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DRAFT ZONE C COMBINED MINOR SITES CORRECTIVE MEASURES STUDY REPORT
CNC CHARLESTON SC
12/22/1999
ENSAFE

**DRAFT ZONE C,
COMBINED MINOR SITES
CORRECTIVE MEASURES STUDY REPORT
CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA**



CTO-029

Contract Number: N62467-89-D-0318

Prepared for:

**Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



Prepared by:

**EnSafe Inc.
5724 Summer Trees Drive
Memphis, Tennessee 38134
(901) 372-7962**

December 22, 1999

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The Contractor, EnSafe Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0318 is complete, accurate, and complies with all requirements of the contract.

Date: December 22, 1999
Signature: *Don Cooke*
Name: Don Cooke
Title: Task Order Manager

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ABBREVIATIONS, ACRONYMS AND SYMBOLS

AOC	Area of Concern
BEQ	Benzo(a)pyrene Equivalent
BRAC	Base Realignment and Closure
BTEX	Benzene, toluene, ethylbenzene, and xylene
CMS	Corrective Measures Study
CNC	Charleston Naval Complex
COC	Chemical of Concern
CRP	Community Relations Plan
CSI	Confirmatory Sampling Investigation
DET	Navy Environmental Detachment
DRMO	Defense Reutilization Marketing Office
DRO	Diesel Range Organics
E/A&H	EnSafe/Allen & Hoshall
GRO	Gasoline Range Organics
HSWA	Hazardous and Solid Waste Amendments
ISM	Interim Stabilization Measure
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
NA	Not Applicable
ND	Not Detected
NS	Sample not Analyzed
OSWER	Office of Solid Waste and Emergency Response
PAH	Polyaromatic hydrocarbon
PCB	Polychlorinated biphenyl
PIP	Public Involvement Plan
RAB	Restoration Advisory Board
RBC	Risk-based Concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGO	Remedial Goal Option

SCDHEC	South Carolina Department of Health and Environmental Control
SOB	Statement of Basis
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SSL	Soil Screening Level
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound
$\mu\text{g/L}$	micrograms per liter
$\mu\text{g/kg}$	micrograms per kilogram
yd^3	cubic yards

1.0 INTRODUCTION

Zone C is one of the twelve investigative zones (A through L) that make up the Charleston Naval Complex (CNC). Zone C, on the western edge of the northern portion of the former naval base, is comprised of administrative areas, former military housing areas, warehouses, and the former base coal storage yard. The zone is bounded by McMillan Avenue on the south, Hobson Avenue on the east, Avenue "D" on the northeast, Noisette Creek on the north, and residential property on the west. Zone C contains properties identified in the *Final Environmental Impact Statement for Disposal and Reuse of the Charleston Naval Base* (Ecology and Environment, Inc., June 1995) to be used for housing, open space/buffer, community support, and office/training.

Sites were designated for a corrective measures study (CMS) during the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) as directed by the CNC project team. Figure 1.1, *Zone C CMS Site Location Map*, shows the location of each CMS-designated site in Zone C. The six Zone C investigated areas listed in Table 1.1 were designated for a CMS. However, four RFI investigation areas have been combined into two separate CMS-designated sites. Solid Waste Management Unit (SWMU) 47 and Area of Concern (AOC) 516 are considered a single CMS area, and AOC 508 and AOC 511 are also considered a single CMS area.

Zone C Combined Minor Sites include SWMU 47 and AOCs 508, 511, 516, and 518. SWMU 44 and AOC 700 will be addressed together in a separate CMS report and AOC 512 has been designated No Further Action by the CNC project team at the December 1998 team meeting. SWMU 47/AOC 516 were designated for a Corrective Measures Study (CMS) based on the presence of BEQs and lead in surface and subsurface soil. AOC 508 and AOC 511 were designated for a CMS based on the presence of BEQs and dieldrin in surface soil. AOC 518 was designated for a CMS based on the presence of chlordane and lead in surface soil.

Table 1.1
Zone C Sites Designated for CMS

SWMU 44	Former coal storage yard
SWMU 47 and AOC 516	Former burning dump site (SWMU 47) and former vehicle/equipment spray-washing area and lead-acid battery recharging area (AOC 516); co-located
AOC 508 and AOC 511	Former incinerator and former oil storage house; close proximity
AOC 512	Former incinerator
AOC 518	Former coal storage bins
AOC 700	Former golf course maintenance building

Groundwater associated with the grid-based sampling and with AOCs 508, 510, 511, and 523 will not be addressed. These sites consist of six shallow and two deep groundwater wells. These eight wells are generally located on the periphery of Zone C. COCs were either not detected in these well samples or were detected at levels below Maximum Contaminant Levels (MCLs). Therefore, groundwater in the vicinity of these wells does not pose a threat to human health and the environment and will not be considered further in the CMS.

This CMS identifies, screens, develops, evaluates, and compares remedial action alternatives to mitigate hazards and threats to human health and the environment from soil and groundwater contamination at Combined Minor Sites at the CNC. The CMS is being performed under the Resource Conservation and Recovery Act of 1976 (RCRA), based on findings reported in the *Zone C RCRA Facility Investigation Report, NAVBASE Charleston, North Charleston, South Carolina* (EnSafe, 1998). As required by RCRA, the CNC Restoration Advisory Board (RAB) provides a focus for community input to the remedial decision making process. The RAB, which regularly holds open public meetings, consists of community members, regulators, and representatives of the Southern Division Naval Facilities Engineering Command (SOUTHDIV) and other CNC project team members.

When the CMS is complete, a Statement of Basis (SOB) that documents the CMS process and presents the preferred site alternative will be made available for public comment to ensure that decision makers are aware of public concerns. The selection of the final remedy for the site could be affected by public input. The primary CNC decision makers include SOUTHDIV, the South Carolina Department of Health and Environmental Control (SCDHEC), and the United States Environmental Protection Agency (USEPA).

This CMS report has been organized according to the format in the Office of Solid Waste and Emergency Response (OSWER) Directive 9902.3-2A, *RCRA Corrective Action Plan* (Final, May 1994):

- **Section 1, Introduction:** This section presents the purpose of this document and summarizes the project.
- **Sections 2, 3, 4: SWMU 47/AOC 516, AOC 508/511, and AOC 518.**
- **Subsections 2.1, 3.1, 4.1, Site Description:** These subsections present site history and background and the applicable results of previous investigations, including the RCRA Facility Investigation (RFI), baseline risk assessment (BRA), interim stabilization measures (ISMs) performed by the Navy Environmental Detachment (DET), and supplemental CMS sampling.
- **Subsections 2.2, 3.2, 4.2, Remedial Objectives:** These subsections describe the areas requiring CMS analysis and remedial action objectives. The objectives were developed using RFI characterization and assessments, and by considering applicable requirements and special requests by the CNC project team. This section also presents site remedial goals and volumes and/or areas that require remediation.

- **Subsections 2.3, 3.3, 4.3, Identification and Screening of Technologies:** These subsections outline response actions and identifies and screens remedial technologies that may be used to achieve remedial action objectives. 1
2
3

- **Subsections 2.4, 3.4, 4.4, Development and Evaluation of Alternatives:** These subsections evaluate potential remedial alternatives according to the nine evaluation criteria identified in OSWER Directive 9902.3-2A, *RCRA Corrective Action Plan* (Final, May 1994), presenting strengths and weaknesses to prioritize or rank them relative to each other. 4
5
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- **Subsections 2.5, 3.5, 4.5, Recommendations:** These subsections assess the relative performance of the alternatives and presents recommendations. 9
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- **Section 5, Public Involvement Plan:** This section summarizes the public involvement plan as it relates to the CMS. 11
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- **Section 6, References:** This section list applicable references used for the preparation of and/or during the CMS. 13
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- **Section 7, Signatory Requirement:** This section provides the applicable signatory requirement for the CMS. 15
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2.0 SWMU 47/AOC 516

2.1 SWMU 47/AOC 516 Site Description

2.1.1 General

SWMU 47 and AOC 516 were combined into a single RFI because of their proximity and common potential contaminants. This investigation site is located in the eastern portion of Zone C, southwest of the intersection of Avenue D and Turnbull Avenue. Figure 2.1 shows the site surface features and RFI sample locations.

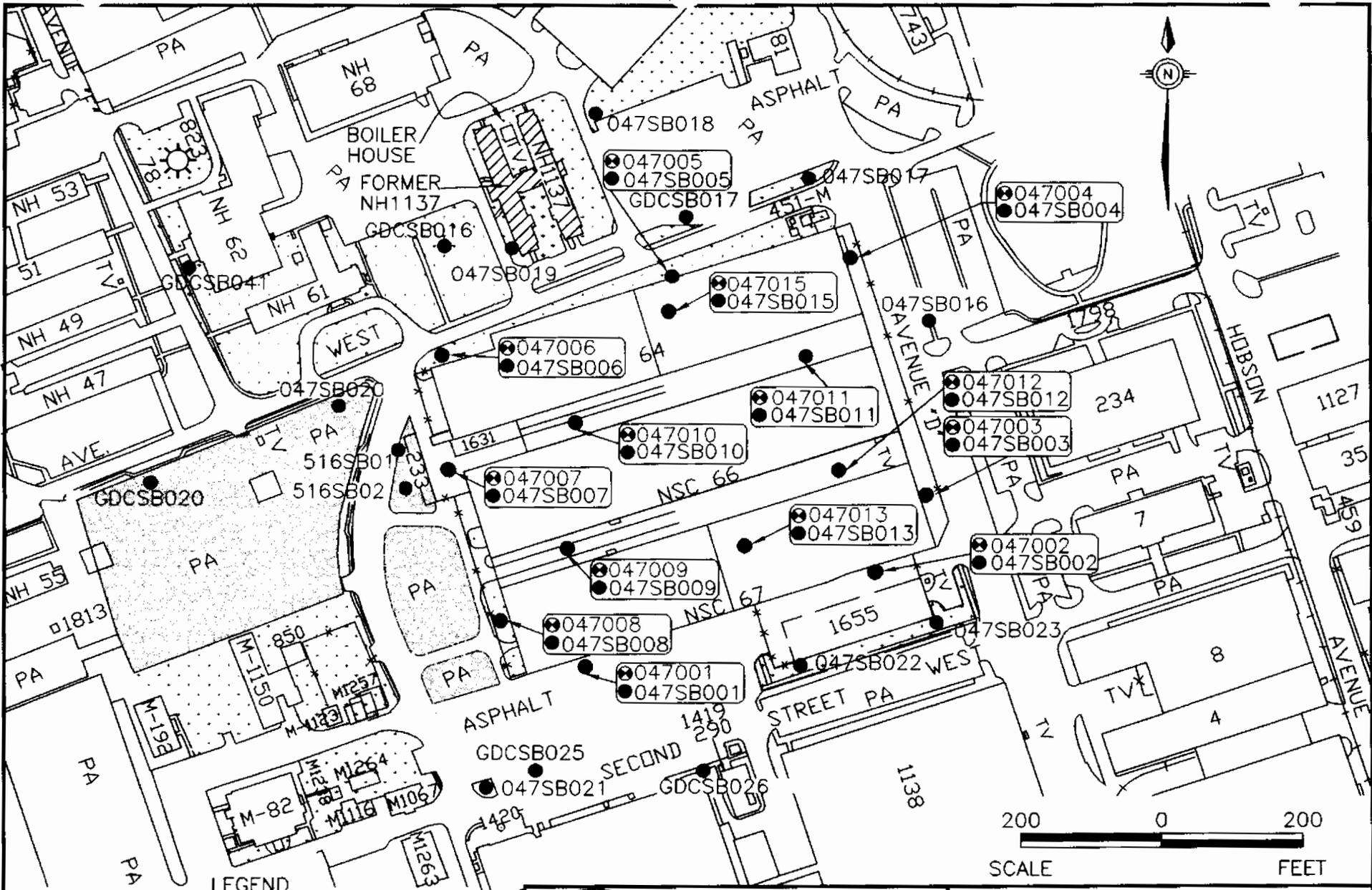
Site History Summary

SWMU 47 was a burning dump in the late 1920s where various types of wastes (including medical waste) were reportedly burned. Petroleum releases have also been reported onsite. Currently, the SWMU 47 site includes Buildings NSC-64, NSC-66, and NSC-67 and the surrounding asphalt and grassed areas. This SWMU also includes property north of Turnbull Avenue where former Building NH-1137 was located (prior to its demolition) and its associated parking lot and grassed areas. The RFI focused on site environmental media potentially impacted by products of incomplete combustion and residual petroleum hydrocarbons.

AOC 516 is just west of SWMU 47 and includes Building 233. This area was used for spray washing vehicles and equipment from 1972 until the 1980s. Prior to the base closure in the spring of 1996, AOC 516 was used for recharging lead-acid batteries. Chemicals of potential concern included lead and other inorganics, solvents, acids, and petroleum hydrocarbons.

Ground Cover

As discussed, the site is currently comprised of three large warehouse-type buildings (NSC-64, NSC-66, and NSC-67), one smaller building (Building 233), and surrounding grassed and asphalt areas. Over 95% of the site is covered by the warehouse-type structures. Figure 2.1 shows the soil sample locations, surface cover and site features.



- - 1ST ROUND SOIL SAMPLE LOCATION
- - 2ND ROUND SOIL SAMPLE LOCATION
- NOTE: 047SB014 NOT INSTALLED
- ⊙ - MONITORING WELL LOCATION
- - GRASS ▨ - GRAVEL ▩ - FORMER BUILDING



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FIGURE 2.1
 SWMU 47 AND AOC 516
 SAMPLE LOCATIONS AND
 SURFACE COVER
 DWG DATE: 12/06/99 DWG NAME: 2903G013

Current Use

With the exception of the vacant site of the former building NH-1137 on the north side of Turnbull Avenue, the area that comprises SWMU 47 and AOC 516 is currently being used by an industrial reuse tenant, Charleston Marine Containers, Inc. This tenant currently occupies Buildings NSC-64, NSC-66, NSC-67, 233, and the surrounding parking and open storage areas north, west and south of the three main warehouse-type buildings. This tenant manufactures, assembles and distributes large steel marine cargo shipping containers.

Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for residential or recreational (i.e., park) purposes. However, as noted above, the site is presently leased and is in full use by a private industrial-use entity.

2.1.2 RFI/CMS Sampling Results

During the RFI, soil and groundwater samples were evaluated to identify environmental media potentially impacted by products of incomplete combustion. Other chemicals of potential concern included lead and other inorganics (aluminum, arsenic, copper), solvents, acids, and petroleum hydrocarbons.

2.1.2.1 Soil

Two rounds of soil sampling were conducted during the RFI. During the first round, 29 soil samples were collected from 16 locations; 16 from the upper interval (0 to 1 foot below ground surface [bgs]) and 13 from the lower interval (3 to 5 feet bgs). Each soil sample was analyzed for VOCs, SVOCs, pesticide/PCBs, metals, cyanide, and TPH. First-round results indicated that five SVOCs were detected above their respective RBCs at several sampling locations, including those along the site perimeter. Eight supplemental RFI sampling locations were selected to further delineate the extent of SVOCs. Second-round soil samples collected from the upper interval at

each of the eight additional locations were submitted for SVOC analysis. Aluminum, arsenic, benzo(a)pyrene equivalents (BEQs), copper, lead, and thallium were identified as chemicals of concern (COCs) for SWMU 47/AOC 516 surface soil.

During the CMS, nine additional surface and subsurface soil samples were collected from SWMU 47/AOC 516. Four supplemental CMS samples were acquired in the vicinity of RFI sample location 047SB007 to delineate the extent of lead and arsenic contamination. These were identified as 516SBC01 through 516SBC04. Five samples were taken at various locations in SWMU 47 and analyzed for dioxins. Tables 2.1 and 2.2 show the RFI/CMS sampling results for surface and subsurface soil primary COCs at SWMU 47/AOC 516. Appendix A contains analytical data reports, chain of custody forms, and data validation reports for CMS supplemental soil samples.

2.1.2.2 Groundwater

RFI groundwater analysis of SWMU 47/AOC 516 consisted of four quarters of sampling. In the first quarter, samples from 14 locations were collected and analyzed for the presence of VOCs, SVOCs, pesticides/PCBs, TPH (GRO and DRO), metals, and cyanide. Aluminum, antimony, arsenic, carbon disulfide, 3,3'-dimethylbenzidine, lead, and manganese were detected in SWMU 47 groundwater above tap water RBCs or background concentrations in first-quarter samples. Thallium was also detected in second through fourth quarters.

A review of second-, third-, and fourth-quarter groundwater results was performed to evaluate trends. Neither antimony nor 3,3'-dimethylbenzidine was detected in any monitoring well after the first quarter. Arsenic was detected above its RBC and reference concentration in at least one well for each quarter. The lead concentration in the first-quarter sample from well 047001 was 467 $\mu\text{g/L}$, but was non-detect in each subsequent round. The first-round sample result was therefore considered anomalous. Although thallium was not detected in first quarter groundwater samples, it was detected inconsistently in subsequent rounds in several wells. In no instance was

Table 2.1
 Surface Soil Data For COCs at SWMU 47/AOC 516

Sample Number	Date	Aluminum (mg/kg)	Arsenic (mg/kg)	Benzo (A) Pyrene Equivalents* ($\mu\text{g}/\text{kg}$)	Copper (mg/kg)	Dioxins** (ng/kg)	Lead (mg/kg)	Thallium (mg/kg)
RBC or Remedial Goal		78,000^b	0.43^b	88^b	3,100^b	1,000^b	400^a	5.5^b
Background		9,990	14.2	268	34.7	NA	330	ND
047-S-B001	4/3/95	7,590	0.38 J	299.5	1.3 J	NS	3.9 J	0.53 U
047-S-B002	4/3/95	13,900	1.1 J	340.7	3.7 J	NS	11 J	0.5 U
047-S-B003	4/13/95	5,440	4.4	37.2	10.1	NS	9.1	0.56 U
047-S-B004	4/13/95	6,210	0.36 UJ	37.2	1.2 J	NS	6.5	0.5 U
047-C-B004	4/13/95	9,300	0.35 UJ	37.2	1.7 J	NS	6.7	0.5 U
047-S-B005	3/31/95	3,610	1.7 UJ	7,648.5	8.2	NS	189	0.48 U
047-S-B006	3/31/95	4,460	4.1 UJ	525.0	15.9	NS	53.5	0.47 U
047-S-B007	4/14/95	6,580	27.8	610.0	416	NS	1120	2.1
047-S-B008	4/13/95	6,110	3 J	51.0	117	NS	132	0.5 U
047-S-B009	4/14/95	3,260	8.6	984.8	131	NS	312	0.51 U
047-C-B009	4/14/95	2,830	7.9	1,495.6	51	NS	97.1	0.51 U
047-S-B010	4/14/95	11,800	3.3	37.2	6.9	NS	6.9	0.57 U
047-S-B011	4/13/95	5,470	0.34 UJ	581.3	1.5 J	NS	3.3	0.48 U
047-S-B012	4/13/95	3,450	3 J	127.6	3.6	NS	6.9	0.47 U
047-S-B013	4/13/95	3,730	0.35 UJ	37.2	1.9 J	NS	5.3	0.49 U
047-S-B015	4/13/95	3,560	0.34 UJ	37.2	1.3 J	NS	7.6	0.47 U
047-S-B016	7/5/95	NS	NS	5,169.6	NS	NS	NS	NS

Table 2.1
 Surface Soil Data For COCs at SWMU 47/AOC 516

Sample Number	Date	Aluminum (mg/kg)	Arsenic (mg/kg)	Benzo (A) Pyrene Equivalents* (µg/kg)	Copper (mg/kg)	Dioxins** (ng/kg)	Lead (mg/kg)	Thallium (mg/kg)
RBC or Remedial Goal		78,000^b	0.43^b	88^b	3,100^b	1,000^b	400^a	5.5^b
Background		9,990	14.2	268	34.7	NA	330	ND
047-C-B016	7/5/95	NS	NS	3,577.3	NS	NS	NS	NS
047-S-B017	7/6/95	NS	NS	374.4	NS	NS	NS	NS
047-S-B018	7/6/95	NS	NS	866.7	NS	NS	NS	NS
047-S-B019	7/6/95	NS	NS	109.6	NS	NS	NS	NS
047-C-B019	7/6/95	NS	NS	56.6	NS	NS	NS	NS
047-S-B020	7/6/95	NS	NS	37.2	NS	NS	NS	NS
047-S-B021	7/5/95	NS	NS	37.2	NS	NS	NS	NS
047-S-B022	7/5/95	NS	NS	249.8	NS	NS	NS	NS
047-S-B023	7/5/95	NS	NS	37.2	NS	NS	NS	NS
516-S-B001	4/5/95	8,260 J	4.2	159.0	12.2	NS	29.6 J	0.5 U
516-S-B002	4/5/95	7,850 J	0.34 U	37.2	2 J	NS	3.9 J	0.48 U
516-S-BC01	3/9/99	NS	2.1	NS	NS	NS	28	NS
516-S-BC02	3/9/99	NS	4.9	NS	NS	NS	36.7	NS
516-S-BC03	3/9/99	NS	3.8	NS	NS	NS	11.2	NS
516-S-BC04	3/9/99	NS	8.7	NS	NS	NS	3.7	NS
516-S-BC05	3/9/99	NS	NS	NS	NS	2.3	NS	NS
516-S-BC06	3/9/99	NS	NS	NS	NS	0.74	NS	NS

Table 2.1
 Surface Soil Data For COCs at SWMU 47/AOC 516

Sample Number	Date	Aluminum (mg/kg)	Arsenic (mg/kg)	Benzo (A) Pyrene Equivalents* ($\mu\text{g}/\text{kg}$)	Copper (mg/kg)	Dioxins** (ng/kg)	Lead (mg/kg)	Thallium (mg/kg)
RBC or Remedial Goal		78,000^b	0.43^b	88^b	3,100^b	1,000^b	400^a	5.5^b
Background		9,990	14.2	268	34.7	NA	330	ND
516-S-BC07	3/9/99	NS	NS	NS	NS	12.2	NS	NS
516-S-BC08	3/9/99	NS	NS	NS	NS	1.3	NS	NS
516-S-BC09	3/9/99	NS	NS	NS	NS	3.2	NS	NS

Notes:

- NS — Sample not analyzed
- U — Undetected
- J — Estimated
- mg/kg — milligrams per kilogram
- $\mu\text{g}/\text{kg}$ — micrograms per kilogram
- ng/kg — nanograms per kilogram
- a — Risk-based residential remedial goal developed by the USEPA
- b — RBC
- * — BEQs are calculated by multiplying the carcinogenic polycyclic aromatic hydrocarbons (cPAH) by their respective toxicity equivalence factors (TEF) and assuming that nondetect values are estimated according to the memo from Barry Doll, EnSafe, Inc. to Johnny Tapia, SCDHEC, *CNC Background Calculations for Carcinogenic PAHs in Terms of BEQs*, February 5, 1999.
- ** — 2,3,7,8 -TCDDs are calculated by multiplying the dioxin and furan congeners by their respective toxicity equivalence factors (TEFs).
- Bold** — Indicates sample exceeded greater of RBC, remedial goal, or background.

