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CNC CHARLESTON
5090.3a

RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT ADDENDUM CORRECTIVE MEASURES STUDY WORK PLAN AREA OF CONCERN 530 AND 531 (AOC 530) AND (AOC 531) ZONE E CNC CHARLESTON SC

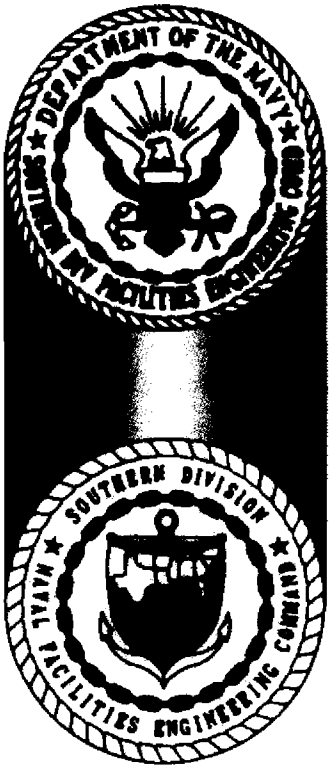
8/20/2002

CH2M HILL

RFI REPORT ADDENDUM

RFI Report Addendum and CMS Work Plan

AOCs 530/531 Zone E



Charleston Naval Complex
North Charleston, South Carolina

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

CH2M Jones

August 2002

Contract N62467-99-C-0960

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August 20, 2002

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

Re: RFI Report Addendum and CMS Work Plan (Revision 1) – AOCs 530/531, Zone E

Dear Mr. Scaturo:

Enclosed please find two copies of the RFI Report Addendum and CMS Work Plan (Revision 1) for AOCs 530/531 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The following pages are included for replacement in the Revision 0 binder:

- Revision 1 Cover/Spine and Flysheet
- Revised pages v; 5-1, 5-2, 5-3, and 5-4; 6-1; 7-1; 8-1, 8-2, 8-3, 8-4, 8-5, and 8-6
- CH2M-Jones Responses to EPA Comments on the Revision 0 document

The principal author of this document is Sam Naik. Please contact him at 770/604-9182, extension 255, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

CH2M-Jones Responses to EPA Comments on the
RFI Report Addendum and CMS Work Plan, AOCs 530/531, Zone E,
***Revision 0* (December 2001)**

GENERAL COMMENT

The RFI Addendum's recommendation that a Corrective Measures Study should be performed is supported by the data presented. However, a few specific comments should be resolved.

SPECIFIC COMMENTS

EPA Comment 1:

Page 3-1. The text states that the RFI indicated the presence of a UST at AOC 531, based upon a registration document. The text states, however, that there is no evidence that a tank is located at AOC 531. Additional information should be presented detailing the investigative steps taken to locate the reported tank. Also, in light of the conversations at the January BCT Meeting, it may be appropriate to transfer AOC 531 to the State UST program.

CH2M-Jones Response 1:

The reference to the UST registration document was made in the Zone E RFI Report, Revision 0 (EnSafe, 1999). CH2M-Jones verified existing maps of UST locations, along with the Navy's records, and did not find a 20,000-gallon UST associated with AOCs 530/531. Additionally, CH2M-Jones contacted Mike Bishop with the SCHDEC Bureau of Water Management (UST Program) and Steve Parker with EnSafe Inc. during February 2002 to verify the existence of the UST. No information on a tank installation at this site exists in either SCDHEC's or the Navy's records. One of the objectives of the Zone E RFI Work Plan for AOC 531 was to investigate the presence of this UST during the RFI. This UST was not found during the Zone E RFI fieldwork. The inclusion of this UST in the referenced 1986 UST registration document is believed to be an incorrect entry.

AOC 531 is Building 459, which houses a transformer and a small cinder-block building with a bank of batteries. With respect to the transfer of AOC 531 to the UST program, since no UST has been found to be associated with this site, transfer of this site to the UST program is not warranted.

