCs 715 and 718.

3. **General Comment:**
The report does not show the soil and groundwater locations that are linked to USTs' investigation. The UST wells, if existing, should be used in determining the

groundwater flow maps. Please provide all the information necessary to complete the public record.

CH2M-Jones Response:
Groundwater flow maps will be presented in Section 1 of the report. The monitoring wells associated with the closed fuel oil UST near AOC 711 were removed. No monitoring wells were installed for the closed waste oil UST at AOC 718.

4. **General Comment:**
The report presented only two well logs for two DPTs in Appendix D. The Navy must either include all well logs or reference their submittal (document date) for the sites under investigation.

CH2M-Jones Response:
Wells installed for the Zone I and Zone L RFIs are described in the respective RFI reports, referenced in Section 1.0 of this report. Logs are provided only for the newly installed wells or those not previously documented.

5. **General Comment:**
Section 2: VOCs in Soil Samples: the Report stated, "*Traces of toluene and xylenes were detected in surface soil at sample location LI037SB005*". The report failed to indicate any source linked to those findings. Please revise and include necessary interpretation. This applies as well for OWS AOC 715 and 718.

CH2M-Jones Response:
The source for these compounds is not clear, although it is not likely that a subsurface source such as a subsurface OWS could have impacted surface soil. At AOC 711, the reported concentrations in the surface soil are low enough to raise suspicions of data reliability – they were "J" flagged. Surface soil data are presented for these sites because they are part of the RFI database, and generally indicate impacts from general site operations that occurred in this industrial area or minor releases not related to OWS operation. COPCs detected in surface soil are discussed for each site in the report.

SCDHEC Specific Hydrogeology Comments Prepared by Mansour Malik:

6. **AOC 711:**
"Section 2.4 AOC 711 CSI Conclusions and Recommendations: The text stated, " *It is concluded that sufficient data exist to evaluate AOC 711, the data indicate no significant releases, and NFA status is recommended for this site*". The word "*significant releases*" does not; in any capacity indicate the nature and extent of a release. Please revise and include precise terms.

   CH2M-Jones Response:
   The data indicate no COCs were identified within the media that would have been impacted by a potential release. The data do not reveal if there actually was a release or not; only that there is no evidence of contamination requiring remedial action. The text will be reworded to state that "the data indicate no chemicals of concern…".

7. Section 2.1 Description of AOC 711, Lines 18+: The text state, " *Groundwater is also expected to flow toward the river, although a tidal component of flow may exist. The depth to groundwater in this area is estimated approximately 3 feet below land surface*". Please refer to comment 1 requesting potentiometric figures supporting this statement. The OWS is 4.3 ft deep. The Navy must present diagrammatically where soil samples were taken.

   CH2M-Jones Response:
   As requested, figures showing the potentiometric surfaces of the shallow and deep aquifers will be presented in Section 1.0. Figure 2-2 shows the location of the samples as surveyed. This figure will be revised and enlarged. Subsurface soil samples were collected at 3 to 5 ft bls; this information will be emphasized in the text.

8. **OWS AOC 715:**
Upon review of a 1947 map of this area of the Base, it seems that the wrong area had been sampled in investigating OWS AOC 715 during this CSI. Please see figure attached. The Navy must reevaluate the actual location of the investigated OWS and submit relevant information.

   CH2M-Jones Response:
   The referenced map (1974) indicates the OWS may have been located up to approximately 20 ft from the location assumed in the CSI, although the drawing was not intended to be to scale. This OWS may have been removed and may no longer be present. At the December 30, 2002 site visit, upon noting the locations of the samples collected for the RFI and the CSI, and the configuration and limited size of the site, SCDHEC agreed that sufficient samples have been collected to characterize the area. Data from these samples indicate no COCs at the site.

9. Section 3.1 Description of AOC 715, Line 22: The text stated, "*As noted in Figure 3-1, shallow groundwater is likely to flow in a northeasterly or easterly direction to Cooper River.*

Because AOC 715 is 150 ft from the Cooper River, the groundwater flow direction may be tidally influenced. The depth of groundwater at AOC 715 is approximately 5 ft bls". The figure in question depicts the Cooper River as lying to the east of the OWS. The groundwater contour of 5 ft is barely representing the site hydrogeology. The conclusion reached about the groundwater flow direction has not been justified. The Navy must revise and modify the figure to reflect a better understanding of the shallow and deep groundwater settings.

CH2M-Jones Response:
Potentiometric surface maps of the deep and shallow groundwater will be added to Section 1.0 of the report. The source of the groundwater mound shown beneath Building 681 on the contour map is unknown.

10. Section 3.5 AOC 715 CSI Conclusions and Recommendations: The text stated," *It is concluded that sufficient data exist to evaluate AOC 715, and the data indicate no significant releases. Therefore this OWS system identified as: AOC 715 is recommended for NFA status".* It is premature to make these conclusions, considering comment 1, 6, 8 &9. Please revise the text accordingly.

CH2M-Jones Response:
The data indicate no COCs were identified within the media that would have been impacted by a potential release. The data do not reveal if there actually was a release or not; only that there is no evidence of contamination requiring remedial action. The text will be reworded to state that "the data indicate no chemicals of concern…".

11. **OWS AOC 718:**
Figure 4.1, Section 4.1 Description of AOC 718: The figure shows only one groundwater well I681GW002. It is not clear whether this well is upgradient or downgradient from the OWS. In reference to Figure 3.1 the text stated in Line 28+ that "*shallow groundwater is assumed to flow in a southerly direction, governed by a groundwater mound beneath Building 681*". Please refer to Comment 9. The Navy must provide groundwater maps correcting and supporting those statements.

CH2M-Jones Response:
The monitoring well is located within several feet of the OWS, in the downgradient direction as identified by the groundwater map to be inserted in Section 1.0. Subsurface utility lines and Building 681 prohibit sampling groundwater close to the OWS in the other directions.

12. Section 4.5 AOC 718 CSI "Conclusions and Recommendations" The report stated, "*It is concluded that sufficient data to characterize site environment conditions exist to evaluate AOC 718, the data indicate no contamination is identified from the historical operation of AOC 718. Therefore NFA is recommended for AOC 718.*" This statement is not quite true because contamination has been identified. However, the contamination being below screening

criteria does not warrant further remedy or cleanup. Please revise text to clearly indicate that.

CH2M-Jones Response:
The text will be reworded to state that "the data indicate no chemicals of concern…".

Conclusion:

The Division of Hydrogeology would recommend granting an approval for this CSI report upon resolving the comments above. The Division is open for discussing and helping in resolving those issues. Please if you have any questions forward them to Mansour Malik at malikmn@dhec.state.sc.us or call 803.896.4169.