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 Charleston Naval Complex
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Table 2.2
 Subsurface Soil Data for COCs at SWMU 47/AOC 516

Sample Number	Date	Aluminum (mg/kg)	Arsenic (mg/kg)	BEQs ^a (µg/kg)	Copper (mg/kg)	Dioxins ^b (ng/kg)	Lead (mg/kg)	Thallium (mg/kg)
SSL ^c		NA	29	8,000	NA	4,000 ^d	NA	0.7
Background		23,700	14.1	NA	42.2	NA	73.2	NA
047-S-B001	4/3/95	7,970	0.61 J	37.2	5.5 J	NS	10.8 J	0.58 U
047-S-B003	4/13/95	3,390	2.6 J	37.2	8.1	NS	2.4	0.6 U
047-S-B004	4/13/95	5,360	0.47 J	37.2	15.2	NS	54.6	0.54 U
047-S-B005	3/31/95	1,030	0.39 U	341.2	0.56 UJ	NS	2.7	0.54 U
047-S-B007	4/14/95	2,660	9.6	2726.2	1,650	NS	1,190	1.8
047-S-B008	4/13/95	22,300	12.2	37.2	41.4	NS	50.7	0.67 U
047-S-B009	4/14/95	9,210	3	1799.3	399	NS	252	0.51 U
047-S-B011	4/13/95	3,840	0.38 UJ	37.2	0.91 J	NS	3	0.54 U
047-S-B012	4/13/95	4,940	0.35 UJ	37.2	1 J	NS	3	0.5 U
047-S-B013	4/13/95	2,670	0.37 UJ	37.2	1 J	NS	2.1	0.52 U
047-S-B015	4/13/95	9,760	2.1 J	37.2	15.6	NS	45.8	0.66 U
516-S-B001	4/5/95	4,130 J	0.37 U	37.2	1.4 J	NS	2.8 J	0.51 U
516-S-B002	4/5/95	4,230 J	0.37 U	37.2	1.5 J	NS	3.9 J	0.51 U
516-S-BC01	3/9/99	NS	3.1	NS	NS	NS	13.8	NS
516-C-BC01	3/9/99	NS	2.7	NS	NS	NS	13.6	NS
516-S-BC02	3/9/99	NS	5	NS	NS	NS	10.3	NS
516-S-BC03	3/9/99	NS	4.3	NS	NS	NS	10.3	NS
516-S-BC04	3/9/99	NS	1.5	NS	NS	NS	4	NS

Table 2.2
 Subsurface Soil Data for COCs at SWMU 47/AOC 516

Sample Number	Date	Aluminum (mg/kg)	Arsenic (mg/kg)	BEQs ^a (μ g/kg)	Copper (mg/kg)	Dioxins ^b (ng/kg)	Lead (mg/kg)	Thallium (mg/kg)
SSL ^c		NA	29	8,000	NA	4,000 ^d	NA	0.7
Background		23,700	14.1	NA	42.2	NA	73.2	NA
516-S-BC05	3/9/99	NS	NS	NS	NS	1.3	NS	NS
516-S-BC06	3/9/99	NS	NS	NS	NS	18.0	NS	NS
516-S-BC07	3/9/99	NS	NS	NS	NS	2.5	NS	NS
516-S-BC08	3/9/99	NS	NS	NS	NS	2.8	NS	NS
516-S-BC09	3/9/99	NS	NS	NS	NS	2.5	NS	NS
516-C-BC09	3/9/99	NS	NS	NS	NS	4.5	NS	NS

Notes:

- J — Estimated Value
- U — Undetected
- mg/kg — milligrams per kilogram
- ng/kg — nanograms per kilogram
- μ g/kg — micrograms per kilogram
- a — BEQs are calculated by multiplying the carcinogenic polycyclic aromatic hydrocarbons (cPAH) by their respective toxicity equivalence factors (TEF) and assuming that nondetect values are estimated according to the memo from Barry Doll, EnSafe, Inc. to Johnny Tapia, SCDHEC, *CNC Background Calculations for Carcinogenic PAHs in Terms of BEQs*, February 5, 1999.
- b — 2,3,7,8 -TCDDs are calculated by multiplying the dioxin and furan congeners by their respective toxicity equivalence factors (TEFs).
- c — USEPA Soil Screening Levels
- d — Tap water RBC
- Bold** — Indicates sample exceeded greater of SSL or background.

it detected in multiple rounds in the same well. Although tetrachloroethene was detected above its RBC in the second-quarter sample from well 047013, no other detection was reported. Aluminum was detected in one second-quarter sample from well 047005 in excess of the tap water RBC. Subsequent sampling rounds did not confirm this exceedance.

Additional samples have been acquired from wells 047GW001 and 047GW01. Lead and thallium were not detected in either well sample and arsenic did not exceed its MCL in either sample. Table 2.3 shows the RFI and CMS sampling results for primary COCs in SWMU 47/AOC 516 groundwater.

2.1.2.3 Sediment

Sediment has not been sampled at SWMU 47/AOC 516.

2.1.2.4 Surface Water

Surface water has not been sampled at SWMU 47/AOC 516.

2.1.3 Interim Stabilization Measures

There were no Interim Stabilization Measures (ISMs) conducted on this site.

2.2 SWMU 47/AOC 516 Remedial Objectives

2.2.1 Chemicals of Concern

2.2.1.1 Soil Chemicals of Concern

Aluminum exceeded its background concentration of 9,990 mg/kg in two of 16 RFI upper-interval samples (047SB002 and 047SB010). However, neither sample exceeded aluminum's risk-based concentration (RBC) of 78,000 mg/kg. Aluminum was not detected above background in RFI lower-interval soil samples. Therefore, aluminum in surface soil will not be further addressed in the CMS.

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**Table 2.3
 Groundwater Data for COCs at SWMU 47/516**

Sample Number	Date	Arsenic ($\mu\text{g/L}$)	Lead ($\mu\text{g/L}$)	Thallium ($\mu\text{g/L}$)
MCL		50	NA	2
Tap Water RBC		.045	NA	2.6
Background		6.07	NA	ND
047-G-W001-01	6/14/95	6.1 J	467	4.5 U
047-G-W001-02	1/25/96	10.9	1.7 U	2.7 U
047-G-W001-03	5/9/96	7.5 J	1.7 U	2.7 U
047-G-W001-04	6/7/96	8.6 J	1.7 U	2.7 U
047-G-W001-F5	1/15/99	25.3 J	1.5 U	3.1 U
047-G-W001-U5	1/15/99	25.3 J	1.5 U	3.1 U
047-G-W002-01	6/14/95	9.2 J	3.7 U	4.5 U
047-G-W002-02	1/25/96	10.5	1.7 U	2.7 U
047-G-W002-03	5/8/96	9 J	1.7 U	2.7 UJ
047-G-W002-04	6/7/96	12 J	1.7 U	3.9 J
047-G-W003-01	6/14/95	3.2 U	3.1 U	4.5 U
047-G-W003-02	1/24/96	2.5 U	1.7 U	2.7 U
047-G-W003-03	5/8/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W003-04	6/10/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W004-01	6/15/95	3.2 U	4.8 J	4.5 U
047-G-W004-02	1/25/96	4.6 J	1.7 U	2.7 U
047-G-W004-03	5/13/96	2.5 UJ	1.4 U	3.4 U
047-G-W004-04	6/10/96	6.6 J	1.7 U	2.7 UJ
047-G-W005-01	6/14/95	3.2 U	6.9 U	4.5 U
047-H-W005-01	6/14/95	3.2 U	4.9 J	4.5 U
047-G-W005-02	1/24/96	9.2 J	12.5	3.9 U
047-G-W005-03	5/13/96	2.5 UJ	4.5	4.3 J
047-G-W005-04	6/10/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W006-01	6/15/95	7.1 J	8.8 J	4.5 U
047-G-W006-02	1/24/96	3.8 J	1.7 U	5.1 U

Table 2.3
Groundwater Data for COCs at SWMU 47/516

Sample Number	Date	Arsenic ($\mu\text{g/L}$)	Lead ($\mu\text{g/L}$)	Thallium ($\mu\text{g/L}$)
MCL		50	NA	2
Tap Water RBC		.045	NA	2.6
Background		6.07	NA	ND
047-H-W006-02	1/24/96	4.4 J	1.7 U	2.7 U
047-G-W006-03	5/14/96	2.5 UJ	1.4 U	3.4 U
047-H-W006-03	5/14/96	2.5 UJ	1.7 U	2.7 U
047-G-W006-04	6/11/96	4.3 J	1.9 U	2.7 UJ
047-G-W007-01	6/14/95	3.2 U	3.4 U	4.5 U
047-G-W007-02	1/25/96	2.5 U	1.7 U	2.7 U
047-G-W007-03	5/14/96	2.5 UJ	1.4 U	3.9 J
047-G-W007-04	6/11/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W008-01	6/15/95	3.2 U	4.0 U	4.5 U
047-G-W008-02	1/25/96	2.5 U	1.7 U	2.7 U
047-G-W008-03	5/15/96	2.5 UJ	1.4 U	3.4 U
047-G-W008-04	6/12/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W009-01	6/15/95	3.2 U	3.9 U	4.5 U
047-G-W009-02	1/26/96	2.5 U	6.4	4.6 U
047-G-W009-03	5/15/96	2.5 UJ	1.4 U	3.4 U
047-G-W009-04	6/12/96	2.5 UJ	1.7 U	2.7 UJ
047-G-W010-01	6/14/95	3.2 U	10.4 U	4.5 U
047-G-W010-02	1/25/96	2.5 U	20.4	2.7 U
047-G-W010-03	5/14/96	2.5 UJ	5.9	3.4 U
047-G-W010-04	6/12/96	2.5 UJ	6.5	2.7 UJ
047-G-W011-01	6/15/95	46.3	4.6 J	4.5 U
047-G-W011-02	1/23/96	164	1.7 U	2.7 U
047-G-W011-03	5/14/96	159	1.4 U	3.4 U
047-G-W011-04	6/13/96	120	1.7 U	2.7 UJ
047-G-W011-F5	1/19/99	28.2	1.5 U	3.1 U

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Table 2.3
Groundwater Data for COCs at SWMU 47/516

Sample Number	Date	Arsenic ($\mu\text{g/L}$)	Lead ($\mu\text{g/L}$)	Thallium ($\mu\text{g/L}$)
MCL		50	NA	2
Tap Water RBC		.045	NA	2.6
Background		6.07	NA	ND
047-G-W011-U5	1/19/99	48.2	1.5 U	3.1 U
047-G-W011-06	7/23/99	22.3	2.2 U	2.3 U
047-G-W011-A6	7/23/99	4.2 J	2.2 U	2.3 U
047-G-W011-B6	7/23/99	3.4 J	2.2 U	2.3 U
047-G-W012-01	6/15/95	3.2 U	3.1 U	4.5 U
047-G-W012-02	1/23/96	15	1.7 U	5.8 U
047-G-W012-03	5/9/96	5.6 J	1.7 U	2.7 UJ
047-G-W012-04	6/13/96	21.1 U	1.7 U	2.7 UJ
047-G-W013-01	6/14/95	3.2 U	4.5 U	4.5 U
047-G-W013-02	1/24/96	2.5 U	1.7 U	3.4 U
047-G-W013-03	5/10/96	3.6 J	1.7 U	2.7 U
047-G-W013-04	6/14/96	5.8 UJ	1.7 U	2.7 UJ
047-G-W015-01	6/15/95	3.9 J	4.9 U	4.5 U
047-G-W015-02	1/25/96	6.5 J	1.7 U	2.7 U
047-G-W015-03	5/10/96	4.5 J	2.6 J	2.8 J
047-G-W015-04	6/14/96	6.1 UJ	1.7 U	2.7 UJ

Notes:

- U — Undetected
- J — Estimated
- $\mu\text{g/L}$ — microgram per liter
- NA — Not applicable
- ND — Not detected
- Bold** — Indicates sample exceeded greater of MCL, Tap Water RBC, or background

Arsenic exceeded its RBC (0.43 mg/kg) and background concentration (14.2 mg/kg) in one of sixteen RFI upper-interval soil samples (047SB007). Arsenic exceeded its RBC in seven RFI samples and four CMS samples, however background concentrations were not exceeded at these locations. Arsenic was not detected above its soil screening level (SSL) or subsurface background concentration in RFI and CMS lower-interval soil samples. Since background concentrations were only exceeded in a single sample, arsenic in surface soil will not be further addressed in the CMS.

Benzo(a)pyrene Equivalent (BEQs) exceeded the RBC (88 µg/kg) and the proposed background concentration (268 µg/kg) in ten of twenty-four RFI upper-interval samples. The proposed background concentrations were exceeded in all twenty-four upper- and thirteen lower-interval soil samples. However, the two sample points (047SB005 and 047SB016) with the highest BEQ detections (7,648 and 4,373 mg/kg respectively) are located near or adjacent to road surfaces which are possible BEQ sources. These two sample points are separated by approximately 300 feet and three other sample points exist between them. The three sample points consist of two non-detects for BEQ and one detect (167 mg/kg) which is less than the proposed background concentration. This random distribution of BEQs infers that the BEQ impact is likely indicative of asphalt applications and vehicular traffic in addition to naturally occurring levels of BEQs throughout the former naval base. Furthermore, this distribution of BEQs is not representative of a source and subsequent contaminant gradients. Therefore, BEQs in surface soil will not be further addressed in the CMS.

Copper exceeded its background concentration of 34.7 mg/kg in three of twenty-four RFI upper-interval soil samples (47SB007, 47SB008, 047SB009, and 047CB009). However, copper's RBC of 3,100 mg/kg was not exceeded at any of the sample locations. Copper exceeded its background concentration of 42.2 mg/kg in two of thirteen lower-interval soil samples. Therefore, copper in surface soil will not be further addressed in the CMS.

Dioxin equivalents (TEQ) did not exceed its RBC of 1 $\mu\text{g}/\text{kg}$ in five CMS supplemental upper-interval soil samples or its SSL of 4 $\mu\text{g}/\text{kg}$ in CMS supplemental lower-interval soil samples. Therefore, dioxin in surface soil will not be further addressed in the CMS.

Lead exceeded its background value of 330 mg/kg and residential risk-based remedial goal of 400 mg/kg in one of sixteen RFI upper-interval soil samples (47SB007) at 1,120 mg/kg. It was not detected above background in the four supplemental CMS samples acquired to delineate the extent of lead contamination. Lead exceeded its subsurface soil background value of 73.2 mg/kg in two of thirteen RFI lower-interval soil samples. The concentration at 047SB007 was 1,190 mg/kg, and the concentration at 047SB009 was 252 mg/kg. Lead concentrations in surface and subsurface soil at sample location 047SB007 will be addressed in the CMS.

Thallium detections in RFI surface soil samples did not exceed its RBC of 5.5 mg/kg. One of thirteen RFI lower-interval soil samples exceeded thallium's SSL of 0.4 mg/kg. The concentration at 047SB007 was 1.8 mg/kg. Since surface soil thallium concentrations did not exceed the RBC, surface soil will not be further addressed for thallium in the CMS. Since thallium was not identified as a COC in groundwater and had only one subsurface soil detection above the SSL, thallium in subsurface soil will not be further addressed in the CMS.

2.2.1.2 Groundwater Chemicals of Concern

Arsenic was the sole COC for SWMU 47/AOC 516. It exceeded its MCL of 50 $\mu\text{g}/\text{L}$ in well 47GW011 in the second through fourth rounds of RFI groundwater sampling. However, the concentration was decreasing over the three rounds of detections. Since both the unfiltered and filtered results from the fifth round do not exceed the MCL, there is a strong possibility that a problem with arsenic in groundwater does not exist at this location. Two additional rounds of sampling under controlled conditions is recommended to determine if the results of the fifth round can be repeated. If the results are repeated then arsenic in groundwater should be dismissed as

a concern at this location. If the results reflect arsenic above MCLs then the CNC project team will need to make risk management decision to determine further remedial action.

2.2.2 Remedial Goal Options

2.2.2.1 Soil

Since SWMU 47/AOC 516 soil contamination can be easily remediated through minor excavation efforts, remedial goal options have not been developed. The purpose of the excavation will be to remove the soil around sample point 047SB007 that exceeds the lead residential cleanup goal of 400 mg/kg. Figure 2.2 shows the RFI/CMS soil sample locations and the proposed excavation area.

2.2.2.2 Groundwater

Groundwater remedial goal options have not been developed based on the need to confirm the presence of arsenic in SWMU 47/AOC 516 groundwater.