EPA Comment 2:

Page 6-2, Section 6.5. The RFIRA has used the former presence of a rail line in the area of AOCs 530/531 to help eliminate elevated arsenic concentrations as a COC in this area. However, this section indicates that the former rail line will not be included in the AOC 504, Investigated Rail Lines, evaluation. A clear discussion of how the former rail lines could be a source of elevated contaminated concentrations and yet not be evaluated as part of the rail line investigation should be included in the text.

CH2M-Jones Response 2:

The AOC 504 rail line investigations mentioned in Section 6.5 were part of the Zone L RFI. The text will be edited to clarify that a previous background study along the railroad lines indicated the presence of elevated arsenic and BEQs. The results of this investigation have

been presented to the CNC BCT in the Technical Memorandum: Results from Additional Background Sampling of the CNC Railroad Lines and Naval Annex (Zone K), *dated August 14, 2001. The arsenic concentrations detected during this investigation ranged from 2 mg/kg to 92 mg/kg, and the BEQ concentrations ranged from 87 µg/kg to 5,133 µg/kg. The BCT has adopted these background ranges of concentrations as screening guidance for surface soils at AOCs and SWMUs with historic or current railroad lines near surface soil sampling locations.*

Although the RFI Report Addendum presented a screening of chemicals of potential concern (COPC) according to the CNC BCT agreements, arsenic is retained as a surface soil chemical of concern (COC) for this site for unrestricted land use.

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CH2MHILL

December 27, 2001

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

Re: RFI Report Addendum and CMS Work Plan (Revision 0) – AOCs 530/531, Zone E

Dear Mr. Scaturo:

Enclosed please find two copies of the RFI Report Addendum and CMS Work Plan (Revision 0) for AOCs 530/531 in Zone E of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is Sam Naik. Please contact him at 770/604-9182, extension 255, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

RFI REPORT ADDENDUM

RFI Report Addendum and CMS Work Plan
AOCs 530/531, Zone E

Charleston Naval Complex
North Charleston, South Carolina

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

PREPARED BY
CH2M-Jones

August 2002

Revision 1
Contract N62467-99-C-0960
158814.ZE.PR.02

Certification Page for RFI Report Addendum and CMS Work Plan (Revision 1) – AOCs 530/531, Zone E

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

South Carolina

P.E. No. 21428

Dean Williamson

Dean Williamson, P.E.

9/19/2002

Date

Contents

Contents, Continued

Appendices

Acronyms and Abbreviations

AOC	area of concern
AST	aboveground storage tank
BCT	BRAC Cleanup Team
BEQ	benzo(a)pyrene equivalent
BRAC	Base Realignment and Closure Act
BRC	background reference concentration
BTEX	benzene, toluene, ethylbenzene, and xylene
CA	corrective action
CMS	corrective measures study
CNC	Charleston Naval Complex
COC	contaminant of concern
COPC	contaminant of potential concern
CSI	Corrective Study Investigation
DAF	dilution attenuation factor
EnSafe	EnSafe Inc.
EPA	U.S. Environmental Protection Agency
ft bls	feet below land surface
FRE	fixed-point risk evaluation
HHRA	Human Health Risk Assessment
HI	hazard index
ILCR	incremental lifetime cancer risk
IM	interim measure
LUC	land use control
LUCIP	Land Use Control Implementation Plan
LUCMP	Land Use Control Management Plan
MCL	maximum contaminant level
MCS	media cleanup standards
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

1	mg/kg	milligrams per kilogram
2	mg/L	milligrams per liter
3	NAVBASE	Naval Base
4	NFA	no further action
5	NFI	no further investigation
6	OWS	oil/water separator
7	PAH	polycyclic aromatic hydrocarbon
8	PCB	polychlorinated biphenyl
9	RAO	remedial action objectives
10	RBC	risk-based concentration
11	RCRA	Resource Conservation and Recovery Act
12	RFA	RCRA Facility Assessment
13	RFI	RCRA Facility Investigation
14	RI	remedial investigation
15	RGO	remedial goal options
16	SCDHEC	South Carolina Department of Health and Environmental Control
17	SSL	soil screening level
18	SVOC	semivolatile organic compound
19	SWMU	solid waste management unit
20	TDS	total dissolved solids
21	VOC	volatile organic compound
22	UST	underground storage tank

Section 1.0

1.0 Introduction

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

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

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to complete the RCRA Facility Investigation (RFI) for Areas of Concern (AOCs) 530 and 531 in Zone E of CNC. The location of this combined site in Zone E is shown in Figure 1-1. Figure 1-2 shows an aerial photograph of the site.

AOC 530 is comprised of three small areas at Building 35 which is located at the intersection of Hobson Avenue and Truxtun Avenue in Zone E of CNC. Building 35 was used to store paint and oil from 1913 to 1939. Additions were made to the building in the 1930s, and the Publication and Printing Service was housed in the building from 1949 to 1979. The printing service supplied the printing needs of much of the 6th Naval District. Before 1979, wastes generated at Building 35 included an unknown quantity of ferric chloride acid etching bath, lithographic developing solution, and photographic developing solution. Most recently, Building 35 has been used as a training facility for welding students.

A review of historical engineering drawings for this site shows that railroad lines were previously located directly adjacent to the south side of Building 35. A loading dock is present along the entire southern edge of Building 35. The railroad lines were either paved over or removed sometime after 1937.

Materials of concern identified based on historical operations for AOC 530 in the *Final Zone E RFI Work Plan, Revision 1* (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1995) include alcohols, paints, solvents, petroleum hydrocarbons, and heavy metals. This area of Zone E is zoned M2 (industrial). The CNC RCRA Permit identified AOC 530 as requiring a CSI.

AOC 531 comprises one small area outside Building 35 at the intersection of Hobson Avenue and Truxtun Avenue and includes Building 459. Building 459 was constructed in 1974 and was used for storage and served as an enclosure for a substation. The building has two sections: a metal enclosure containing high-voltage switches and a transformer, and a concrete building containing a battery bank and associated supplies. A 1986 Underground Storage Tank (UST) Registration document reported the presence of a 20,000-gallon fuel oil tank which was not found during the RFI. No other investigations have been located regarding this facility. Materials of concern identified in the *Final Zone E RFI Work Plan* include batteries, dielectric fluid, and petroleum hydrocarbons.

This area of Zone E is zoned M2 (industrial). The CNC RCRA Permit identified AOC 531 as requiring a CSI.

The RFI was initially conducted by EnSafe Inc. and the *Zone E RFI Report, Revision 0* (EnSafe, 1997) was prepared and submitted during 1997. Regulatory review was conducted on this document and a draft response to the comments from SCDHEC were prepared by the Navy/EnSafe team.

1.1 Purpose of the RFI Report Addendum

The purpose of this RFI Report Addendum is to document the results of previous RFI investigations conducted by EnSafe at AOCs 530 and 531. This RFI Report Addendum also discusses various close-out issues and the findings of previous investigations, existing site conditions, and surrounding area land use.

1.2 Report Organization

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

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

2.0 Summary of RFI Conclusions for AOCs 530/531 – Summarizes the conclusions from the RFI investigations and risk evaluations for AOCs 530/531 as presented in *the Zone E RFI Report, Revision 0.*

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

4.0 Summary of Additional Investigations – Summarizes information, if any, collected after completion of the *Zone E RFI Report, Revision 0* (EnSafe, 1997).

5.0 COPC/COC Refinement – Provides further evaluation of chemicals of potential concern (COPC) based on RFI and additional data to assess them as chemicals of concern (COCs).

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

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

8.0 CMS Work Plan – Presents a focused CMS Work Plan.

9.0 References – Lists the references used in this document.

Appendix A – Contains excerpts from the *Zone E RFI Report, Revision 0*, including summary of detections of chemicals and a groundwater flow map for the site vicinity.

Appendix B – Contains responses to SCDHEC comments for AOCs 530/531 from the *Zone E RFI Report, Revision 0* (EnSafe, 1997).

Appendix C – Includes Figure C1 showing the site location from the Public Works Map of the Charleston Navy Shipyard dated June 1928, depicting the presence of railroad lines at the site. This appendix also includes a recent photograph of Building 35 at AOC 530 showing the loading dock under which some soil samples were collected during the RFI.