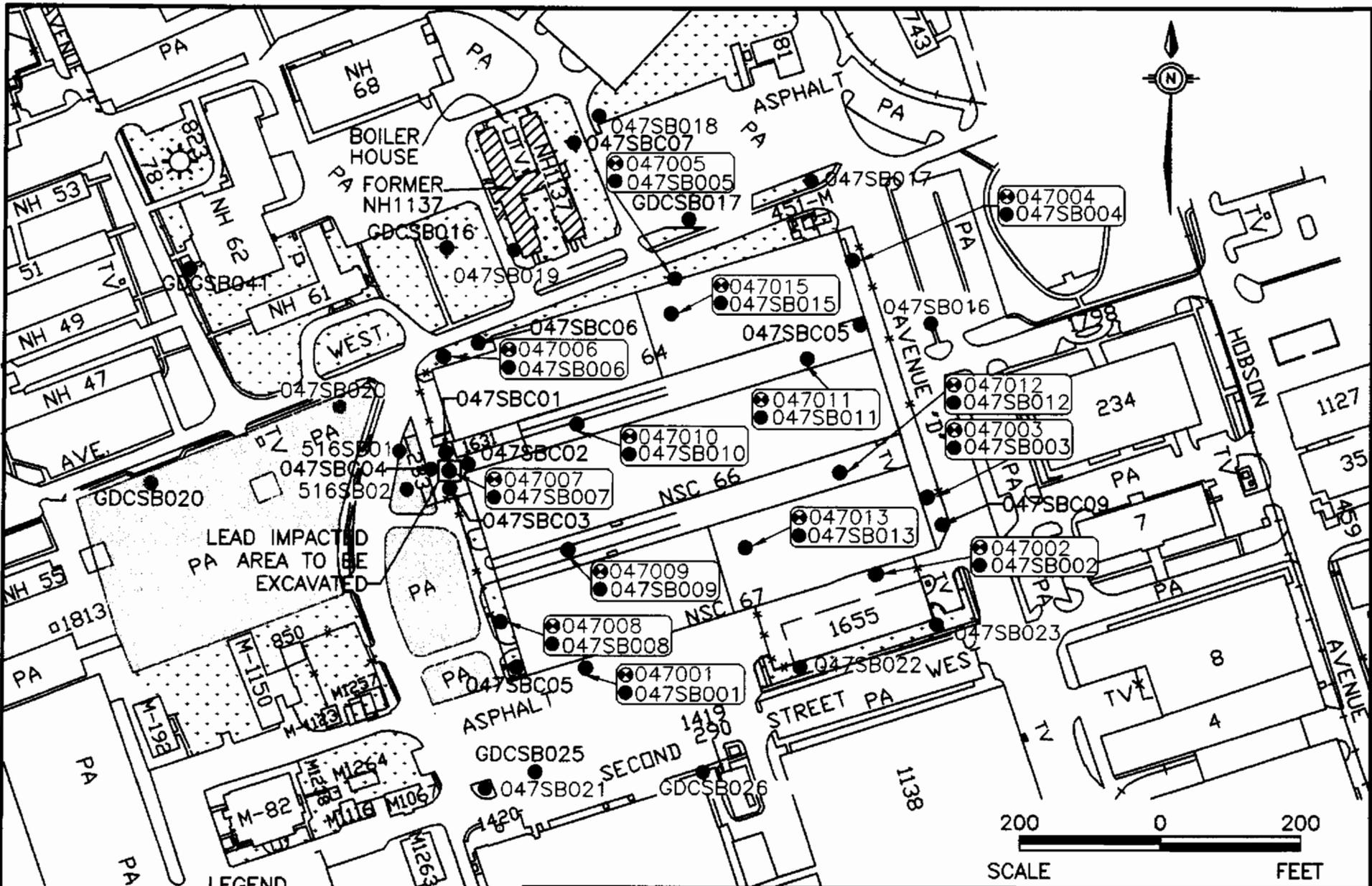
2.3 SWMU 47/AOC 516 Identification And Screening of Technologies

2.3.1 Technology Screening Results for Soil Remediation

Identification and screening of soil remedial technologies is not warranted for this CMS based on the limited extent of contaminated soil and suitability for excavation and disposal.

2.3.2 Technology Screening Results for Groundwater Remediation

Groundwater remedial technology identification and screening were not required during the CMS. Since arsenic concentrations in fifth round samples did not exceed groundwater MCL, additional controlled sampling is recommended to determine if arsenic concentrations exceed groundwater MCLs and require corrective measure consideration.



- - 1ST ROUND SOIL SAMPLE LOCATION
- - 2ND ROUND SOIL SAMPLE LOCATION
- NOTE: 047SB014 NOT INSTALLED
- ⊙ - MONITORING WELL LOCATION
- - GRASS ▨ - GRAVEL ▩ - FORMER BUILDING



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FIGURE 2.2
 SWMU 47 AND AOC 516
 RFI/CMS SAMPLE LOCATIONS AND
 PROPOSED EXCAVATION AREA

2.4 SWMU 47/AOC 516 Development And Evaluation of Alternatives 1

2.4.1 Development and Evaluation of Soil Remedial Alternatives 2

Development and evaluation of soil remedial alternatives was not required during the CMS based on the limited extent of contaminated soil and suitability for excavation and disposal. 3
4

2.4.2 Development and Evaluation of Groundwater Remedial Alternatives 5

Development and evaluation of groundwater remedial alternatives was not required during the CMS. Additional groundwater sampling is recommended to determine the need, if any, for groundwater remediation. 6
7
8

2.5 Recommendations 9

2.5.1 Soil Remedial Alternatives 10

Limited excavation is recommended to eliminate the presence of soil containing lead concentrations exceeding the residential risk threshold (400 mg/kg). 11
12

2.5.2 Groundwater Remedial Alternatives 13

Two additional sampling rounds are recommended to determine the presence of arsenic contamination and the need, if any, for remediation. 14
15

3.0 AOC 508/AOC 511

3.1 AOC 508/511 Site Description

3.1.1 General

AOC 508 is the former location of an incinerator of unknown size. This site is an approximately 75 by 75 foot area along Avenue H, north of Building 762 (a former Naval residential housing unit). AOC 511, a former oil storehouse of unknown dimensions, is a small area between AOC 508 and Building 762. Figure 3.1, AOC 508/AOC 511 Soil Sample Locations and Surface Cover, shows the site features and RFI sample locations.

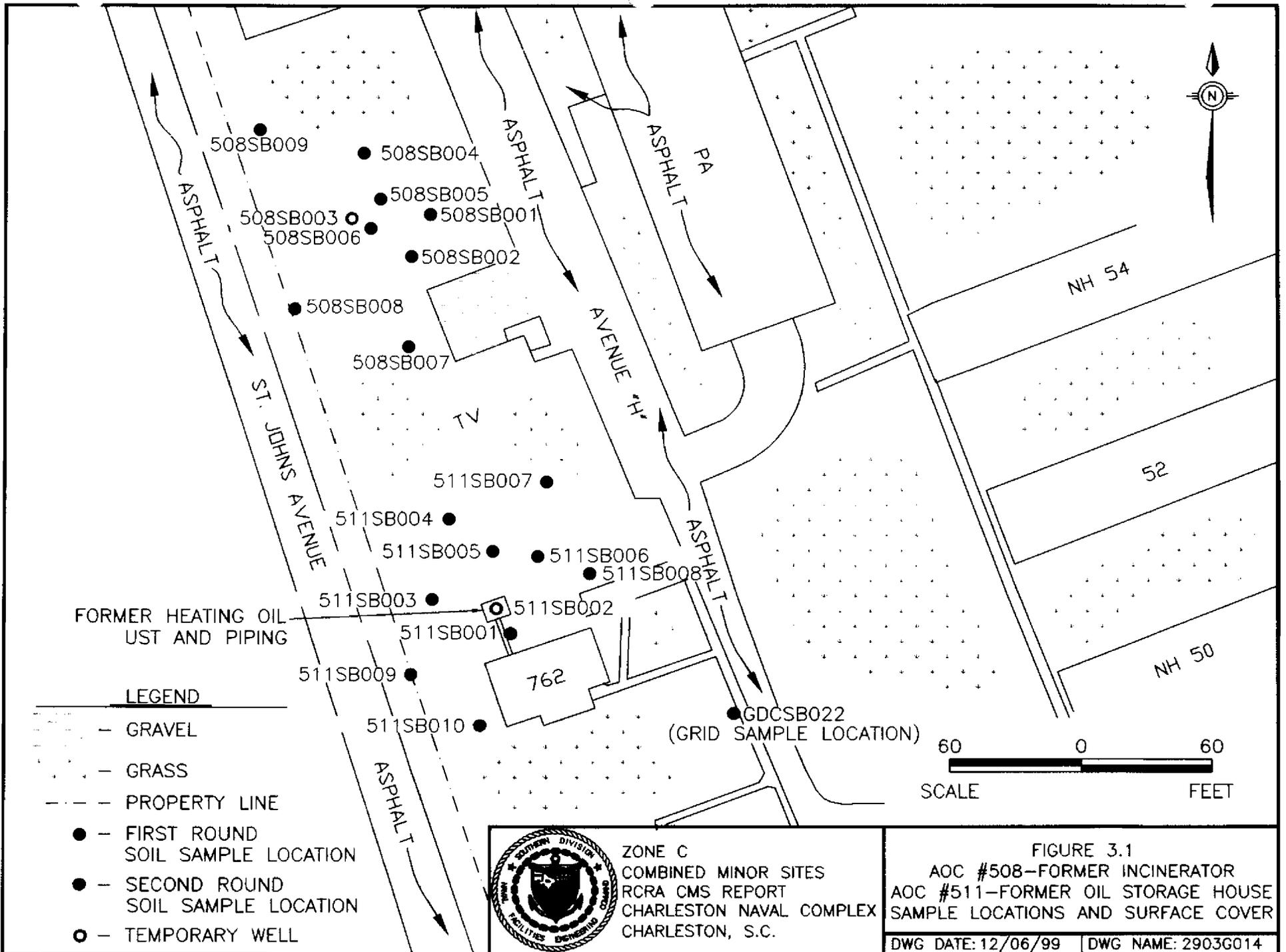
A confirmatory sampling investigation (CSI) was completed at AOC 508/AOC 511 to identify impacts to soil from former site operation releases. In addition, during the RFI, soil was sampled at 15 locations and groundwater was sampled at two temporary wells. Sediment and surface water were not sampled.

Site History Summary

The AOC 508 former incinerator operated from 1922 until 1929. Its operating practices are unknown, but the site was investigated based on the potential presence of contaminants such as petroleum hydrocarbons, metals, and residues of incomplete combustion. The AOC 511 former oil storehouse operated from 1922 until 1954. Its operating practices are also unknown, but the site was investigated based on the potential presence of petroleum hydrocarbons. Prior to the CSI and RFI, there were no previous environmental investigations at AOC 508/AOC 511.

Ground Cover

Both sites are presently grass-covered as shown in Figure 3.1.



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FIGURE 3.1
 AOC #508-FORMER INCINERATOR
 AOC #511-FORMER OIL STORAGE HOUSE
 SAMPLE LOCATIONS AND SURFACE COVER
 DWG DATE: 12/06/99 | DWG NAME: 2903G014

Current Use

AOC 508/AOC 511 are not in use at this time.

Future Use

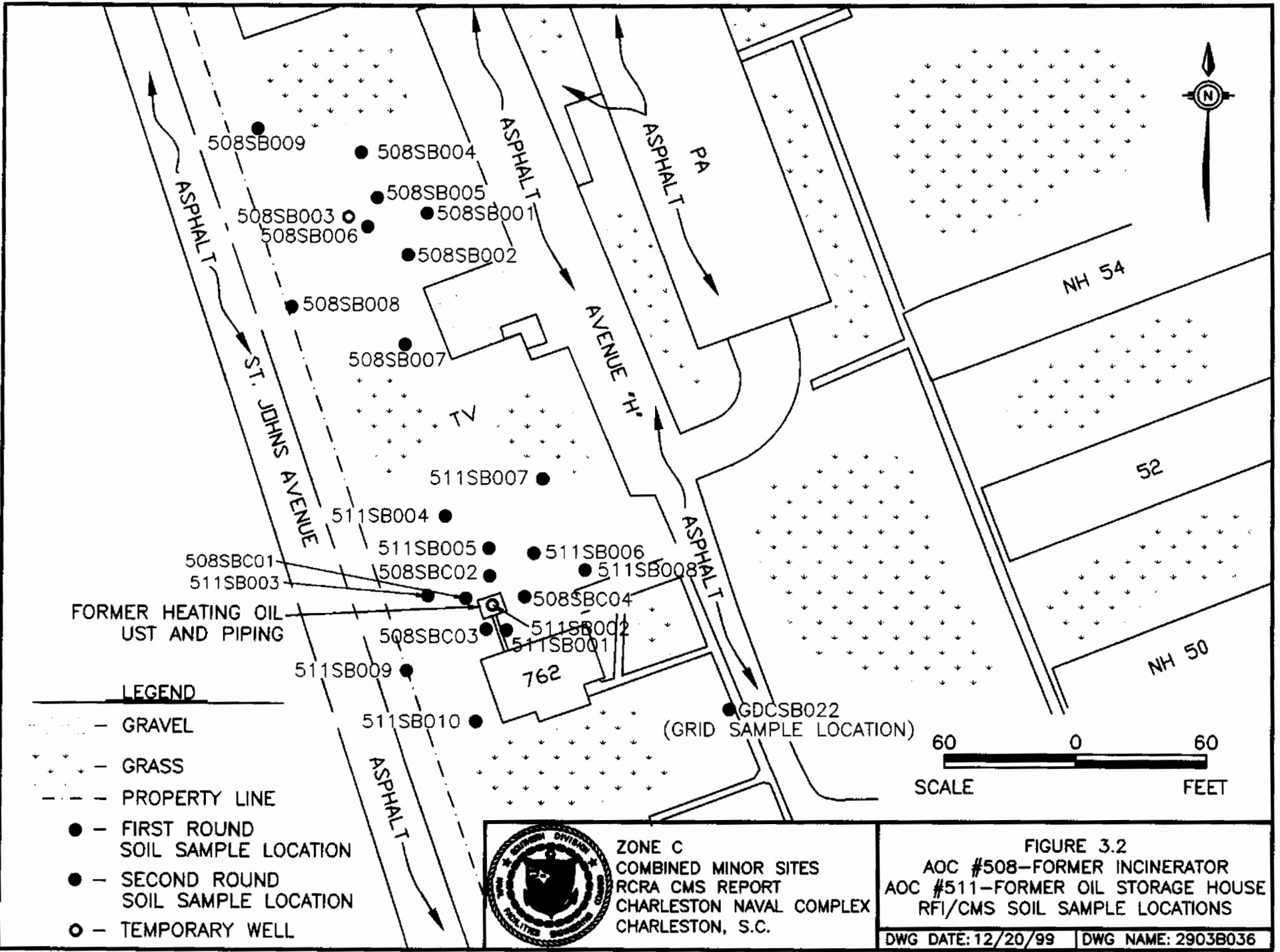
According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for residential or recreational (i.e., park) purposes.

3.1.2 RFI/CMS Sampling Results

3.1.2.1 Soil

Two rounds of soil sampling were completed during the RFI. During the first round, samples were collected from six locations at each site. Eighteen samples were collected in all during the first round, 12 from the upper-interval and six from the lower-interval. Samples were analyzed for VOCs, SVOCs, pesticide/PCBs, metals, cyanide, and TPH. SVOCs exceeded their RBCs in upper-interval samples from locations 508SB003, 508SB005, and 508SB006, and 4,4-DDT was detected above its RBC in the upper-interval from 508SB003. Based on this preliminary review, a second round of sampling was conducted. For this second round, seven upper-interval soil samples (three at AOC 508 and four at AOC 511) were collected from seven additional locations. The additional samples were analyzed for SVOCs, pesticide/PCBs and metals.

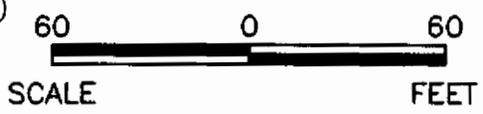
During the CMS, four surface and subsurface soil samples were collected in the vicinity of soil boring 511SB002 and analyzed for dieldrin. The RBC (40 $\mu\text{g}/\text{kg}$) was exceeded at sample locations 508SBC02 (91 $\mu\text{g}/\text{kg}$) and 508SBC03 (200 $\mu\text{g}/\text{kg}$). Table 3.1 and 3.2 summarize the RFI/CMS sample results for surface and subsurface soil primary COCs at AOC 508/511. RFI and CMS sample locations are shown in Figure 3.2. Appendix A contains analytical data reports, chain of custody forms, and data validation reports for CMS supplemental soil samples.



FORMER HEATING OIL
UST AND PIPING

LEGEND

- - GRAVEL
- - GRASS
- - - - PROPERTY LINE
- - FIRST ROUND SOIL SAMPLE LOCATION
- - SECOND ROUND SOIL SAMPLE LOCATION
- - TEMPORARY WELL



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FIGURE 3.2
AOC #508-FORMER INCINERATOR
AOC #511-FORMER OIL STORAGE HOUSE
RFI/CMS SOIL SAMPLE LOCATIONS

DWG DATE: 12/20/99 | DWG NAME: 2903B036

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Table 3.1
 Surface Soil Data For COCs at AOC 508 and AOC 511

Sample Number	Date	4,4'-DDT ($\mu\text{g}/\text{kg}$)	BEQs* ($\mu\text{g}/\text{kg}$)	Chlordane ($\mu\text{g}/\text{kg}$)	Dieldrin ($\mu\text{g}/\text{kg}$)
RBC		1,900	88	1,800	40
Background		NA	268	NA	NA
508-S-B001	3/21/95	57 J	37.2	450	8.2 U
508-S-B002	3/21/95	130	42.7	42	6.6 J
508-S-B003	3/21/95	2,700	1,546	140	29 J
508-S-B004	3/21/95	56	74.1	4.3 U	1.5 J
508-S-B005	3/21/95	220	130.6	4.2 U	4.1 J
508-S-B006	3/21/95	370	1,057	4.8 U	5.1 J
508-C-B006	3/21/95	380 J	1,370	24 U	9.2 U
508-S-B007	6/27/95	17	37.2	110	0.72 J
508-S-B008	6/27/95	960	317.8	520	18
508-S-B009	6/27/95	95	37.2	78	1.2
508-S-BC01	3/8/99	NS	NS	NS	2.6 U
508-S-BC02	3/8/99	NS	NS	NS	91 DJ
508-S-BC03	3/8/99	NS	NS	NS	270 D
508-S-BC04	3/8/99	NS	NS	NS	2.2 U
511-S-B001	3/21/95	240	107.7	12	21 J
511-S-B002	3/21/95	64	77.6	11 J	200 J
511-S-B003	3/21/95	3.7 U	37.2	4.3 U	1.6 U
511-S-B004	3/21/95	18	37.2	11	1.9 J
511-S-B005	3/21/95	27	82.4	35	1.6 U
511-S-B006	3/21/95	110	37.2	42 J	2.2 J

Notes:

- NS — Sample not analyzed
- D — Diluted
- U — Undetected
- J — Estimated
- $\mu\text{g}/\text{kg}$ — micrograms per kilogram
- * — BEQs are calculated by multiplying the carcinogenic polycyclic aromatic hydrocarbons (cPAH) by their respective toxicity equivalence factors (TEF) and assuming that nondetect values are estimated according to the memo from Barry Doil, EnSafe, Inc. to Johnny Tapia, SCDHEC, *CNC Background Calculations for Carcinogenic PAHs in Terms of BEQs*, February 5, 1999.
- Bold** — Indicates sample exceeded greater of RBC or background.

Table 3.2
Subsurface Soil Data For COCs at AOC 508 and AOC 511

Sample Number	Date	4,4'-DDT ($\mu\text{g}/\text{kg}$)	BEQs* ($\mu\text{g}/\text{kg}$)	Chlordane ($\mu\text{g}/\text{kg}$)	Dieldrin ($\mu\text{g}/\text{kg}$)
SSL		32,000	8,000	10,000	4
Background		NA	155	NA	NA
508-S-B004	3/21/95	3.7 U	37.2	4.2 U	1.6 U
508-S-BC01	3/8/99	NS	NS	NS	2.6 U
508-S-BC02	3/8/99	NS	NS	NS	2.7 U
508-S-BC03	3/8/99	NS	NS	NS	9.6 J
508-S-BC04	3/8/99	NS	NS	NS	2.6 U
508-C-BC04	3/8/99	NS	NS	NS	3.1 U
511-S-B001	3/21/95	5.6	37.2	4.3 U	1.6 U
511-S-B002	3/21/95	7.5	37.2	4.2 J	20 J
511-S-B003	3/21/95	3.7 U	37.2	4.3 U	1.6 U
511-S-B005	3/21/95	3.7 U	37.2	4.2 U	1.6 U
511-C-B005	3/21/95	3.7 U	37.2	4.2 U	1.6 U
511-S-B006	3/21/95	3.7 U	37.2	4.2 U	1.6 U

Notes:

NS — Sample not analyzed

D — Diluted

U — Undetected

J — Estimated

$\mu\text{g}/\text{kg}$ — micrograms per kilogram

* — BEQs are calculated by multiplying the carcinogenic polycyclic aromatic hydrocarbons (cPAH) by their respective toxicity equivalence factors (TEF) and assuming that nondetect values are estimated according to the memo from Barry Doll, EnSafe, Inc. to Johnny Tapia, SCDHEC, *CNC Background Calculations for Carcinogenic PAHs in Terms of BEQs*, February 5, 1999.

Bold — Indicates sample exceeded greater of SSL or background.

3.1.2.2 Groundwater

Based on subsurface soil results, groundwater was sampled from two temporary wells and analyzed for pesticides/PCBs to determine the potential for soil to groundwater transport. In addition, one well (511GW002) was sampled for a limited set of VOCs and SVOCs. There were no detections in either sample. Therefore, during the RFI, groundwater was eliminated as a concern at this site.

3.1.2.3 Sediment

Sediment has not been sampled at AOC 508/511.

3.1.2.4 Surface Water

Surface water has not been sampled at AOC 508/511.

3.1.3 Interim Stabilization Measures

In May 1998, the DET removed an underground storage tank (UST) at this site. The 1,000 gallon tank had been used to store heating fuel oil for approximately 20 years. Upon completion of tank removal activities, the DET-produced closure report stated, "...concentrations of BTEX and PAH compounds were not detected above established method detection limits in soil grab samples obtained from the UST excavation. In this regard, the employed closure activities and sampling results appear to indicate that no additional endeavors for remedial actions and/or contaminant characterization are warranted ...at this time." The DET Completion Report was submitted to SCDHEC for review and approval.