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

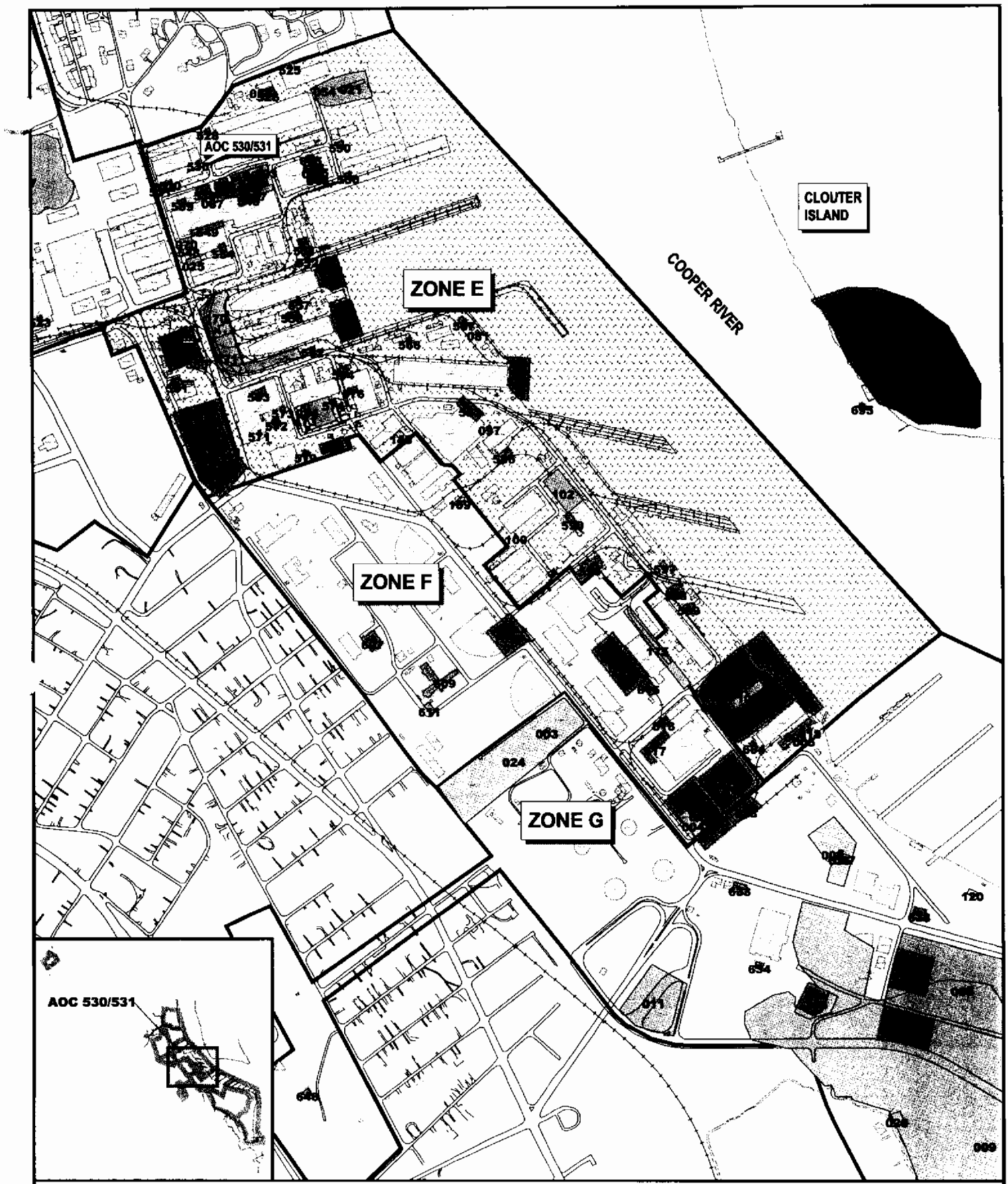

Figure 1-1

Location of Zone E Within CNC
Charleston Naval Complex

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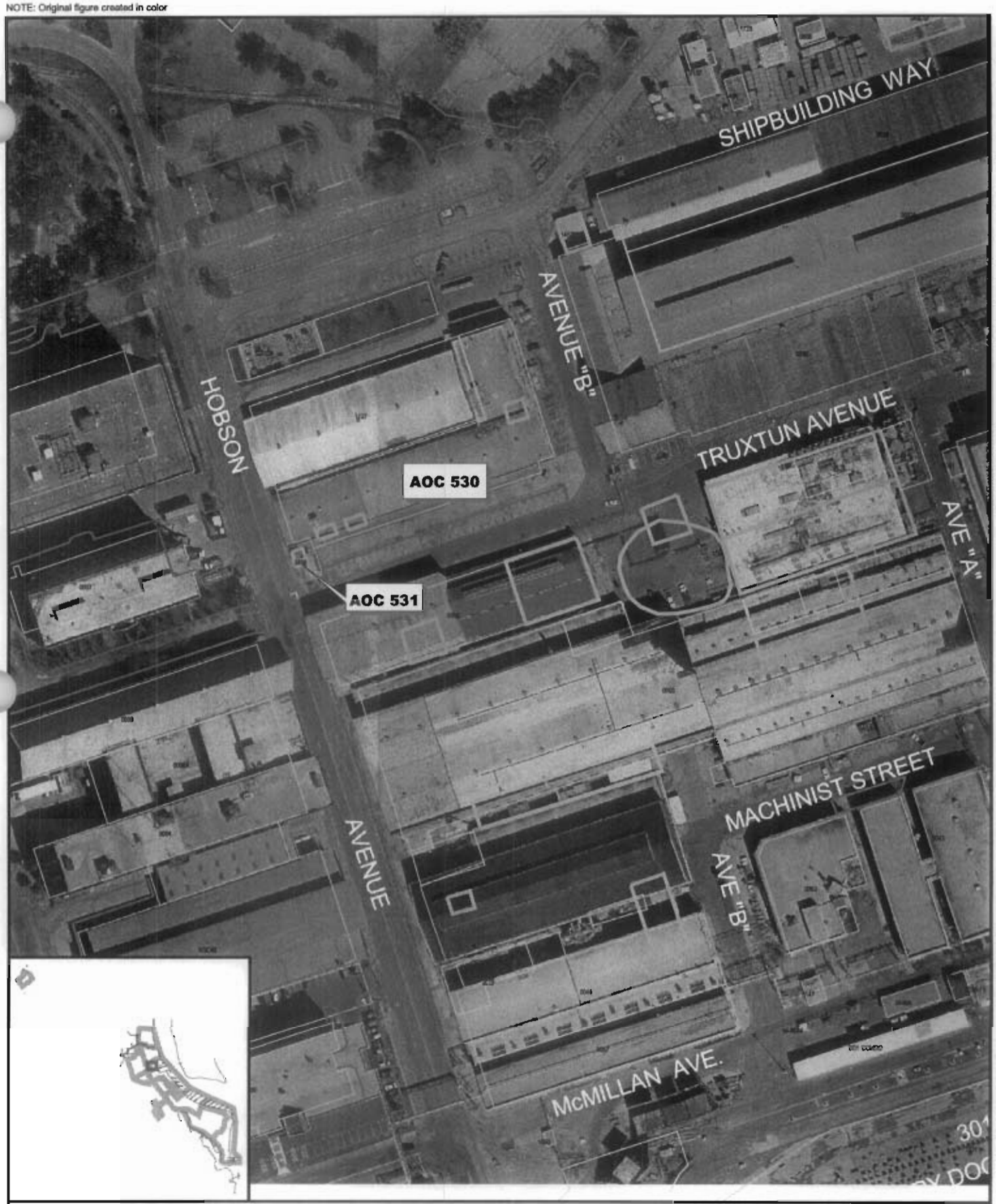
NOTE: Aerial Photo Date is 1997
NOTE: Original figure created in color



AOC Boundary
SWMU Boundary
Buildings

N

0 100 200 Feet

1 inch = 153 feet

Figure 1-2
Site Location of AOCs 530/531
Zone E
Charleston Naval Complex

CH2MHILL

Section 2.0

2.0 Summary of RFI Conclusions for AOCs 530/531

This section summarizes the results and conclusions from the soil and groundwater investigations conducted at AOCs 530/531 which were reported in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Figure 2-1 shows soil and groundwater sampling locations.

As part of the Zone E RFI, soil and groundwater investigations were conducted at AOCs 530/531 during 1995 and 1996. The RFI report presented the results of these investigations and conclusions concerning contamination and risk, as summarized in the following sections. A further evaluation of chemicals of concern (COCs) at this combined site is provided in Section 5.0.

2.1 Soil Sampling and Analysis

Soil was sampled during two sampling events at AOC 530. During the first event, three surface samples were collected from the crawl space under the loading dock along the south side of Building 35. There are no unpaved surface soils around Building 35, except possibly under the loading dock area. Surface and subsurface soil samples were collected from six other locations under concrete/asphalt pavements. These boring locations were identified as E530SB001 through E530SB008. One soil sampling location E531SB001 was shared with AOC 531. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals. One lower interval sample was collected as a field duplicate and analyzed for an extended list of analytes, including VOCs, SVOCs, metals, herbicides, organophosphate pesticides and dioxins.

During the second sampling event at AOC 530, surface and subsurface soil samples were collected at three additional locations to define the outer extent of the exceedances of screening criteria detected during the first event. These locations, under asphalt and concrete pavement, were identified as E531SB009 through E531SB011 and analyzed for SVOCs and metals only (see Figure 2-1).

Soil was sampled during two sampling events at AOC 531. During the first event, surface and subsurface soil samples were collected from three locations. These locations were identified as E531SB001 through E531SB003 and samples collected from these locations

were analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), pH and metals. One soil sampling location E530SB006 was shared with AOC 530.

During the second sampling event at AOC 531, surface and subsurface soil samples were collected at two additional locations based on exceedances of screening criteria detected during the first event. These samples were analyzed for SVOCs, metals and pH.

2.1.1 Surface Soil

During the RFI, surface soil detections of organic compounds were evaluated against the EPA Region III industrial risk-based concentrations (RBCs) (with a hazard index [HI]=0.1 for noncarcinogens). Surface soil detections of inorganic compounds were evaluated against the EPA Region III industrial RBCs (HI=0.1 for noncarcinogens) and the Zone E background reference concentrations (BRCs).

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

- **VOCs:** No VOCs exceeded the screening criteria in surface soils.
- **SVOCs:** The RFI reported that among detected SVOC compounds, elevated BEQ concentrations were detected at 11 locations. The BEQ calculation was performed using the method adopted by the BCT at the time of writing of the *Zone E RFI Report, Revision 0*. The calculated BEQ values at the 11 locations ranged from 548 micrograms per kilogram (µg/kg) to 57,300 µg/kg. There were no other exceedances of SVOC compounds in surface soils above screening criteria.
- **Inorganics:** Among detected inorganic analytes, only arsenic exceeded the screening criteria used in the RFI, which were the industrial RBC of 3.80 mg/kg and the Zone E BRC of 23.9 mg/kg. The exceedances occurred at four locations with concentrations of 39 mg/kg (at E530SB008), 68.3 milligrams per kilogram (mg/kg) (at E530SB001), 76.7 mg/kg (at E531SB002) and 83.8 mg/kg (at E530SB010). The latter three samples are under concrete pavement within the footprint of the old railroad line (see Figure C1).
- **PCBs:** There were no detections of PCBs above screening criteria limits in soil samples from AOC 531.

Figure 2-2 shows the soil sampling locations along with surface and subsurface BEQ concentrations. Figure 2-3 shows arsenic concentrations in surface soil.

2.1.2 Subsurface Soil

During the RFI, subsurface soil detections of organic compounds were compared with generic soil screening levels (SSLs) (using a dilution attenuation factor [DAF]=10) and the Zone E BRCs. Subsurface soil detections of inorganic compounds were compared with generic SSLs (using a DAF=10) and the Zone E reference BRCs.

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

- **VOCs:** There were no exceedances of VOC concentrations of the screening criteria.
- **SVOCs:** There were no exceedances of SVOC concentrations of screening criteria.
- **Dioxins:** The RFI reported that there were no detections above the respective SSLs for the detected dioxin compounds.
- **Inorganics:** There were no exceedances of inorganic concentrations of the screening criteria.
- **PCBs:** There were no PCB detections above laboratory detection limits in soil samples from AOC 531.