3.2 AOC 508/511 Remedial Objectives 1

3.2.1 Chemicals of Concern 2

3.2.1.1 Soil Chemicals of Concern 3

4,4-DDT was detected in fourteen of fifteen RFI upper-interval soil samples but exceeded its RBC of 1,900 $\mu\text{g}/\text{kg}$ in one sample location (508SB003). Since all but one detected concentration was below the DDT RBC, it will not be further addressed in this CMS. 4
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BEQ exceeded its background concentration (268 $\mu\text{g}/\text{kg}$) and RBC (88 $\mu\text{g}/\text{kg}$) in five of fifteen RFI upper-interval soil samples. RBCs were exceeded in all fifteen samples. 7
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Chlordane was detected in eleven of fifteen RFI upper-interval soil samples but did not exceed its RBC of 1,800 $\mu\text{g}/\text{kg}$ in any of these samples. Therefore, chlordane will not be further addressed in the CMS. 9
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Dieldrin exceeded its RBC of 40 $\mu\text{g}/\text{kg}$ in one RFI upper-interval soil sample (511SB002) and two CMS upper-interval soil samples (508SBC02 and 508SBC03). 12
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3.2.1.2 Groundwater Chemicals of Concern 14

No COCs were identified for AOC 508/AOC 511 groundwater. 15

3.2.2 Remedial Goal Options 16

3.2.2.1 Soil 17

In the RFI, the term remedial goal option (RGO) refers to the 95% upper confidence level (UCL) of the mean residual concentration of a chemical that produces a specific level of risk and/or hazard. RFI RGOs were based on selected regulatory thresholds. The CMS work plan introduced alternate RGOs based on risk reduction analysis and comparison to Zone C background risk and 18
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hazard. SCDHEC expressed interest in also setting maximum residual concentrations corresponding to the RGOs to facilitate confirmation sampling.

RFI RGOs did not consider cumulative effects of different chemicals. They simply gave the residual site risk and hazard for a given 95% UCL concentration of a given chemical. CMS RGOs are more conservative than RFI RGOs in that they consider the cumulative effects of the COCs to produce the 95% UCL based on maximum residual site concentrations.

The current cumulative site risk from AOC 508/AOC 511 surface soil is 1.0E-05 and the cumulative hazard quotient (HQ) is 0.0079. The background site risk is 4.6E-06 and the background site hazard is 0.00038. Since current site risk is within the USEPA acceptable range of 1E-06 to 1E-04, no point risk exceeded 1E-04, and the site HQ is less than 1.0, development of RGOs is not warranted for AOC 508/AOC 511 surface soil. Appendix B contains a discussion of the risk calculation methodology, a site data summary, and the results of risk and hazard calculations for AOC 508/AOC 511.

3.2.2.2 Groundwater

Since no COCs were identified for groundwater, RGOs were not developed.

3.3 AOC 508/511 Identification And Screening of Technologies

3.3.1 Soil Remedial Technologies

Since the residential site and point risk values are within the acceptable USEPA range (1E-06 to 1E-04), and site hazard is less than 1.0, identification and screening of soil remedial technologies is not warranted for this CMS.

3.3.2 Groundwater Remedial Technologies 1

Since there were no COCs identified, identification and screening of groundwater remedial technologies is not warranted. 2
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3.4 AOC 508/511 Detailed Evaluation of Alternatives 4

3.4.1 Evaluation of Soil Remedial Alternatives 5

Since the residential site and point risk values are within the acceptable USEPA range (1E-06 to 1E-04), and site hazard is less than 1.0, an evaluation of alternatives is not warranted for this CMS. 6
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3.4.2 Evaluation of Groundwater Remedial Alternatives 9

Since no COCs were identified, detailed evaluation of groundwater remedial alternatives is not warranted. 10
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3.5 AOC 508/511 Recommendations 12

3.5.1 Soil Recommendations 13

AOC 508/511 soil is recommended for no further action under the RCRA process based on the residential site and point risk values within the acceptable USEPA range (1E-06 to 1E-04) and a site HQ less than 1.0. 14
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3.5.2 Groundwater Recommendations 17

Since no COCs were identified, AOC 508/AOC 511 groundwater is recommended for no further action under the RCRA process. 18
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4.0 AOC 518

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4.1 AOC 518 Site Description

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4.1.1 General

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AOC 518 is a site where coal was stored in bins from 1926 until 1937. The coal storage bins have since been removed and the site is no longer used for coal storage. Figure 4.1, AOC 518 Soil Locations and Surface Cover, shows surface features and RFI soil sample locations.

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Site History Summary

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AOC 518 is a site of potential historical concern because it was used for coal storage. The coal was used at the former naval base to fuel steam generating boilers. The steam was primarily used to heat the building. The RFI focused on potential soil contaminants that may have resulted from coal storage including coal derivatives such as SVOCs and inorganics (metals). No groundwater monitoring wells were installed at AOC 518.

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Ground Cover

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The site is presently developed and is covered with grass, gravel, and asphalt parking lots and roads. In addition, Building M-1257 and other nearby buildings now occupy the former coal storage bins area. Figure 4.1 shows general site features and surface conditions.

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Current Use

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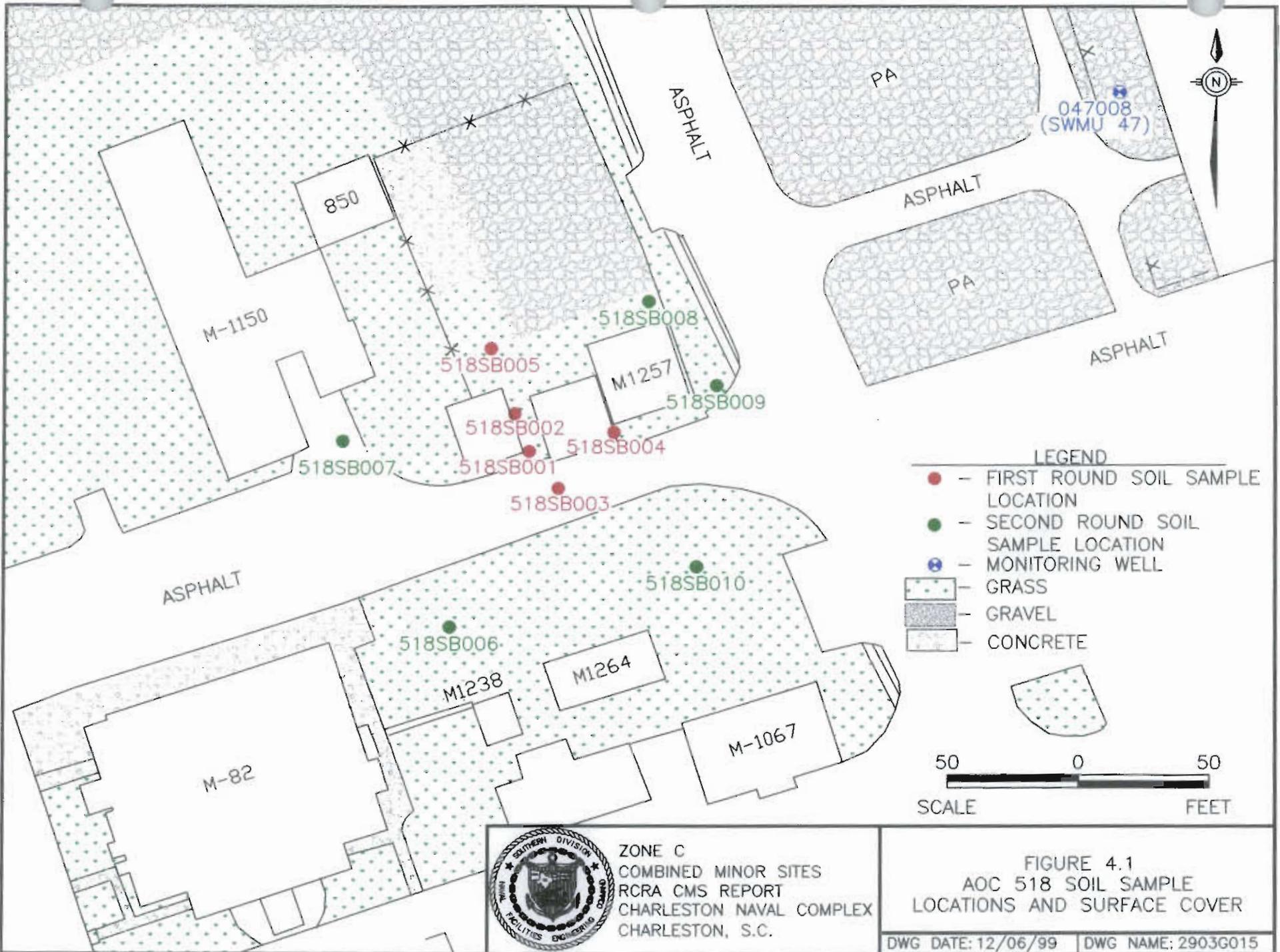
Several of the buildings near and at AOC 518 are either secured and empty because of BRAC requirements or are in use by a current base reuse tenant, the North Charleston Police Department. Roadways and parking lots in the vicinity of AOC 518 are also in use by the police department and/or other adjacent base reuse tenants.

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ZONE C
 COMBINED MINOR SITES
 RCRA CMS REPORT
 CHARLESTON NAVAL COMPLEX
 CHARLESTON, S.C.

FIGURE 4.1
 AOC 518 SOIL SAMPLE
 LOCATIONS AND SURFACE COVER

DWG DATE: 12/06/99 | DWG NAME: 2903G015

Future Use

According to the Charleston Naval Complex Redevelopment Authority, this area will likely be used for residential or recreational (i.e., park) purposes. However, as noted above, a portion of the site is presently leased and in full use by the North Charleston Police Department.

4.1.2 RFI/CMS Sampling Results

During the RFI, soil was sampled to identify impacts to soil resulting from coal storage onsite. Potential contaminants included coal derivatives (SVOCs) and metals. Supplemental CMS sampling was conducted to assess the aerial extent of chlordane around sample location 518SB001 and lead around sample location 518SB010.

4.1.2.1 Soil

RFI soil samples were collected in two rounds. Ten soil samples were collected from five locations during the first round (one upper- and one lower-interval sample per location). First round samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. This preliminary review indicated that benzo(a)pyrene (BaP) exceeded its RBC of 88 $\mu\text{g}/\text{kg}$ at locations 518SB001 and 518SB002 in the upper interval, and chlordane exceeded its RBC of 1,800 $\mu\text{g}/\text{kg}$ at 518SB001 in the upper and lower intervals. Based on these results, a second round of RFI sampling was conducted. During the second-round sampling, five supplemental sample locations were added near these locations to delineate the extent of SVOC and pesticide contamination. Upper-interval soil samples were collected from each location. Two sample locations were analyzed for pesticides (518SB006 and 518SB007), one for SVOCs (518SB007), and three for metals (518SB008, 518SB009, 518SB010).

During the CMS, eleven surface and subsurface soil samples were collected and analyzed for the presence of lead around RFI sample location 518SB010. Three supplemental surface and subsurface samples were collected around RFI sample location 518SB001 and analyzed for

chlordanes. Tables 4.1 and 4.2 summarize the RFI/CMS sampling results for surface and subsurface soil primary COCs at AOC 518. Appendix A contains analytical data reports, chain of custody forms, and data validation reports for CMS supplemental soil samples.

4.1.2.2 Groundwater

There are no groundwater wells at AOC 518. The nearest downgradient well is in SWMU 47 (047GW008) and is approximately 200 feet northeast of AOC 518. It had no detections above tap water RBCs or background concentrations.

4.1.2.3 Sediment

Sediment has not been sampled at AOC 518.

4.1.2.4 Surface Water

Surface water has not been sampled at AOC 518.

4.1.3 Interim Stabilization Measures

No ISMs have been conducted at this site.

4.2 AOC 518 SOIL Remedial Objectives

Chlordane exceeded its RBC of 1,800 $\mu\text{g}/\text{kg}$ in one of fifteen RFI and CMS upper-interval soil samples. This isolated exceedance is recommended to be addressed through excavation and off-site disposal. Confirmation sample results will be used to determine the extent of excavation. Approximately 11 yd^3 is proposed for removal from the location shown in Figure 4.2.

Lead was detected above its background concentration (330 mg/kg) and risk-based remedial goal (400 mg/kg) in five of twenty RFI and CMS upper-interval soil samples (518SB010, 518SBC05, 518SBB06, 518SBC09, 518SBC10). Lead exceeded its background value of 73.2 mg/kg in two

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 Charleston Naval Complex
 Section 4: AOC 518
 Revision: 0

Table 4.1
 Surface Soil Data for COCs at AOC 518

Sample Number	Date	Chlordane ($\mu\text{g}/\text{kg}$)	Lead (mg/kg)
RBC or Remedial Goal		1,800^b	400^a
Background		NA	330
518-S-B001	4/5/95	7,400	5.6 J
518-S-B002	4/5/95	4.2 U	129 J
518-S-B003	4/5/95	4.2 U	55.3 J
518-S-B004	4/5/95	48	89.6 J
518-C-B004	4/5/95	4.2 U	185 J
518-S-B005	4/5/95	4.3 U	9.8 J
518-S-B006	6/28/95	70	3.2 J
518-C-B006	6/28/95	55	30
518-S-B007	6/28/95	11 U	NS
518-S-B008	6/28/95	NS	94.2
518-S-B009	6/28/95	NS	71.1 U
518-S-B010	6/28/95	NS	750
518-S-BC01	3/8/99	2.8 U	NS
518-S-BC02	3/8/99	1.55 U	NS
518-S-BC03	3/8/99	2.8 U	NS
518-S-BC04	3/8/99	9.7 J	123 J
518-S-BC05	3/8/99	23.3 J	934 J
518-S-BC06	3/8/99	2.8 U	766 J
518-S-BC07	3/8/99	2.8 U	214 J
518-S-BC08	5/13/99	NS	149 N
518-S-BC09	5/13/99	NS	508 N
518-S-BC10	5/12/99	NS	645 N
518-S-BC11	5/12/99	NS	210 N
518-S-BC12	5/12/99	NS	38.1 N
518-S-BC13	5/12/99	NS	176 N
518-S-BC14	5/12/99	NS	306 N
518-C-BC14	5/12/99	NS	297 N

Notes:

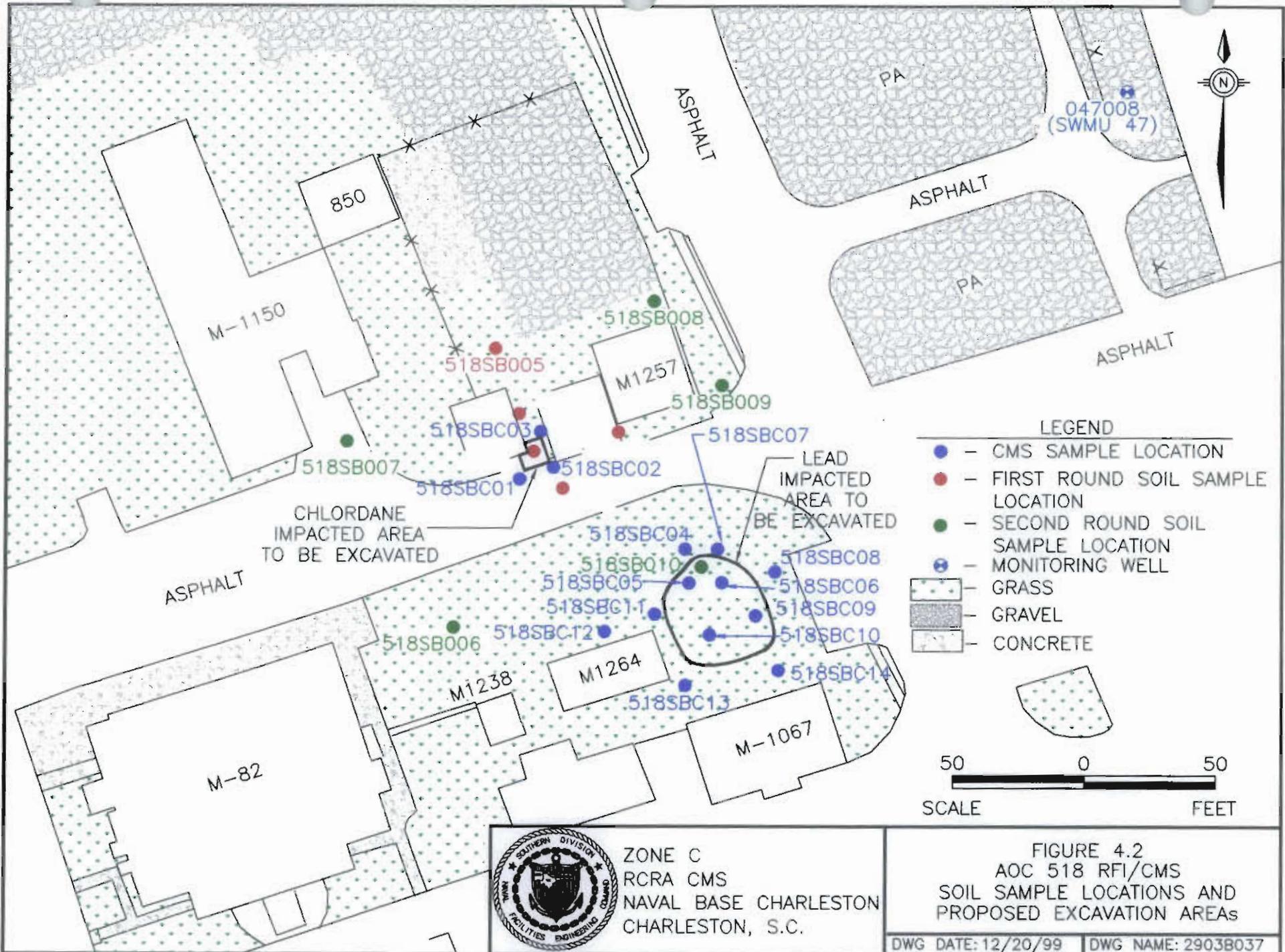
- D — Diluted result
- J — Estimated Value
- U — Undetected
- $\mu\text{g}/\text{kg}$ — micrograms per kilogram
- mg/kg — milligrams per kilogram
- a — Risk-based remedial goal from USEPA
- b — RBC
- Bold** — Indicates sample exceeded greater of RBC, remedial goal, or background.

Table 4.2
Subsurface Soil Data for COCs at AOC 518

Sample Number	Date	Chlordane ($\mu\text{g}/\text{kg}$)	Lead (mg/kg)
SSL*		2,000	NA
Background		NA	73.2
518-S-B001	4/5/95	1,800	2.6 J
518-S-B002	4/5/95	4.3 U	6.5 J
518-S-B003	4/5/95	4.3 U	4.5 J
518-S-B004	4/5/95	4.2 U	3.2 J
518-S-B005	4/5/95	4.2 U	3.2 J
518-S-BC01	3/8/99	48 D	NS
518-S-BC02	3/8/99	0.24 J	NS
518-S-BC03	3/8/99	1.65 U	NS
518-C-BC03	3/8/99	0.31 J	NS
518-S-BC04	3/8/99	1.74 U	17.6 J
518-S-BC05	3/8/99	2.8 J	16.8 J
518-S-BC06	3/8/99	2.8 U	45.4 J
518-S-BC07	3/8/99	0.35 J	14.1 J
518-C-BC07	3/8/99	2.8 U	12.6 J
518-S-BC08	5/13/99	NS	34.8 J
518-S-BC09	5/13/99	NS	3 J
518-S-BC10	5/12/99	NS	177 J
518-S-BC11	5/12/99	NS	5 J
518-S-BC12	5/12/99	NS	3 J
518-S-BC13	5/12/99	NS	9.5 J
518-S-BC14	5/12/99	NS	428 J

Notes:

- NS — Sample not analyzed
- J — Estimated Value
- U — Undetected
- mg/kg — milligrams per kilogram
- $\mu\text{g}/\text{kg}$ — micrograms per kilogram
- * — USEPA Soil Screening Levels
- Bold** — Indicates sample exceeded greater of SSL or background



of sixteen RFI and CMS lower-interval soil samples. These isolated exceedances are recommended to be addressed through excavation and off-site disposal. Confirmation sample results will be used to determine the extent of excavation. Approximately 100 yd³ is proposed for removal from the location shown in Figure 4.2.

4.2.1 Remedial Goal Options

Since AOC 518 soil contamination can be easily remediated through minor excavation efforts, remedial goal options have not been developed. The purpose of the excavation will be to remove the contaminated soil and achieve cleanup goals. The residential cleanup goal for lead is 400 mg/kg lead and the chlordane RBC is 1,800 µg/kg.

4.3 AOC 518 Identification and Screening of Soil Technologies

Identification and screening of soil remedial technologies is not warranted for this CMS based on the limited extent of contaminated soil and suitability for excavation and disposal.

4.4 AOC 518 Detailed Evaluation of Soil Alternatives

Detailed evaluation of soil remedial alternatives is not warranted for this CMS based on the limited extent of contaminated soil and suitability for excavation and disposal.

4.5 AOC 518 Soil Recommendations

Excavation and offsite disposal is recommended for AOC 518 soil based on the limited extent of contaminated soil and suitability for excavation and disposal.

5.0 PUBLIC INVOLVEMENT PLAN

5.1 General

The following Public Involvement Plan (PIP) is included as part of this report in accordance with the USEPA's guidance on RCRA CMS. This PIP reflects and summarizes information prepared and presented in the Navy's Community Relations Plan (CRP), prepared for the CNC in 1995.

Under RCRA, there is no required interaction with the community during the Corrective Measures Study process. Public input is required to be solicited only at the beginning of the permitting process, or during certain permit modifications. Therefore, the Navy has outlined a voluntary program of informing local communities throughout the entire RCRA corrective action process. Activities are detailed in the 1995 CRP.

However, because the CMS process results in a modification to the facility's RCRA permit, certain provisions are made to solicit the public's input on the proposed alternative (as the reason for the modification). The requirements are identical to those required for a draft permit.

Two primary objectives are stated in the CRP:

- To initiate and sustain community involvement.
- To provide a mechanism for communicating to the public.

5.2 RFI Public Involvement Plan

To achieve these objectives, the CRP identifies public involvement and outreach activities at each step of the corrective action process. For example, the following activities have been designated for the completion of the RFI. All have been accomplished.

- Update and publicize the information repository.
- Continue to publicize the point of contact.

- Update the mailing list 1

- Distribute fact sheets and/or write articles to explain RFI findings. 2

- Inform community leaders of the completion and results of the RFI. 3

- Update and continue to provide, whenever possible, presentations for informal community groups. 4
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- Update the community on results of the RFI through public Restoration Advisory Board (RAB) meetings. 6
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5.3 CMS Public Involvement Plan 8

During the CMS, the following activities will be carried out as part of the Navy’s current and ongoing community involvement program. 9
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- Distribute a fact sheet and/or write articles for publication that report CMS recommendations. 11
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- Continue to update the mailing list. 13

- Continue to respond to requests for speaking engagements. 14

- Update the community on CMS status through public RAB meetings. 15

5.4 Statement of Basis Public Involvement Plan 16

Upon completion of the Corrective Measures Study, when the preferred alternative has been proposed, the following activities are required if a modification to the RCRA permit is required. 17
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If a permit modification is not necessary, the Navy may choose to implement all, some, or none of the following actions, depending on the level of public interest or concern: 1
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- An SOB will be prepared, explaining the proposed remedy and the method by which it was chosen. 3
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- A 45-day comment period will be provided to allow community members the opportunity to review and comment on the preferred alternative. The comment period may be as short as 30 days in cases where no permit modification is necessary, but a public comment period is warranted. 5
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- Availability of the comment period and SOB will be announced in a public notice. 9
- The community will be provided an update on the proposed remedy through the informal and publicized RAB meetings. 10
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In addition, the following activities will be carried out, as identified in the CRP: 12

- Update and publicize the information repository. 13
- Publicize the environmental point of contact. 14
- Continue to update the mailing list. 15

5.5 Restoration Advisory Board 16

The RAB is a key component of this community outreach program. It is through the RAB that the Navy has a regular, scheduled, and publicized forum for interfacing with community members on the progress of the environmental program, including the CMS. In addition, RAB members are key instruments in measuring community interest in specific issues and knowledge of them. A Community Relations Subcommittee to the RAB has been tasked with identifying issues and information to be addressed by the Navy. 17
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6.0 REFERENCES

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7.0 SIGNATORY REQUIREMENT

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA Part B Permit (EPA SCO 170 022 560) states: All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with Section 40 CFR 270.11. The certification reads as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Henry N. Sheppard II, P.E.
Caretaker Site Office, Charleston

Date

Appendix A

Analytical Data, Chain of Custody Forms, and Data Validation Reports

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

AS,PB		SAMPLE ID ----->	516-S-BC01-01	516-S-BC01-02	516-C-BC01-02	516-S-BC02-01	516-S-BC02-02	516-S-BC03-01				
		ORIGINAL ID ----->	516SBC0101	516SBC0102	516CBC0102	516SBC0201	516SBC0202	516SBC0301				
		LAB SAMPLE ID ---->	37681.03	37681.04	37681.05	37681.06	37681.07	37681.08				
		ID FROM REPORT -->	516SBC0101	516SBC0102	516CBC0102	516SBC0201	516SBC0202	516SBC0301				
		SAMPLE DATE ----->	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99				
		DATE EXTRACTED -->	03/18/99	03/18/99	03/18/99	03/18/99	03/18/99	03/18/99				
		DATE ANALYZED ---->	03/21/99	03/21/99	03/21/99	03/21/99	03/21/99	03/21/99				
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil				
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG				
CAS #	Parameter	37681	VAL	37681	VAL	37681	VAL	37681	VAL	37681	VAL	
7440-38-2	Arsenic (As)	2.1		3.1		2.7		4.9		5.		3.8
7439-92-1	Lead (Pb)	28.		13.8		13.6		36.7		10.3		11.2

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

AS,PB		SAMPLE ID ----->	516-S-BC03-02	516-S-BC04-01	516-S-BC04-02			
		ORIGINAL ID ----->	516SBC0302	516SBC0401	516SBC0402			
		LAB SAMPLE ID ---->	37681.09	37681.10	37681.11			
		ID FROM REPORT ---->	516SBC0302	516SBC0401	516SBC0402			
		SAMPLE DATE ----->	03/09/99	03/09/99	03/09/99			
		DATE EXTRACTED -->	03/18/99	03/18/99	03/18/99			
		DATE ANALYZED ---->	03/21/99	03/21/99	03/21/99			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	37681	VAL	37681	VAL	37681	VAL	
7440-38-2	Arsenic (As)	4.3		8.7		1.5		
7439-92-1	Lead (Pb)	10.3		3.7		4.		

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

SWS46-DIOX		SAMPLE ID ----->	516-S-BC05-01	516-S-BC05-02	516-S-BC06-01	516-S-BC06-02	516-S-BC07-01	516-S-BC07-02 RE	
		ORIGINAL ID ----->	516SBC0501	516SBC0502	516SBC0601	516SBC0602	516SBC0701	516SBC0702	
		LAB SAMPLE ID ---->	37681.14	37681.15	37681.12	37681.13	37681.16	37681.17	
		ID FROM REPORT -->	516SBC0501	516SBC0502	516SBC0601	516SBC0602	516SBC0701	516SBC0702	
		SAMPLE DATE ----->	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	
		DATE EXTRACTED -->	03/11/99	03/11/99	03/11/99	03/11/99	03/11/99	03/11/99	
		DATE ANALYZED ---->	03/17/99	03/17/99	03/17/99	03/17/99	03/18/99	03/26/99	
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil	
		UNITS ----->	NG/KG	NG/KG	NG/KG	NG/KG	NG/KG	NG/KG	
CAS #	Parameter	37681	VAL	37681	VAL	37681	VAL	37681	VAL
1746-01-6	2378-TCDD	0.51	U	0.581	U	0.239	U	0.249	U
3268-87-9	OCDD	731.917		153.689		301.178		1152.704	
40321-76-4	12378-PeCDD	0.63	U	0.412	U	0.386	U	0.612	U
39227-28-6	123478-HxCDD	0.879	U	1.175	U	0.531	U	0.546	U
57653-85-7	123678-HxCDD	1.55	J	0.656	U	0.346	U	1.743	
19408-74-3	123789-HxCDD	0.583	U	0.78	U	0.401	U	3.318	
35822-46-9	1234678-HpCDD	84.162		9.543		9.906		62.63	
51207-31-9	2378-TCDF	0.361	U	0.703	U	0.301	U	0.334	U
57117-41-6	12378-PeCDF	0.516	U	0.356	U	0.275	U	0.514	U
57117-31-4	23478-PeCDF	0.539	U	0.371	U	0.28	U	0.523	U
70648-26-9	123478-HxCDF	7.734	J	0.836	U	1.424	J	1.006	J
57117-44-9	123678-HxCDF	2.713	U	0.557	U	0.327	U	0.485	U
72918-21-9	123789-HxCDF	4.427	U	0.909	U	0.482	U	0.714	U
60851-34-5	234678-HxCDF	3.974	U	0.816	U	0.423	U	0.627	U
67562-39-4	1234678-HpCDF	51.953		1.072		3.781		19.156	
55673-89-7	1234789-HpCDF	9.798	U	0.898	U	1.08	U	0.747	U
39001-02-0	OCDF	167.044		1.825		5.023	J	8.085	
41903-57-5	Total Tetra-Dioxins	0.51	U	0.581	U	0.507		3.693	
36088-22-9	Total Penta-Dioxins	0.63	U	0.412	U	0.386	U	5.323	
34465-46-8	Total Hexa-Dioxins	4.987		10.18		0.346	U	97.615	
37871-00-4	Total Hepta-Dioxins	176.587		31.647		23.039		60.002	
55722-27-5	Total Tetra-Furans	2.313		0.703	U	1.56		190.067	
30602-15-4	Total Penta-Furans	22.123		0.371	U	11.506		1.702	
55684-94-1	Total Hexa-Furans	59.215		0.557	U	6.894		12.61	
38998-75-3	Total Hepta-Furans	51.953		1.072		3.781		25.932	
								19.156	
									1.044

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

SW846-DIOX		SAMPLE ID ----->	516-S-BC08-01	516-S-BC08-02	516-S-BC09-01	516-S-BC09-02	516-C-BC09-02				
		ORIGINAL ID ----->	516SBC0801	516SBC0802	516SBC0901	516SBC0902	516CBC0902				
		LAB SAMPLE ID ---->	37681.18	37681.19	37681.20	37681.21	37681.22				
		ID FROM REPORT -->	516SBC0801	516SBC0802	516SBC0901	516SBC0902	516CBC0902				
		SAMPLE DATE ----->	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99				
		DATE EXTRACTED -->	03/11/99	03/11/99	03/11/99	03/11/99	03/11/99				
		DATE ANALYZED -->	03/18/99	03/26/99	03/26/99	03/26/99	03/18/99				
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil				
		UNITS ----->	NG/KG	NG/KG	NG/KG	NG/KG	NG/KG				
CAS #	Parameter	37681	VAL	37681	VAL	37681	VAL	37681	VAL		
1746-01-6	2378-TCDD	0.3	U	0.387	U	0.564	U	0.483	U	1.144	UJ
3268-87-9	OCDD	194.183		81.352		132.021		231.214		334.062	J
40321-76-4	12378-PeCDD	0.555	U	0.406	U	0.443	U	0.382	U	1.712	UJ
39227-28-6	123478-HxCDD	0.959	U	0.449	U	0.443	U	0.512	U	2.	UJ
57653-85-7	123678-HxCDD	0.536	U	0.251	U	0.247	U	0.286	U	1.117	UJ
19408-74-3	123789-HxCDD	0.636	U	0.298	U	0.294	U	0.34	U	1.327	UJ
35822-46-9	1234678-HpCDD	8.023		4.663		4.991		14.111		19.802	J
51207-31-9	2378-TCDF	0.258	U	0.202	U	0.443	U	0.496	U	1.197	UJ
57117-41-6	12378-PeCDF	0.361	U	0.276	U	0.315	U	0.208	U	1.128	UJ
57117-31-4	23478-PeCDF	0.377	U	0.289	U	0.328	U	0.217	U	1.178	UJ
70648-26-9	123478-HxCDF	0.316	U	0.354	U	0.248	U	0.311	U	1.393	UJ
57117-44-9	123678-HxCDF	0.211	U	0.236	U	0.165	U	0.208	U	0.929	UJ
72918-21-9	123789-HxCDF	0.344	U	0.385	U	0.269	U	0.339	U	1.515	UJ
60851-34-5	234678-HxCDF	0.309	U	0.346	U	0.242	U	0.304	U	1.36	UJ
67562-39-4	1234678-HpCDF	1.345		0.257	U	0.615	J	1.034		1.333	J
55673-89-7	1234789-HpCDF	0.469	U	0.343	U	0.479	U	0.294	U	1.135	UJ
39001-02-0	OCDF	0.486	U	0.558	U	1.576	U	4.029	U	1.712	UJ
41903-57-5	Total Tetra-Dioxins	0.3	U	1.917		1.911		0.483	U	1.144	UJ
36088-22-9	Total Penta-Dioxins	0.555	U	0.984		0.646		0.382	U	1.712	UJ
34465-46-8	Total Hexa-Dioxins	9.876		3.018		8.322		20.51		37.384	
37871-00-4	Total Hepta-Dioxins	31.183		12.943		17.777		42.067		77.55	
55722-27-5	Total Tetra-Furans	0.258	U	0.202	U	0.443	U	0.496	U	1.197	U
30602-15-4	Total Penta-Furans	0.841		0.289	U	0.328	U	2.542		1.178	U
55684-94-1	Total Hexa-Furans	0.211	U	0.236	U	0.165	U	0.208	U	1.56	
38998-75-3	Total Hepta-Furans	2.277		0.257	U	0.718		1.184		1.333	

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

SW846-META	SAMPLE ID ----->	047-G-W011-06	047-G-W011-A6	047-G-W011-B6			
	ORIGINAL ID ----->	047GW01106	047GW011A6	047GW011B6			
	LAB SAMPLE ID ---->	39641.01	39641.02	39641.03			
	ID FROM REPORT -->	047GW01106	047GW011A6	047GW011B6			
	SAMPLE DATE ----->	07/23/99	07/23/99	07/23/99			
	DATE EXTRACTED -->	07/28/99	07/28/99	07/28/99			
	DATE ANALYZED ---->	07/28/99	07/28/99	07/28/99			
	MATRIX ----->	Water	Water	Water			
	UNITS ----->	UG/L	UG/L	UG/L			

CAS #	Parameter	39641	VAL	39641	VAL	39641	VAL
7429-90-5	Aluminum (Al)	32.1	U	32.1	U	32.1	U
7440-36-0	Antimony (Sb)	5.	U	5.	U	5.	U
7440-38-2	Arsenic (As)	22.3		4.2	J	3.4	J
7440-39-3	Barium (Ba)	51.5		49.5		47.9	
7440-41-7	Beryllium (Be)	0.3	U	0.3	U	0.3	U
7440-43-9	Cadmium (Cd)	0.3	U	0.3	U	0.3	U
7440-70-2	Calcium (Ca)	101000.		99400.		95000.	
7440-47-3	Chromium (Cr)	0.5	U	0.5	U	0.5	U
7440-48-4	Cobalt (Co)	1.7	U	1.7	U	1.7	U
7440-50-8	Copper (Cu)	1.	U	1.	U	1.	U
7439-89-6	Iron (Fe)	847.		24.2	U	24.2	U
7439-92-1	Lead (Pb)	2.2	U	2.2	U	2.2	U
7439-95-4	Magnesium (Mg)	6440.		6430.		6160.	
7439-96-5	Manganese (Mn)	29.5		4.9	J	5.5	J
7439-97-6	Mercury (Hg)	0.1	U	0.1	U	0.1	U
7440-02-0	Nickel (Ni)	3.4	J	10.5	J	3.5	J
7440-09-7	Potassium (K)	2880.		3000.		2870.	
7782-49-2	Selenium (Se)	2.9	U	2.9	U	2.9	U
7440-22-4	Silver (Ag)	2.	U	2.	U	2.	U
7440-23-5	Sodium (Na)	20000.	J	18600.	J	20100.	J
7440-28-0	Thallium (Tl)	2.3	U	2.3	U	2.3	U
7440-31-5	Tin (Sn)	29.5	U	29.5	U	29.5	U
7440-62-2	Vanadium (V)	0.9	U	0.9	U	0.9	U
7440-66-6	Zinc (Zn)	5.3	J	5.	J	5.7	J

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

SW846METAL		SAMPLE ID ----->	047-G-W001-F5	047-G-W001-U5	047-G-W011-F5	047-G-W011-U5			
		ORIGINAL ID ----->	047GW001F5	047GW001U5	047GW011F5	047GW011U5			
		LAB SAMPLE ID ---->	37110.03	37110.02	37131.03	37131.02			
		ID FROM REPORT -->	047GW001F5	047GW001U5	047GW011F5	047GW011U5			
		SAMPLE DATE ----->	01/15/99	01/15/99	01/19/99	01/19/99			
		DATE EXTRACTED -->	01/19/99	01/19/99	01/21/99	01/21/99			
		DATE ANALYZED ---->	01/19/99	01/19/99	01/21/99	01/21/99			
		MATRIX ----->	Water	Water	Water	Water			
		UNITS ----->	UG/L	UG/L	UG/L	UG/L			
CAS #	Parameter	37110	VAL	37110	VAL	37131	VAL	37131	VAL
7439-97-6	Mercury (Hg)	0.1	U	0.1	U	0.1	U	0.1	U
7440-36-0	Antimony (Sb)	2.7	U	2.7	U	2.7	U	2.7	U
7440-38-2	Arsenic (As)	25.3	J	25.3	J	28.2		48.2	
7440-41-7	Beryllium (Be)	0.1	U	0.1	U	0.1	U	0.1	U
7440-47-3	Chromium (Cr)	0.7	U	0.7	U	0.7	U	0.7	U
7439-92-1	Lead (Pb)	1.5	U	1.5	U	1.5	U	1.5	U
7440-28-0	Thallium (Tl)	3.1	U	3.1	U	3.1	U	3.1	U

Appendix A
Charleston Naval Complex - Zone C
SWMU 47 / AOC 516

TSS	SAMPLE ID ----->	047-G-W001-05				
	ORIGINAL ID ----->	047GW00105				
	LAB SAMPLE ID ---->	37110.01				
	ID FROM REPORT -->	047GW00105				
	SAMPLE DATE ----->	01/15/99				
	DATE ANALYZED ---->	01/21/99				
	MATRIX ----->	Water				
	UNITS ----->	MG/L				

CAS #	Parameter	37110	VAL			
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9999900-03-7	Total Suspended Solids (TSS)	4.	U			
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Appendix A
Charleston Naval Complex - Zone C
AOC 508 & 511

DIELDRIN		SAMPLE ID -----> 508-S-BC01-01	508-S-BC01-02	508-S-BC02-01	508-S-BC02-02	508-S-BC03-01	508-S-BC03-02
ORIGINAL ID ----->		508SBC0101	508SBC0102	508SBC0201	508SBC0202	508SBC0301	508SBC0302
LAB SAMPLE ID ---->		37659.01	37659.02	37659.03	37659.04	37659.08	37659.09
ID FROM REPORT -->		508SBC0101	508SBC0102	508SBC0201	508SBC0202	508SBC0301	508SBC0302
SAMPLE DATE ----->		03/08/99	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99
DATE EXTRACTED -->		03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99
DATE ANALYZED ---->		03/18/99	03/18/99	03/21/99	03/18/99	03/18/99	03/21/99
MATRIX ----->		Soil	Soil	Soil	Soil	Soil	Soil
UNITS ----->		UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG
CAS #	Parameter	37659 VAL	37659 VAL	37659 VAL	37659 VAL	37659 VAL	37659 VAL
60-57-1	Dieldrin	2.6 U	2.6 U	91. DJ	2.7 U	270. D	9.6 J

Appendix A
Charleston Naval Complex - Zone C
AOC 508 & 511

DIELDRIN		SAMPLE ID ----->	508-S-BC04-01	508-S-BC04-02	508-C-BC04-02			
		ORIGINAL ID ----->	508SBC0401	508SBC0402	508CBC0402			
		LAB SAMPLE ID ---->	37659.05	37659.06	37659.07			
		ID FROM REPORT -->	508SBC0401	508SBC0402	508CBC0402			
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99			
		DATE EXTRACTED -->	03/09/99	03/09/99	03/09/99			
		DATE ANALYZED ---->	03/18/99	03/18/99	03/18/99			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	37659	VAL	37659	VAL	37659	VAL	
60-57-1	Dieldrin	2.2	U	2.6	U	3.1	U	

CHARLESTON - ZONE C
CHARLESTON ZONE C - QUARTERLY SAMPLING

SW846-PEST		SAMPLE ID ----->	508-G-W003-01	511-G-W002-01				
		ORIGINAL ID ----->	508GW00301	511GW00201				
		LAB SAMPLE ID ---->	30644.02	30644.04				
		ID FROM REPORT -->	508GW00301	511GW00201				
		SAMPLE DATE ----->	08/14/97	08/14/97				
		DATE EXTRACTED -->	08/16/97	08/16/97				
		DATE ANALYZED ---->	08/20/97	08/20/97				
		MATRIX ----->	Water	Water				
		UNITS ----->	UG/L	UG/L				
CAS #	Parameter	30644	VAL	30644	VAL			
319-84-6	alpha-BHC	0.04	U	0.04	U			
319-85-7	beta-BHC	0.04	U	0.04	U			
58-89-9	gamma-BHC (Lindane)	0.04	U	0.04	U			
319-86-8	delta-BHC	0.04	U	0.04	U			
76-44-8	Heptachlor	0.04	U	0.04	U			
309-00-2	Aldrin	0.04	U	0.04	U			
1024-57-3	Heptachlor epoxide	0.04	U	0.04	U			
959-98-8	Endosulfan I	0.04	U	0.04	U			
72-55-9	4,4'-DDE	0.08	U	0.08	U			
60-57-1	Dieldrin	0.08	U	0.08	U			
72-20-8	Endrin	0.08	U	0.08	U			
33213-65-9	Endosulfan II	0.08	U	0.08	U			
72-54-8	4,4'-DDD	0.08	U	0.08	U			
1031-07-8	Endosulfan sulfate	0.08	U	0.08	U			
50-29-3	4,4'-DDT	0.08	U	0.08	U			
7421-93-4	Endrin aldehyde	0.08	U	0.08	U			
72-43-5	Methoxychlor	0.38	U	0.38	U			
5103-71-9	alpha-Chlordane	0.04	U	0.04	U			
5103-74-2	gamma-Chlordane	0.04	U	0.04	U			
53494-70-5	Endrin ketone	0.08	U	0.08	U			
8001-35-2	Toxaphene	2.5	U	2.5	U			
12674-11-2	Aroclor-1016	1.	U	1.	U			
11104-28-2	Aroclor-1221	1.	U	1.	U			
11141-16-5	Aroclor-1232	1.	U	1.	U			
53469-21-9	Aroclor-1242	1.	U	1.	U			
12672-29-6	Aroclor-1248	1.	U	1.	U			
11097-69-1	Aroclor-1254	2.	U	2.	U			
11096-82-5	Aroclor-1260	2.	U	2.	U			

CHARLESTON - ZONE C
CHARLESTON ZONE C - QUARTERLY SAMPLING

UST-SVQA		SAMPLE ID ----->	511-G-W002-01				
		ORIGINAL ID ----->	511GW00201				
		LAB SAMPLE ID ----->	30644.04				
		ID FROM REPORT -->	511GW00201				
		SAMPLE DATE ----->	08/14/97				
		DATE EXTRACTED -->	08/16/97				
		DATE ANALYZED -->	08/18/97				
		MATRIX ----->	Water				
		UNITS ----->	UG/L	A			
CAS #	Parameter	30644	VAL				
91-20-3	Naphthalene	5.	U				
56-55-3	Benzo(a)anthracene	10.	U				
218-01-9	Chrysene	10.	U				
205-99-2	Benzo(b)fluoranthene	10.	U				
207-08-9	Benzo(k)fluoranthene	10.	U				
53-70-3	Dibenz(a,h)anthracene	10.	U				

CHARLESTON - ZONE C
CHARLESTON ZONE C - QUARTERLY SAMPLING

UST-VOA		SAMPLE ID ----->	511-G-W002-01				
		ORIGINAL ID ----->	511GW00201				
		LAB SAMPLE ID ---->	30644.04				
		ID FROM REPORT -->	511GW00201				
		SAMPLE DATE ----->	08/14/97				
		DATE ANALYZED ---->	08/20/97				
		MATRIX ----->	Water				
		UNITS ----->	UG/L	A			
CAS #	Parameter	30644	VAL				
71-43-2	Benzene	5.	U				
108-88-3	Toluene	5.	U				
100-41-4	Ethylbenzene	5.	U				
1330-20-7	Xylene (Total)	5.	U				
1634-04-4	Methyl tert-butyl ether	5.	U				

Appendix A
Charleston Naval Complex - Zone C
AOC 518

CHLORDANE		SAMPLE ID ----->	518-S-BC01-01	518-S-BC01-02	518-S-BC02-01	518-S-BC02-02	518-S-BC03-01	518-S-BC03-02			
		ORIGINAL ID ----->	518SBC0101	518SBC0102	518SBC0201	518SBC0202	518SBC0301	518SBC0302			
		LAB SAMPLE ID ---->	37659.12	37659.13	37659.10	37659.11	37659.14	37659.15			
		ID FROM REPORT -->	518SBC0101	518SBC0102	518SBC0201	518SBC0202	518SBC0301	518SBC0302			
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99			
		DATE EXTRACTED -->	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99			
		DATE ANALYZED ---->	03/18/99	03/18/99	03/18/99	03/18/99	03/18/99	03/18/99			
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	37659	VAL	37659	VAL	37659	VAL	37659	VAL	37659	VAL
5103-71-9	alpha-Chlordane	1.4	U	14.		1.4	U	1.3	U	1.4	U
5103-74-2	gamma-Chlordane	1.4	U	34.	D	0.15	U	0.24	J	1.4	U

Appendix A
Charleston Naval Complex - Zone C
AOC 518

CHLORDANE		SAMPLE ID ----->	518-C-BC03-02	518-S-BC04-01	518-S-BC04-02	518-S-BC05-01	518-S-BC05-02	518-S-BC06-01					
		ORIGINAL ID ----->	518CBC0302	518SBC0401	518SBC0402	518SBC0501	518SBC0502	518SBC0601					
		LAB SAMPLE ID ---->	37659.16	37659.17	37659.18	37659.22	37659.23	37659.24					
		ID FROM REPORT -->	518CBC0302	518SBC0401	518SBC0402	518SBC0501	518SBC0502	518SBC0601					
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99					
		DATE EXTRACTED -->	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99	03/09/99					
		DATE ANALYZED ---->	03/18/99	03/18/99	03/18/99	03/16/99	03/16/99	03/16/99					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG					
CAS #	Parameter	37659	VAL	37659	VAL	37659	VAL	37659	VAL				
5103-71-9	alpha-Chlordane	1.4	U	3.1		1.4	U	15.	DNJ	1.8	J	1.4	U
5103-74-2	gamma-Chlordane	0.31	J	6.6	J	0.34	U	8.3		1.	J	1.4	U

Appendix A
Charleston Naval Complex - Zone C
AOC 518

CHLORDANE		SAMPLE ID ----->	518-S-BC06-02	518-S-BC07-01	518-S-BC07-02	518-C-BC07-02			
		ORIGINAL ID ----->	518SBC0602	518SBC0701	518SBC0702	518CBC0702			
		LAB SAMPLE ID ---->	37659.25	37659.19	37659.20	37659.21			
		ID FROM REPORT -->	518SBC0602	518SBC0701	518SBC0702	518CBC0702			
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99	03/08/99			
		DATE EXTRACTED -->	03/09/99	03/09/99	03/09/99	03/09/99			
		DATE ANALYZED -->	03/16/99	03/18/99	03/18/99	03/16/99			
		MATRIX ----->	Soil	Soil	Soil	Soil			
		UNITS ----->	UG/KG	UG/KG	UG/KG	UG/KG			
CAS #	Parameter	37659	VAL	37659	VAL	37659	VAL	37659	VAL
5103-71-9	alpha-Chlordane	1.4	U	1.4	U	1.4	U	1.4	U
5103-74-2	gamma-Chlordane	1.4	U	1.4	U	0.35	J	1.4	U

Appendix A
Charleston Naval Complex - Zone C
AOC 518

LEAD		SAMPLE ID ----->	518-S-BC04-01	518-S-BC04-02	518-S-BC05-01	518-S-BC05-02	518-S-BC06-01	518-S-BC06-02					
		ORIGINAL ID ----->	518SBC0401	518SBC0402	518SBC0501	518SBC0502	518SBC0601	518SBC0602					
		LAB SAMPLE ID ---->	37945.01	37945.02	37945.06	37945.07	37945.08	37945.09					
		ID FROM REPORT -->	518SBC0401	518SBC0402	518SBC0501	518SBC0502	518SBC0601	518SBC0602					
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99	03/08/99					
		DATE EXTRACTED -->	04/09/99	04/09/99	04/09/99	04/09/99	04/09/99	04/09/99					
		DATE ANALYZED ---->	04/12/99	04/12/99	04/12/99	04/12/99	04/12/99	04/12/99					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG					
CAS #	Parameter	37945	VAL	37945	VAL	37945	VAL	37945	VAL	37945	VAL		
7439-92-1	Lead (Pb)	123.	J	17.6	J	934.	J	16.8	J	766.	J	45.4	J

Appendix A
Charleston Naval Complex - Zone C
AOC 518

LEAD		SAMPLE ID ----->	518-S-BC07-01	518-S-BC07-02	518-C-BC07-02			
		ORIGINAL ID ----->	518SBC0701	518SBC0702	518CBC0702			
		LAB SAMPLE ID ---->	37945.03	37945.04	37945.05			
		ID FROM REPORT -->	518SBC0701	518SBC0702	518CBC0702			
		SAMPLE DATE ----->	03/08/99	03/08/99	03/08/99			
		DATE EXTRACTED -->	04/09/99	04/09/99	04/09/99			
		DATE ANALYZED ---->	04/12/99	04/12/99	04/12/99			
		MATRIX ----->	Soil	Soil	Soil			
		UNITS ----->	MG/KG	MG/KG	MG/KG			
CAS #	Parameter	37945	VAL	37945	VAL	37945	VAL	
7439-92-1	Lead (Pb)	214.	J	14.1	J	12.6	J	

Appendix A
Charleston Naval Complex - Zone C
AOC 518

LEAD (PB)		SAMPLE ID ----->	518-S-BC08-01	518-S-BC08-02	518-S-BC09-01	518-S-BC09-02	518-S-BC10-01	518-S-BC10-02					
		ORIGINAL ID ----->	518SBC0801	518SBC0802	518SBC0901	518SBC0902	518SBC1001	518SBC1002					
		LAB SAMPLE ID ---->	38545.03	38545.04	38545.01	38545.02	38511.05	38511.06					
		ID FROM REPORT -->	518SBC0801	518SBC0802	518SBC0901	518SBC0902	518SBC1001	518SBC1002					
		SAMPLE DATE ----->	05/13/99	05/13/99	05/13/99	05/13/99	05/12/99	05/12/99					
		DATE EXTRACTED -->	05/17/99	05/17/99	05/17/99	05/17/99	05/15/99	05/15/99					
		DATE ANALYZED ---->	05/27/99	05/27/99	05/27/99	05/27/99	05/21/99	05/21/99					
		MATRIX ----->	Soil	Soil	Soil	Soil	Soil	Soil					
		UNITS ----->	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG					
CAS #	Parameter	38511	VAL	38511	VAL	38511	VAL	38511	VAL	38511	VAL		
7439-92-1	Lead (Pb)	149.	J	34.8	J	508.	J	3.	J	645.	J	177.	J

Appendix A
Charleston Naval Complex - Zone C
AOC 518

LEAD (PB)		SAMPLE ID ----->	518-S-BC11-01	518-S-BC11-02	518-S-BC12-01	518-S-BC12-02	518-S-BC13-01	518-S-BC13-02					
ORIGINAL ID ----->		518SBC1101	518SBC1102	518SBC1201	518SBC1202	518SBC1301	518SBC1302						
LAB SAMPLE ID ---->		38511.01	38511.02	38511.03	38511.04	38511.10	38511.11						
ID FROM REPORT -->		518SBC1101	518SBC1102	518SBC1201	518SBC1202	518SBC1301	518SBC1302						
SAMPLE DATE ----->		05/12/99	05/12/99	05/12/99	05/12/99	05/12/99	05/12/99						
DATE EXTRACTED -->		05/15/99	05/15/99	05/15/99	05/15/99	05/15/99	05/15/99						
DATE ANALYZED ---->		05/21/99	05/21/99	05/21/99	05/21/99	05/21/99	05/21/99						
MATRIX ----->		Soil	Soil	Soil	Soil	Soil	Soil						
UNITS ----->		MG/KG	MG/KG	MG/KG	MG/KG	MG/KG	MG/KG						
CAS #	Parameter	38511	VAL	38511	VAL	38511	VAL	38511	VAL				
7439-92-1	Lead (Pb)	210.	J	5.	J	38.1	J	3.	J	176.	J	9.5	J

Appendix A
Charleston Naval Complex - Zone C
AOC 518

LEAD (PB)		SAMPLE ID ----->	518-S-BC14-01	518-C-BC14-01	518-S-BC14-02		
		ORIGINAL ID ----->	518SBC1401	518CBC1401	518SBC1402		
		LAB SAMPLE ID ---->	38511.07	38511.08	38511.09		
		ID FROM REPORT -->	518SBC1401	518CBC1401	518SBC1402		
		SAMPLE DATE ----->	05/12/99	05/12/99	05/12/99		
		DATE EXTRACTED -->	05/15/99	05/15/99	05/15/99		
		DATE ANALYZED ---->	05/21/99	05/21/99	05/21/99		
		MATRIX ----->	Soil	Soil	Soil		
		UNITS ----->	MG/KG	MG/KG	MG/KG		
CAS #	Parameter	38511	VAL	38511	VAL	38511	VAL
7439-92-1	Lead (Pb)	306.	J	297.	J	428.	J

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1
 PROJECT/JOB NO: 2903-08014-00
 COC NO: _____
 PO NO: 4
 REL NO: 85
 LAB NAME: SCW

800-888-7963
 MEMPHIS, TENNESSEE
 CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN
 LANCASTER, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL
 RALEIGH, NC; COLOGNE, GERMANY

CLIENT NAJAL BARE Charlem PROJECT MANAGER Charlie Vandy
 LOCATION Zowie C TELE/FAX NO. 843-834-6029/856-0107
 SAMPLERS: (SIGNATURE) J. Wadd

ANALYSIS REQUIRED
 NO. OF CONTAINERS
Diethylam
Chloroform

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	REMARKS
					TEMP.	CHEMICAL		
NBCC\508SBC0101	3-8-99	1125	Soil	4oz JAR	4°C	NONE	1 X	
508SBC0102		1130					1 X	
508SBC0201		1125					1 X	
508SBC0202		1130					1 X	
508SBC0401		1140					1 X	
508SBC0402		1145					1 X	
508SBC0402		1145					1 X	
508SBC0301		1200					1 X	
508SBC0302		1205					1 X	
518SBC0201		1505					1 X	
518SBC0202		1512					1 X	
518SBC0101		1510					1 X	
518SBC0102		1515					1 X	
518SBC0301		1515					1 X	
518SBC0302		1518					1 X	
518SBC0302		1518					1 X	

RELINQUISHER: J. Wadd DATE: 3-8-99 RECEIVER: _____ DATE: _____
 PRINTED: J. Wadd, SA TIME: _____ PRINTED: _____ TIME: _____
 COMPANY: ENSAFE TIME: 1715 COMPANY: _____

METHOD OF SHIPMENT: Fedex COMMENTS: DQ011
 SHIPMENT NO. 8086 259 48712
 SEND RESULTS TO: Charlie Vandy

CHAIN OF CUSTODY RECORD

PAGE 1 OF 2
 PROJECT/JOB NO: 2903-08-014-00
 COC NO: _____
 PO NO: 4
 REL NO: 85
 LAB NAME: SW6

CLIENT NAVAL Base Charleston PROJECT MANAGER Charlie Verway
 LOCATION Zone C TELE/FAX NO. 843-894-0029/856-6107
 SAMPLERS: (SIGNATURE) J. Watson

Revised
CH
4-7-99

ANALYSIS REQUIRED
 NO. OF CONTAINERS
Chloride
Lead
CH
4-7-99

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL			
NBCC \ 518SBC0401	3-8-99	1525	Soil	402 JAR	4°C	None	1	X X	
\ 518SBC0402		1530					1	X X	
\ 518SBC0701		1530					1	X X	*- 14 day
\ 518SBC0702		1540					1	X X	turnaround
\ 518CBC0702		1540					1	X X	Full package
\ 518SBC0501		1530					1	X X	
\ 518SBC0502		1540					1	X X	
\ 518SBC0601		1545					1	X X	
\ 518SBC0602		1550					1	X X	
<p><i>J. Watson</i> <i>3-8-99</i></p>									

RELINQUISHER: <u>J. Watson</u>	DATE: <u>3-8-99</u>	RECEIVER: _____	DATE: _____
PRINTED: <u>J. Watson</u>	TIME: <u>1715</u>	PRINTED: _____	TIME: _____
COMPANY: <u>ENSAFÉ</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fedex
 SHIPMENT NO. RO625949712
 SEND RESULTS TO: Charlie Verway

COMMENTS: DOU III

EN SAFE



**CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C**

CTO-Task: 2903-001-00-001

CoC: 99067-JEW

BPA/SO: 00P04REL85/000

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Project Manager: Todd

Telephone No.: (901) 372-7962

Fax No.: (901) 372-2454

Page: 1 of 3

Database Number 2903-00001

Samplers: (Signature): _____

No. of Containers	ANALYSIS REQUIRED										Remarks
	DIELDRIN										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	DIELDRIN										Remarks
					TEMP.	Chemical												
NBCC/508CBC0402	03/08/99	11:45	Soil		40 C		1	X										
NBCC/508SBC0101	03/08/99	11:25	Soil		40 C		1	X										
NBCC/508SBC0102	03/08/99	11:30	Soil		40 C		1	X										
NBCC/508SBC0201	03/08/99	11:25	Soil		40 C		1	X										
NBCC/508SBC0202	03/08/99	11:30	Soil		40 C		1	X										
NBCC/508SBC0301	03/08/99	12:00	Soil		40 C		1	X										
NBCC/508SBC0302	03/08/99	12:05	Soil		40 C		1	X										
NBCC/508SBC0401	03/08/99	11:40	Soil		40 C		1	X										
NBCC/508SBC0402	03/08/99	11:45	Soil		40 C		1	X										

RELINQUISHED BY: Signature: _____ Printed: <u>James Watson</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>03/08/99</u> TIME <u>17:15</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948712</u> Special Instruction: <u>SWL</u>	Comments: <u>DQ03</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
---	-----------------------	---

EN SAFE



CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C

CTO-Task: 2903-001-00-001

CoC: 99067-JEW

BPA/SO: 00P04REL85/000

Project Manager: Todd

Telephone No.: (901) 372-7962

Fax No.: (901) 372-2454

Page: 2 of 3

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Database Number 2903-00001

Samplers: (Signature): _____

No. of Containers	ANALYSIS REQUIRED										Remarks
	DIELDRIN	CHLORDANE	LEAD								
1	X										
1		X	X								
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X	X									

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	DIELDRIN	CHLORDANE	LEAD								Remarks
					TEMP.	Chemical												
NBCC/518CBC0302	03/08/99	15:18	Soil		4ø C		1	X										
NBCC/518CBC0702	03/08/99	15:40	Soil		4ø C		1	X	X									
NBCC/518SBC0101	03/08/99	15:10	Soil		4ø C		1	X										
NBCC/518SBC0102	03/08/99	15:15	Soil		4ø C		1	X										
NBCC/518SBC0201	03/08/99	15:05	Soil		4ø C		1	X										
NBCC/518SBC0202	03/08/99	15:12	Soil		4ø C		1	X										
NBCC/518SBC0301	03/08/99	15:15	Soil		4ø C		1	X										
NBCC/518SBC0302	03/08/99	15:18	Soil		4ø C		1	X										
NBCC/518SBC0401	03/08/99	15:25	Soil		4ø C		1	X	X									

RELINQUISHED BY: Signature: _____ Printed: <u>James Watson</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>03/08/99</u> TIME <u>17:15</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948712</u> Special Instruction: <u>SHL</u>	Comments: <u>DQ03</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
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EN SAFE



**CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C**

CTO-Task: 2903-001-00-001

CoC: 99067-JEW

BPA/SO: 00P04REL85/000

Page: 3 of 3

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Project Manager: Todd
Telephone No.: (901) 372-7962
Fax No.: (901) 372-2454

Database Number 2903-00001

Samplers: (Signature): _____

No. of Containers	ANALYSIS REQUIRED										Remarks
	DIELDRIN	CHLORDANE	LEAD								
1		X	X								
1		X	X								
1		X	X								
1		X	X								
1		X	X								
1		X	X								
1		X	X								

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	DIELDRIN	CHLORDANE	LEAD								Remarks
					TEMP.	Chemical												
NBCC/518SBC0402	03/08/99	15:30	Soil		4ø C		1		X	X								
NBCC/518SBC0501	03/08/99	15:30	Soil		4ø C		1		X	X								
NBCC/518SBC0502	03/08/99	15:40	Soil		4ø C		1		X	X								
NBCC/518SBC0601	03/08/99	15:45	Soil		4ø C		1		X	X								
NBCC/518SBC0602	03/08/99	15:50	Soil		4ø C		1		X	X								
NBCC/518SBC0701	03/08/99	15:30	Soil		4ø C		1		X	X								
NBCC/518SBC0702	03/08/99	15:40	Soil		4ø C		1		X	X								

RELINQUISHED BY: Signature: _____ Printed: <u>James Watson</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>03/08/99</u> TIME <u>17:15</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
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Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948712</u> Special Instruction: <u>SWL</u>	Comments: <u>DQ03</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
---	-----------------------	---



800-588-7962
MEMPHIS, TENNESSEE

CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;
CASTLETON, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;
RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 2 OF 2
PROJECT/JOB NO: 2903-00. -014-00
COC NO: _____
PO NO: 4
REL NO: 85
LAB NAME: Southwest

CLIENT: Naval Base Charleston PROJECT MANAGER: Charlie Verney
LOCATION: Zone C CMS TELE/FAX NO.: 843-856-0107/884-0029
SAMPLERS: (SIGNATURE) [Signature]

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED							REMARKS		
					TEMP.	CHEMICAL		SVOC's	As, Cd, Cu, Hg, Ni, Pb, Tl	Dieldrin, chlordane	As, Pb, Tl	Dioxin					
BCC\516SBC0702	3-9-99	1450	S	4oz glass	4°C		1				X	X					Dioxin only
BCC\516SBC0801	T	1505	S	T	T		1				X	X					T
BCC\516SBC0802	T	1510	S	T	T		1				X	X					T
BCC\516SBC0901	T	1510	S	T	T		1				X	X					T
BCC\516SBC0902	T	1515	S	T	T		1				X	X					T
BCC\516CBC0902	✓	1515	S	✓	✓		1				X	X					✓

RELINQUISHER: [Signature] DATE: 3/9/99 RECEIVER: _____ DATE: _____
 NAME: Todd B Temple TIME: _____ PRINTED: _____ TIME: _____
 COMPANY: ENSAFE TIME: 1730 COMPANY: _____ TIME: _____

METHOD OF SHIPMENT: FedEx COMMENTS: DDOTII
 SHIPMENT NO.: 808625948733
 SEND RESULTS TO: _____



CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 2903-00 1-014-00
 COC NO: _____
 PO NO: 4
 REL NO: 85
 LAB NAME: Southwest

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

CLIENT: Naval Base Charleston PROJECT MANAGER: Charlie Verroy
 LOCATION: Zone C CMS TELE/FAX NO.: 843-884-0029/856-0107
 SAMPLERS: (SIGNATURE) [Signature]

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED						REMARKS	
					TEMP.	CHEMICAL		SVOC's	As, Cd, Cu, Hg, Ni, Se, Tl	Dieldrin, Chlordane	As, Pb	Dioxin			
BCC\516DBC0101	3/9/99	1000	S	4 glass 1B	4°C	ATP	7	X	X	X	X	X			HNO ₃ - Metals
BCC\516EBC0101		1005	S	*		HNO ₃ -Metals	7	X	X	X	X	X			✓
BCC\516SBC0101		1410	S	4oz glass			1			X	X	X			As, Pb only
BCC\516SBC0102		1415	S				1			X	X	X			
BCC\516CBC0102		1415	S				1			X	X	X			
BCC\516SBC0201		1330	S				1			X	X	X			
BCC\516SBC0202		1340	S				1			X	X	X			
BCC\516SBC0301		1330	S				1			X	X	X			
BCC\516SBC0302		1340	S				1			X	X	X			
BCC\516SBC0401		1330	S				1			X	X	X			
BCC\516SBC0402		1340	S				1			X	X	X			
BCC\516SBC0601		1410	S				1			X	X	X			Dioxin only
BCC\516SBC0602		1415	S				1			X	X	X			
BCC\516SBC0501		1415	S				1			X	X	X			
BCC\516SBC0502		1420	S				1			X	X	X			
BCC\516SBC0701		1445	S				1			X	X	X			

RELINQUISHER: <u>[Signature]</u>	DATE: <u>3/9/99</u>	RECEIVER: _____	DATE: _____
PRINTED: <u>Todd B. Temple</u>	TIME: <u>1730</u>	PRINTED: _____	TIME: _____
COMPANY: <u>ENSAFE</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fed Ex
 SHIPMENT NO.: 808625948723
 COMMENTS: DQOTTI



800-585-7962
MEMPHIS, TENNESSEE

CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;
MASTERS, PA; NASHVILLE, TN; NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;
RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PROJECT/JOB NO: 2903-00' 9-014-00

COC NO: _____

PO NO: 7

REL NO: H358 114

LAB NAME: Southwest

CLIENT: Naval Base Charleston

PROJECT MANAGER: Don Cook

LOCATION: SLOMU 47

TELE/FAX NO: 843-884-0029

SAMPLERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED

NO. OF CONTAINERS
metals

REMARKS

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL			
0476W0110b	7/23/99	14:35	Water	1 liter Poly	4°	HNO ₃	1	X	
0476W011A b	↓	14:40	↓	↓	↓	↓	1	X	
0476W011B b	↓	14:45	↓	↓	↓	↓	1	X	
0476W011C b	↓	14:50	↓	↓	↓	↓	1	X	Hold

[Signature] 7/26/99

RELINQUISHER: <u>[Signature]</u>	DATE: <u>7/26/99</u>	RECEIVER: _____	DATE: _____
PRINTED: <u>Robert Butts</u>	TIME: <u>09:15</u>	PRINTED: _____	TIME: _____
COMPANY: <u>EnSafe, Inc</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fed Ex
 SHIPMENT NO: 4849148916
 SEND RESULTS TO: Charlie Vernoy

COMMENTS: "A" Fraction = 0.45µm
 "B" Fraction = 0.2µm
 "C" Fraction = 0.1µm
Hold "C" Fraction until contacted by En Safe

ANALYTICAL DATA RECEIVED BY (INITIALS/DATE) _____



CHAIN OF CUSTODY RECORD

PAGE 1 OF 1
 PROJECT/JOB NO: 2903 11-09-014
 COC NO: _____
 PO NO: 4
 REL NO: 85
 LAB NAME: SWL

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

CLIENT Naval Base Charleston PROJECT MANAGER Charlie Verroy
 LOCATION Zone C TELE/FAX NO. 843-884-0029 / 856-0107
 SAMPLERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED
 NO. OF CONTAINERS
Lead

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	REMARKS
					TEMP.	CHEMICAL		
NBCC\5185BC110	5/12/99	1115	S	4oz glass	4°C	None	1	
NBCC\5185BC1102		1130	S				1	
NBCC\5185BC1201		1115	S				1	* 14 day Temp rounded Cite 51377
NBCC\5185BC1202		1120	S				1	
NBCC\5185BC1001		1135	S				1	
NBCC\5185BC1002		1140	S				1	
NBCC\5185BC1401		1200	S				1	
NBCC\5185BC1401		1200	S				1	
NBCC\5185BC1402		1205	S				1	
NBCC\5185BC1301		1200	S				1	
NBCC\5185BC1302		1205	S				1	

[Signature]
 5-12-99

ACQUISHER: <u>[Signature]</u>	DATE: <u>5/13/99</u>	RECEIVER: _____	DATE: _____	RECEIVER: _____	DATE: _____
BY: <u>Todd B. Temple</u>	TIME: <u>1730</u>	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>Ensafe</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: Fed Ex
 SHIPMENT NO. 808625940918
 COMMENTS: _____

03/12/99 10:30 EEL 14/7306 ENSAFE ALLEN HOS CHARSAFE 01

SAFE



**CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C**

CTO-Task: 2903-001-00-001
CoC: 99132-TBT
BPA/SO: 00P04REL85/000

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Project Manager: Todd
Telephone No.: (901) 372-7962
Fax No.: (901) 372-2454

Page: 1 of 2

Database Number 2903-00001

Samplers: (Signature): _____

No. of Containers	ANALYSIS REQUIRED										Remarks
	LEAD										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										
1	X										

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation	
					TEMP.	Chemical
NBCC/518CBC1401	05/12/99	12:00	Soil		4ø C	
NBCC/518SBC1001	05/12/99	11:35	Soil		4ø C	
NBCC/518SBC1002	05/12/99	11:40	Soil		4ø C	
NBCC/518SBC1101	05/12/99	11:15	Soil		4ø C	
NBCC/518SBC1102	05/12/99	11:30	Soil		4ø C	
NBCC/518SBC1201	05/12/99	11:15	Soil		4ø C	
NBCC/518SBC1202	05/12/99	11:20	Soil		4ø C	
NBCC/518SBC1301	05/12/99	12:00	Soil		4ø C	
NBCC/518SBC1302	05/12/99	12:05	Soil		4ø C	

RELINQUISHED BY: Signature: _____ Printed: <u>Todd Temple</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>05/12/99</u> TIME <u>17:30</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
--	---	---	--------------	---	--------------	---	--------------

Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948917</u> Special Instruction: <u>SWL</u>	Comments: <u>DOO3 *14 DAY TURN AROUND*</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
---	--	---

EN SAFE



**CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C**

CTO-Task: 2903-001-00-001

CoC: 99132-TBT

BPA/SO: 00P04REL85/000

Project Manager: Todd

Telephone No.: (901) 372-7962

Fax No.: (901) 372-2454

Page: 2 of 2

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Database Number 2903-00001

Samplers: (Signature): _____

No. of Containers	ANALYSIS REQUIRED										Remarks	
	LEAD											
1	X											
1	X											

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation	
					TEMP.	Chemical
NBCC/518SBC1401	05/12/99	12:00	Soil		4ø C	
NBCC/518SBC1402	05/12/99	12:05	Soil		4ø C	

RELINQUISHED BY: Signature: _____ Printed: <u>Todd Temple</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>05/12/99</u> TIME <u>17:30</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE TIME
--	---	---	--------------	---	--------------	---	--------------

Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948917</u> Special Instruction: <u>SWL</u>	Comments: <u>DG03 *14 DAY TURN AROUND*</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
---	--	---



800-588-7962

MEMPHIS, TENNESSEE
CHARLESTON, SC; CINCINNATI, OH; DALLAS, TX; JACKSON, TN; KNOXVILLE, TN;
NORFOLK, VA; PADUCAH, KY; PENSACOLA, FL;
RALEIGH, NC; COLOGNE, GERMANY

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

PROJECT/JOB NO: 2903-09-014-00

COC NO: _____

PO NO: 4

REL NO: 85

LAB NAME: SWL

CLIENT Naval Base Charleston

PROJECT MANAGER Charlie Verray

LOCATION Zone C

TELE/FAX NO. 843-684-0029 / 856-0107

SAMPLERS: (SIGNATURE) [Signature]

ANALYSIS REQUIRED

NO. OF CONTAINERS
Lead

REMARKS

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL			
VBCC\518SBC0901	5-13-99	1510	S	4oz glass	4°C	None	1	X	
VBCC\518SBC0902	↓	1515	S	↓	↓	↓	1	X	
BCC\518SBC0801	↓	1520	S	↓	↓	↓	1	X	
VBCC\518SBC0802	↓	1525	S	↓	↓	↓	1	X	
<u>[Signature]</u>									

RELINQUISHER: <u>[Signature]</u>	DATE: <u>5/13/99</u>	RECEIVER: _____	DATE: _____	RELINQUISHER: _____	DATE: _____	RECEIVER: _____	DATE: _____
PRINTED: <u>Todd B. Temple</u>	TIME: <u>1700</u>	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____	PRINTED: _____	TIME: _____
COMPANY: <u>ENSAFÉ</u>	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____	COMPANY: _____

METHOD OF SHIPMENT: FedEx

SHIPMENT NO. 808625948930

SEND RESULTS TO: _____

COMMENTS: _____

SAFE



CHAIN OF CUSTODY RECORD
CHARLESTON ZONE C

CTO-Task: 2903-001-00-001
CoC: 99133-TBT
BPA/SO: 00P04REL85/000

Address: 5724 Summer Trees Drive
Memphis, TN 38134

Project Manager: Todd
Telephone No.: (901) 372-7962
Fax No.: (901) 372-2454

Page: 1 of 1

Database Number 2903-00001

Samplers: (Signature): _____

Field Sample Number	Date	Time	Sample Type	Type/Size Of Container	Preservation		No. of Containers	ANALYSIS REQUIRED										Remarks								
					TEMP.	Chemical		LEAD																		
NBCC/518SBC0801	05/13/99	15:20	Soil		4ø C		1	X																		
NBCC/518SBC0802	05/13/99	15:25	Soil		4ø C		1	X																		
NBCC/518SBC0901	05/13/99	15:10	Soil		4ø C		1	X																		
NBCC/518SBC0902	05/13/99	15:15	Soil		4ø C		1	X																		

RELINQUISHED BY: Signature: _____ Printed: <u>Todd Temple</u> Company: <u>E/A&H</u> Reason: <u>Ship to Lab</u>	DATE <u>05/13/99</u> TIME <u>17:00</u>	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____	RELINQUISHED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____	RECEIVED BY: Signature: _____ Printed: _____ Company: _____ Reason: _____	DATE _____ TIME _____
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Method of Shipment: <u>FED-EX</u> Shipment No.: <u>808625948930</u> Special Instruction: <u>SWL</u>	Comments: <u>DQ03 *14 DAY TURN AROUND*</u>	After Analysis, Samples are to be: <input checked="" type="checkbox"/> Disposed of <input type="checkbox"/> Stored (90 days Max) <input type="checkbox"/> Stored Over 90 Days <input type="checkbox"/> Returned to Customer
---	--	---



HEARTLAND

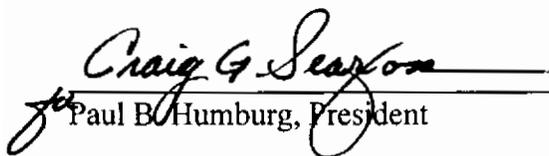
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 37681
Date: April 23, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone C
Date Sampled: March 9, 1999
Number of Samples: 2 Aqueous Sample(s) with 0 MS/MSD(s)
20 Non-aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data,
February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Semivolatiles, Pesticides, Dioxins/Furans, Metals, Arsenic, Lead

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

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


Paul B. Humburg, President

4.27.99
Date

SDG# 37681

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	SVOA		PEST		D/F		MET		AS		PB	
516EBC0101	WATER	X		X		X		X					
516DBC0101	WATER	X		X		X		X					
516SBC0501	SOIL						X						
516SBC0502	SOIL						X						
516SBC0601	SOIL						X						
516SBC0602	SOIL						X						
516SBC0701	SOIL						X						
516SBC0702	SOIL						X						
516SBC0801	SOIL						X						
516SBC0802	SOIL						X						
516SBC0901	SOIL						X						
516SBC0902	SOIL						X						
516CBC0902	SOIL						X						
516SBC0101	SOIL									X		X	
516SBC0102	SOIL									X		X	
516CBC0102	SOIL									X		X	
516SBC0201	SOIL									X		X	
516SBC0202	SOIL									X		X	
516SBC0301	SOIL									X		X	
516SBC0302	SOIL									X		X	
516SBC0401	SOIL									X		X	
516SBC0402	SOIL									X		X	
Total Billable Samples (Water/Soil)		2	0	2	0	2	11	2	0	0	9	0	9

SVOA= Semivolatiles
 PEST= Pesticides
 D/F= Dioxins/Furans
 MET= Metals
 AS= Arsenic
 PB= Lead

DATA ASSESSMENT NARRATIVE

SEMIVOLATILE ORGANICS

General

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

SDG # 37681

A validation was performed on the Semivolatile Data from SDG 37681. The data was evaluated based on the following parameters:

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

* - All criteria were met for this parameter.

System Performance and Overall Assessment

The data did not require qualifications. This SDG consisted of two (2) field QC blanks only.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported Quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

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

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

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

SUMMARY OF DATA QUALIFICATIONS

SAMPLE ID

COMPOUND ID

DL

QL

NO QUALIFICATIONS WERE REQUIRED

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

DATA ASSESSMENT NARRATIVE

PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081; the National Functional Guidelines for Organic Data Validation, February 1994; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 37681

A validation was performed on the Pesticide Data from SDG 37681. The data was evaluated based on the following parameters:

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

* - All criteria were met for this parameter.

System Performance and Overall Assessment

The data did not require qualifications. Only QC blanks were included in this SDG.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

NJ = Result is considered presumptively present at an estimated concentration

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

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

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

SUMMARY OF DATA QUALIFICATIONS

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

NO QUALIFICATIONS WERE REQUIRED.

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

DATA ASSESSMENT AND NARRATIVE

Dioxin/Furans

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike recoveries, GC/MS performance, tuning results, calibration results and internal standard recoveries. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the U.S. EPA SW846, Method 8290; National Functional Guidelines for Organic Data Review, and DQO Level III. All comments made within this report should be considered when examining the analytical results (Form I's).

SDG # 37681 Level III

A validation was performed on the Dioxin/Furans Data from SDG 37681. The data was evaluated based on the following parameters.

- * • Data Completeness
- * • Holding Times
- * • Mass Resolution Checks
- * • Column Performance
- * • Calibrations
- Internal Standard Performance
- Blanks
- NA • Matrix Spike/Matrix Spike Duplicate
- * • Field Duplicates
- * • Congener Identification /Quantitation

* - All criteria were met for this parameter

Blanks

Blank ID	Associated Sample ID	Congener	Blank Conc. ng/Kg	Action Limit (5X)	Sample Conc. ng/Kg	Qual.
DFBLK4	516SBC0902	OCDF	0.842	4.21	4.029	U
	516SBC0901				1.576	U

Data Assessment Narrative
Page - 2

Internal Standard

<u>Sample ID</u>	<u>ISDT ¹³C₁₂</u>	<u>% Rec</u>
516SBC0702RE	OCDD	32.11%
	TCDF	36.87%
516CBC0902	TCDD	22.26%
	PeCDD	26.96%
	HxCDD	21.80%
	HpCDD	17.63%
	OCDD	14.38%
	TCDF	15.70%
	PeCDF	16.08%
	HxCDF	22.69%
HpCDF	22.85%	

Compound Identification

Do not report 516SBC0702 in favor of its reanalysis due to poor internal standard recoveries.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

UR = Result is rejected and unusable

D= Result value is based on the dilution analysis

METHOD BLANK QUALIFICATION CODES

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

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

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

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

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>CONGENER ID</u>	<u>DL</u>	<u>QL</u>
516SBC0901 516SBC0902	OCDF	+B	U
516SBC0702RE	OCDD/OCDF TCDF	+/- -	J/UUJ UJ
516CBC0902	All congeners	+/-	J/UJ
516SBC0702	All congeners		DNR

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

DATA ASSESSMENT NARRATIVE METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # 37681A

A validation was performed on the Metals Data from SDG 37681A. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

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

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all "B" results	all analytes	B	J

DATA ASSESSMENT NARRATIVE ARSENIC AND LEAD ONLY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # 37681B

A validation was performed on the arsenic and lead Data from SDG 37681B. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

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

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all "B" results	all analytes	B	J



HEARTLAND

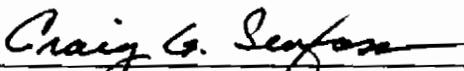
ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 37659
Date: April 14, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone C
Date Sampled: March 8, 1999
Number of Samples: 25 Non-Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Alpha-Chlordane, Gamma-Chlordane, and Dieldrin

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

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


for Paul B. Hamburg, President

4-14-99.
Date

SDG# 37659

Samples and Fractions Reviewed

Sample Identifications Analytical Fraction

ENSAFE ID	MATRIX	CHLOR		DIELD	
518SBC0101	SOIL		X		
518SBC0102	SOIL		X		
518SBC0201	SOIL		X		
518SBC0202	SOIL		X		
518SBC0301	SOIL		X		
518SBC0302	SOIL		X		
518CBC0302	SOIL		X		
518SBC0401	SOIL		X		
518SBC0402	SOIL		X		
518SBC0501	SOIL		X		
518SBC0502	SOIL		X		
518SBC0601	SOIL		X		
518SBC0602	SOIL		X		
518SBC0701	SOIL		X		
518SBC0702	SOIL		X		
518CBC0702	SOIL		X		
508SBC0101	SOIL				X
508SBC0102	SOIL				X
508SBC0201	SOIL				X
508SBC0202	SOIL				X
508SBC0301	SOIL				X
508SBC0302	SOIL				X
508SBC0401	SOIL				X
508SBC0402	SOIL				X
508CBC0402	SOIL				X
Total Billable Samples (Water/Soil)		0	16	0	9

CHLOR= Alpha and Gamma Chlordane
DIELD= Dieldrin

DATA ASSESSMENT NARRATIVE

PESTICIDES

General

The organic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, surrogate and matrix spike recoveries, GC performance, and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW846 Method 8081 with a limited TCL; the National Functional Guidelines for Organic Data Validation, February 1994; and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 37659

A validation was performed on the Pesticide Data from SDG 37659. The data was evaluated based on the following parameters:

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

* - All criteria were met for this parameter.

Calibrations

The continuing calibration standard INDAL38U exhibited one (1) compound with a %D greater than 15% but less than 50% for which qualifications were required. For the following samples and compound, the reported positive results are qualified as estimated, J.

508SBC0201	alpha-chlordane (17.3%)
508SBC0302	

**DATA ASSESSMENT NARRATIVE
PESTICIDES ANALYSIS**

PAGE - 2

Compound Identification/Quantitation

Several samples exhibited column quantitation %Ds greater than 40%. The following guidelines were used to qualify the data:

1. No qualifications are required for positive sample results which exhibited column quantitation differences <40%. The "P" flag is removed from the result.
2. The positive sample result which exhibited a column quantitation difference >40%, but ≤100% is qualified as estimated, J.
3. The positive single component pesticide sample result which exhibited a column quantitation difference >100% and is <10X the respective compound CRQL, is qualified as non-detect, U. (All multi-component results are exempt from this rule.)
4. The positive single component pesticide sample result which exhibited a column quantitation difference >100% and >10X the respective compound CRQL, is qualified as presumptively present at an estimated concentration, NJ. (All multi-component results are exempt from this rule.)
5. The positive multi-component pesticide sample result which exhibited a column quantitation difference >100% and <10X the respective multi-component CRQL is qualified as presumptively present at an estimated concentration, NJ.

The following samples and compounds have been qualified for high column quantitation %Ds.

<u>Sample ID</u>	<u>Compound</u>	<u>%D</u>	<u>Lab Qual.</u>	<u>HESI Qual.</u>	<u>Ref. #</u>
508SBC0201DL	dieldrin	80.8%	P	J	2
508SBC0401	dieldrin	136%	P	U	3
508SBC0302	dieldrin	47.9%	P	J	2
518SBC0201	gamma-chlordane	107%	P	U	3
518SBC0202	gamma-chlordane	75.0%	P	J	2
518SBC0302	gamma-chlordane	108%	P	U	3

**DATA ASSESSMENT NARRATIVE
PESTICIDES ANALYSIS**

PAGE - 3

Compound Identification/Quantitation (continued)

The following samples and compounds have been qualified for high column quantitation %Ds.

<u>Sample ID</u>	<u>Compound</u>	<u>%D</u>	<u>Lab Qual.</u>	<u>HESI Qual.</u>	<u>Ref. #</u>
518CBC0302	gamma-chlordane	54.8%	P	J	2
518SBC0401	gamma-chlordane	43.9%	P	J	2
518SBC0402	gamma-chlordane	109%	P	U	3
518SBC0501DL	alpha-chlordane	633%	P	NJ	4
518SBC0502	alpha-chlordane	83.3%	P	J	2

Several samples required dilution to accurately quantitate target compounds.

For the following samples, the E flagged results are not used in favor of the corresponding D flagged results reported in the dilution analyses. All other results reported in the dilution analyses are not used in favor of the results from the undiluted analyses.

508SBC0201
508SBC0301
518SBC0102
518SBC0501

System Performance and Overall Assessment

The data, as reported, did require qualifications.

GLOSSARY OF DATA QUALIFIERS

QUALIFICATION CODES

U = Not detected

J = Estimated value

UJ = Reported quantitation limit is qualified as estimated

NJ = Result is considered presumptively present at an estimated concentration

UR = Result is rejected and unusable

D = Result value is based on dilution analysis

METHOD BLANK QUALIFICATION CODES

CRQL = The sample result for the blank contaminant is less than the sample CRQL and is less than 5X the method blank value. The sample result for the blank contaminant is rejected and the CRQL for that compound is reported.

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

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

SUMMARY OF DATA QUALIFICATIONS

<u>SAMPLE ID</u>	<u>COMPOUND ID</u>	<u>DL</u>	<u>QL</u>
508SBC0201 508SBC0302	alpha-chlordane (17.3%)	+	J
ALL	All P < 40%	+	
ALL	All P ≥ 40% But ≤ 100%	+	J
ALL	single component pests All P > 100% And < 10X CRQL	+	U
ALL	single component pests All P > 100% And > 10X CRQL	+	NJ
ALL	multi-component pests All P > 100% And < 10X CRQL	+	NJ
508SBC0201 508SBC0301 518SBC0102 518SBC0501	All E flagged results	+E	Do Not Use
508SBC0201DL 508SBC0301DL 518SBC0102DL 518SBC0501DL	All except corresponding D flagged results	+/-	Do Not Use

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

HEARTLAND ESI P/A 1

HESI95.1

MULTI-MEDIA PESTICIDE/AROCLOR ORGANIC FRACTION

CASE NUMBER: _____ SDG NUMBER: 37659

LABORATORY: SWOK

CLIENT: Ensafe PROJECT: Charleston Zone C

REVIEWER: JACleveland DATE: 4/3/99

QA/QC LEVEL

- NEESA C
- NEESA D
- DQO LEVEL III
- DQO LEVEL IV
- _____

Statement Of Work (SOW)

- CLP 3/90
- SW 846 8081

ANALYSIS MODIFICATIONS: limited TCL



HEARTLAND

ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 39641
Date: August 20, 1999
Client Name: Ensafe
Project/Site Name: Charleston - Zone C
Date Sampled: July 23, 1999
Number of Samples: 3 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Metals

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

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

Craig G. Seaton
for Paul B. Humburg, President

8-25-99.
Date

SDG# 39641

Samples and Fractions Reviewed

Sample Identifications Analytical Fraction

ENSAFE ID	MATRIX	MET	
047GW01106	WATER	X	
047GW011A6	WATER	X	
047GW011B6	WATER	X	
Total Billable Samples (Water/Soil)		3	0

MET= Metals

DATA ASSESSMENT NARRATIVE

METALS

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods for Appendix IX metals; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # 39641

A validation was performed on the Metals Data from SDG 39641. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

Preparation and Field Blanks

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

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Cadmium	0.44 ug/l	no impact

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

Serial Dilution results

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

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

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples	Na.	+	J
all "B" results	all analytes	B	J



HEARTLAND

ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 37945
Date: May 10, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone C
Date Sampled: March 8, 1999
Number of Samples: 9 Non-aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Lead

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

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



Paul B. Humburg, President

5-11-99

Date

SDG# 37945

Samples and Fractions Reviewed

Sample Identifications Analytical Fraction

ENSAFE ID	MATRIX	PB	
518SBC0401	SOIL		X
518SBC0402	SOIL		X
518SBC0501	SOIL		X
518SBC0502	SOIL		X
518SBC0601	SOIL		X
518SBC0602	SOIL		X
518SBC0701	SOIL		X
518SBC0702	SOIL		X
518CBC0702	SOIL		X
Total Billable Samples (Water/Soil)		0	9

PB= Lead

DATA ASSESSMENT NARRATIVE LEAD ONLY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Method; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDG # 37945

A validation was performed on the lead Data from SDG 37945. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

Matrix Spike Recovery results

The matrix spike recovery for waters for Lead (183%) was above the upper control limits. All positive results are qualified as estimated, "J".

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all water samples	Pb.	+	J



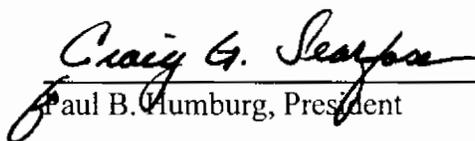
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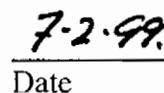
Data Validation Report

SDG#: 38511
Date: July 2, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone C
Date Sampled: March 12-13, 1999
Number of Samples: 15 Non-aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data, February, 1994
QA/QC Level: DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fractions: Lead

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

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


Paul B. Humburg, President


Date

SDG# 38511

Samples and Fractions Reviewed

Sample Identifications Analytical Fraction

ENSAFE ID	MATRIX	PB	
518SBC0801	SOIL		X
518SBC0802	SOIL		X
518SBC0901	SOIL		X
518SBC0902	SOIL		X
518SBC1001	SOIL		X
518SBC1002	SOIL		X
518SBC1101	SOIL		X
518SBC1102	SOIL		X
518SBC1201	SOIL		X
518SBC1202	SOIL		X
518SBC1301	SOIL		X
518SBC1302	SOIL		X
518SBC1401	SOIL		X
518CBC1401	SOIL		X
518SBC1402	SOIL		X
Total Billable Samples (Water/Soil)		0	15

PB= Lead

DATA ASSESSMENT NARRATIVE LEAD ONLY

General

The inorganic findings offered in this screening report assumes that all analytical results are correct as reported and is based upon the examination of the reported holding times, blank analysis results, matrix spike and LCS recoveries, matrix duplicates and calibration results. This report was prepared in compliance relative to the analytical and deliverable requirements specified in the SW 846 Methods for Appendix IX metals; the Functional Guidelines for Inorganic Data Validation, February 1994, and DQO Level III requirements. All comments made within this report should be considered when examining the analytical results. Please refer the specific findings found in each category to the Summary of Data Qualification table.

SDGs # 38511

A validation was performed on the Lead Data from SDG 38511. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

Preparation and Field Blanks

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

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Lead	0.24 mg/kg	no impact

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

Matrix Spike Recovery results

The matrix spike recovery for soils for Lead (0%) was below 30%. All positive results are qualified as estimated, "J" and all non-detect results are rejected.

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

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples	Pb.	+	J
		U	UR
all "B" results	all analytes	B	J



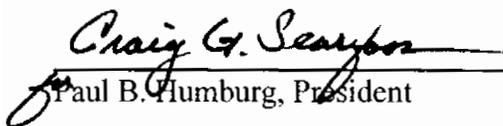
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ENVIRONMENTAL SERVICES, INC.

Data Validation Report

SDG#: 40801
Date: November 22, 1999
Client Name: Ensafe
Project/Site Name: Charleston Zone C
Date Sampled: October 20, 1999
Number of Samples: 2 Non-Aqueous Sample(s) with 0 MS/MSD(s)
2 Aqueous Sample(s) with 0 MS/MSD(s)
Laboratory: Southwest Laboratory of Oklahoma
Validation Guidance: National Functional Guidelines for Organic and Inorganic Data,
February, 1994
QA/QC Level: EPA DQO Level III
Method(s) Utilized: SW846 Third Edition
Analytical Fraction: Copper, Mercury, Cadmium and Selenium

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

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


Paul B. Humburg, President

11-23-99
Date

SDG# 40801

Samples and Fractions Reviewed

Sample Identifications

Analytical Fractions

ENSAFE ID	MATRIX	Cu		Hg		Cd		Se	
044MC00101	SOIL		X		X		X		X
044MC00201	SOIL		X		X		X		X
044WC00101	WATER	X							
044WC00201	WATER	X							
Total Billable Samples (Water/Soil)		2	2	0	2	0	2	0	2

Cu= Copper

Hg= Mercury

Cd= Cadmium

Se= Selenium

DATA ASSESSMENT NARRATIVE

METALS

General

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

SDGs # 40801

A validation was performed on the Metals Data from SDG 40801. The data was evaluated based on the following parameters.

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

* - All criteria were met for this parameter.

Preparation and Field Blanks

The preparation blanks exhibited negative bias for the following elements.

<u>Elements</u>	<u>Conc.</u>	<u>Samples affected</u>
Mercccury	-0.02 mg/kg	all soil samples below 0.2 mg/kg

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

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

SUMMARY OF DATA QUALIFICATIONS

Sample ID	Analyte	DL	QL
all soil samples below 0.2 mg/kg	Hg.	+/U	J/UJ
all "B" results	all analytes	B	J

Appendix B
Risk Reduction Calculations

Appendix B

Risk Reduction Calculations

B.1 Introduction

This appendix describes the methodology and results of the surface soil risk and hazard assessment for combined AOC 508/AOC 511. This assessment is needed because additional soil samples have been collected at this site since completion of the baseline risk assessment presented in the November 1997 Zone C RFI.

B.2 Methodology

This assessment used the same assumptions and equations as those used in the RFI for this site. The primary differences in the RFI and CMS assessments are (1) the CMS assessment uses additional data collected since the completion of the RFI assessment and (2) the CMS evaluated data only for the chemicals of concern (COCs) identified in the RFI. Several chemicals not identified as COCs in the RFI were evaluated in the original RFI baseline assessment and were determined to have negligible effect on site risk ($< 1.0 \text{ E-}06$).

B.2.1 Risk and Hazard Equations

The following equations for soil ingestion and dermal contact are derived from those used in the RFI baseline risk assessment for the residential re-use scenario.

Carcinogens (Cancer Risk)

$$RISK = \left(\frac{(EPC_s)(EF_{res})(F)(SF)}{AT_c} \right) \left[(FI) \left(\frac{(IR_c)(ED_c)}{BW_c} + \frac{(IR_a)(ED_a)}{BW_a} \right) + (FC)(AF)(ABS)(ADJ) \left(\frac{(CF_c)(ED_c)}{BW_c} + \frac{(CF_a)(ED_a)}{BW_a} \right) \right] \quad (1)$$

Where:

ABS	Absorbance factor
ADJ	Dermal to absorbed adjustment factor
AF	Adherence factor (1 mg/cm^2)
ATc	Averaging time (carcinogen)
ATnc-c	Averaging time (non-carcinogen, child)
BWa	Average body weight (adult, kg)
BWc	Average body weight (child, ages 1-6, kg)
CFa	Soil dermal contact factor (adult, $\text{mg}\cdot\text{day}^{-1}$)
CFc	Soil dermal contact factor (child, $\text{mg}\cdot\text{day}^{-1}$)
EDa	Exposure duration (adult, ages 7-31, years)
EDc	Exposure duration (child, ages 1-6, years)
EFres	Exposure frequency ($\text{days}\cdot\text{yr}^{-1}$)
EPCs	Exposure point concentration in surface soil ($\text{mg}\cdot\text{kg}^{-1}$)
F	Conversion factor ($1 \text{ E-06 kg}\cdot\text{mg}^{-1}$)
FI	Fraction ingested from contaminated source (unitless = 1)
IRa	Intake rate (adult, $\text{mg}\cdot\text{day}^{-1}$)
IRc	Intake rate (child, $\text{mg}\cdot\text{day}^{-1}$)
RfD	Oral Reference Dose ($\text{mg}\cdot\text{kg}^{-1}\cdot\text{day}^{-1}$)
SF	Cancer slope factor ($\text{kg}\cdot\text{day}\cdot\text{mg}^{-1}$)

B.2.2 Chemicals of Concern

Chemicals of concern - BEQs and dieldrin - were initially taken directly from the recommendations in Table 10.5.29 of the RFI. This table lists only chemicals with calculated exposure point concentrations (EPC) contributing to greater than 1 E-06 residential risk or 0.1 residential Hazard Quotient (HQ).

B.2.3 Data Selection

Assessment data includes AOC 508/AOC 511 RFI and CMS surface soil data. One-half the reported standard quantification limit was input for all nondetect arsenic values and the 10 percentile "J" flagged value was used for nondetect BEQ results. Data used is presented in Table 2.1.

B.2.4 Zone C Background and Current Site Risk and Hazard

Zone C background and AOC 508/AOC 511 site risk and hazard were calculated by applying the Zone C background exposure point concentration (EPC), which is the 95% upper confidence limit (UCL) of the mean Zone C background concentrations for arsenic and BEQs to the same risk and hazard formulas in Section B.2.1. Tables B.1 presents the AOC 508/AOC 511 summary data and Table B.2 present the AOC 508/AOC 511 site results.

**Table B.1
Combined AOC 508/511 Site Data Summary**

Compound or Element:	BEQ	Dieldrin
Background Conc. (mg/kg):	0.28	0.01
Number of Samples (n):	15.00	19.00
Standard Deviation of Ln Transformed Data:	1.25	1.89
Sample Mean of Ln Transformed Data:	-2.36	-5.19
H-Stat Interpolation		
n(low)	15.00	15.00
n(high)	21.00	21.00
S(low)	1.25	1.75
S(high)	1.50	2.00
H(NL,SL)	3.16	4.08
H(NL,SH)	3.61	4.56
H(NH,SL)	2.92	3.72
H(NH,SH)	3.31	4.14
NL Interp	3.16	4.35
NH Interp	2.92	3.96
H-stat:	3.16	4.09
95% UCL:	0.60	0.21
Maximum Value:	1.55	0.27
Exposure Point Concentration (mg/kg):	0.60	0.21

BORING ID	CONCENTRATION (mg/kg)			
	BEQ		Dieldrin	
508SB00101	0.037	U	0.0041	U
508SB00201	0.043		0.0066	J
508SB00301	1.546		0.029	J
508SB00401	0.074		0.0015	J
508SB00501	0.131		0.0041	J
508SB00601	1.213		0.0051	J
508SB00701	0.037	U	0.00072	J
508SB00801	0.318		0.018	
508SB00901	0.037	U	0.0012	
508SBC0101			0.0013	U
508SBC0201			0.091	DJ
508SBC0301			0.27	D
508SBC0401			0.0011	U
511SB00101	0.107728		0.021	J
511SB00201	0.077594		0.2	J
511SB00301	0.037184		0.0008	U
511SB00401	0.0371595	U	0.0019	J
511SB00501	0.08235		0.0008	U
511SB00601	0.0371595	U	0.0022	J

**Table B.2
Combined AOC 508/511 Site Risk and Hazard Summary**

Surface Soil Ingestion	BEQ	Arsenic	Site Totals
Residential Scenario (Child)			
Hazard Quotient (HQ):	0.0E+00	5.3E-03	5.3E-03
Background HQ:	0.0E+00	2.6E-04	2.6E-04
HQ Above Background:	0.0E+00	5.0E-03	5.0E-03
Incremental Excess Lifetime Cancer Risk (ILCR):	6.8E-06	1.1E-07	6.9E-06
Background ILCR:	3.2E-06	5.3E-09	3.2E-06
ILCR Above Background:	3.6E-06	1.0E-07	3.7E-06
Industrial Scenario (Adult Site)			
Hazard Quotient (HQ):	0.0E+00	2.0E-04	2.0E-04
Background HQ:	0.0E+00	9.8E-06	9.8E-06
HQ Above Background:	0.0E+00	1.9E-04	1.9E-04
Incremental Excess Lifetime Cancer Risk (ILCR):	7.6E-07	1.2E-08	7.7E-07
Background ILCR:	3.6E-07	5.9E-10	3.6E-07
ILCR Above Background:	4.0E-07	1.2E-08	4.2E-07
Surface Soil Dermal Contact			
Residential Scenario (Child)			
Hazard Quotient (HQ):	0.0E+00	2.6E-03	2.6E-03
Background HQ:	0.0E+00	1.3E-04	1.3E-04
HQ Above Background:	0.0E+00	2.5E-03	2.5E-03
Incremental Excess Lifetime Cancer Risk (ILCR):	3.1E-06	4.9E-08	3.1E-06
Background ILCR:	1.4E-06	2.4E-09	1.4E-06
ILCR Above Background:	1.6E-06	4.7E-08	1.7E-06
Industrial Scenario (Adult Site)			
Hazard Quotient (HQ):	0.0E+00	1.0E-04	1.0E-04
Background HQ:	0.0E+00	4.9E-06	4.9E-06
HQ Above Background:	0.0E+00	9.6E-05	9.6E-05
Incremental Excess Lifetime Cancer Risk (ILCR):	1.2E-06	2.0E-08	1.3E-06
Background ILCR:	5.9E-07	9.7E-10	5.9E-07
ILCR Above Background:	6.6E-07	1.9E-08	6.8E-07

**Table B.2 (cont.)
Combined AOC 508/511 Site Risk and Hazard Summary**

Ingestion and Dermal Contact Combined Totals

Residential Scenario (Child)

Hazard Quotient (HQ):	0.0E+00	7.9E-03	7.9E-03
Background HQ:	0.0E+00	3.8E-04	3.8E-04
HQ Above Background:	0.0E+00	7.5E-03	7.5E-03

Incremental Excess Lifetime

Cancer Risk (ILCR):	9.9E-06	1.6E-07	1.0E-05
Background ILCR:	4.6E-06	7.7E-09	4.6E-06
ILCR Above Background:	5.2E-06	1.5E-07	5.4E-06

Industrial Scenario (Adult Site Worker)

Hazard Quotient (HQ):	0.0E+00	3.0E-04	3.0E-04
Background HQ:	0.0E+00	1.5E-05	1.5E-05
HQ Above Background:	0.0E+00	2.9E-04	2.9E-04

Incremental Excess Lifetime

Cancer Risk (ILCR):	2.0E-06	3.2E-08	2.0E-06
Background ILCR:	9.4E-07	1.6E-09	9.4E-07
ILCR Above Background:	1.1E-06	3.1E-08	1.1E-06