2.2 Groundwater

During the RFI for AOC 530, two shallow and two deep groundwater monitoring wells were installed—one for each depth on the south side of Building 35 and the east side of Building 35. Each well was sampled four times between 1996 and 1997. Groundwater samples were submitted for analysis for VOCs, SVOCs, metals, chlorides, sulfates, and total dissolved solids (TDS) during the four sampling events. No groundwater well was installed specifically to investigate AOC 531; however, well E530GW001 is located directly east of AOC 531 (see Figure 2-1).

During the RFI, detections in groundwater samples were compared with the EPA Region III tap water RBCs, MCLs and the Zone E BRCs for shallow and deep aquifers.

2.2.1 Shallow Groundwater

The detections were in the shallow groundwater samples and found as follows at this site:

VOCs: There were no detections of VOC concentrations above screening criteria except 1,1-dichlorothene at 1 microgram per liter (µg/L) in the first sampling event in well E530GW001. This detection exceeded the tap water RBC of 0.044 µg/L. This reported value

is well below the MCL of 7 µg/L. Subsequent sampling did not indicate the presence of this VOC in groundwater.

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

Inorganics: The *Zone E RFI Report, Revision 0* reported detections in the first sampling event only. Among detected inorganic analytes, only iron at a concentration of 4,610 µg/L, exceeded both its secondary MCL of 300 µg/L and the tap water RBC of 1,100 µg/L (HI=0.1). No shallow groundwater BRC was developed for iron in Zone E during the RFI. The RFI identified arsenic as a COPC based on its exceedance of the tap water RBC of 0.045 µg/L in both site wells, although the highest detected concentration during the first sampling event of 24.2 µg/L is below the MCL of 50 µg/L.

2.2.2 Deep Groundwater

The following detections were found in the deep groundwater at the site:

VOCs: There were no detections above laboratory detection limits.

SVOCs: There were no detections above laboratory detection limits.

Inorganics: There were no exceedances of inorganic analytes of their respective Zone E BRCs and MCLs.

2.3 Wipe Sampling

The RFI Work Plan for AOC 531 proposed collection of four wipe samples from locations that could have the most potential for PCB contamination from spills or leaks near PCB-containing equipment. Accordingly, four wipe samples were collected from a concrete pad as shown in Figure 2-4 and analyzed for PCBs. There were no PCB detections above laboratory detection limits in these wipe samples. The RFI Work Plan for AOC 530 did not identify a requirement for wipe sampling at AOC 530.

2.4 RFI Human Health Risk Assessment (HHRA)

The *Zone E RFI Report Revision 0* used a fixed-point risk evaluation (FRE) approach at this site. The FRE considered site resident and site worker scenarios during the FRE. The detailed risk assessment for the AOCs 530/531 site are presented in Sections 10.21.6 and 10.22.6 of the *Zone E RFI Report, Revision 0.*

2.4.1 Soils

The HHRA for AOC 530 considered antimony, arsenic, BEQs, cadmium, lead and mercury from AOC 530 as COPCs based on exceedances of the Zone E BRCs and the EPA Region III residential RBCs in effect at the time of writing of the RFI. The HHRA for AOC 531 considered antimony, arsenic, Aroclor-1260 and BEQs as COPCs for surface soils based on exceedances of the same criteria.

For the unrestricted future land use scenario, only arsenic and BEQs were retained as COCs for surface soils. For the commercial/industrial reuse scenario, only arsenic and BEQs were retained as COCs in surface soils. The FRE did not identify COCs in subsurface soils at AOC 530 or 531.

2.4.2 Groundwater

The FRE for AOC 530 considered arsenic and 1,1-dichloroethene as COPCs in the shallow groundwater based on detections during the first sampling event only, and were retained as COCs in shallow groundwater only. No COCs were retained for deep groundwater.

2.5 RFI Conclusions and Recommendations

The *Zone E RFI Report, Revision 0* recommended that a CMS be conducted for surface soil COCs (arsenic and BEQs) at AOCs 530/531, and for shallow groundwater COCs (arsenic and 1,1-DCE) at AOC 530.

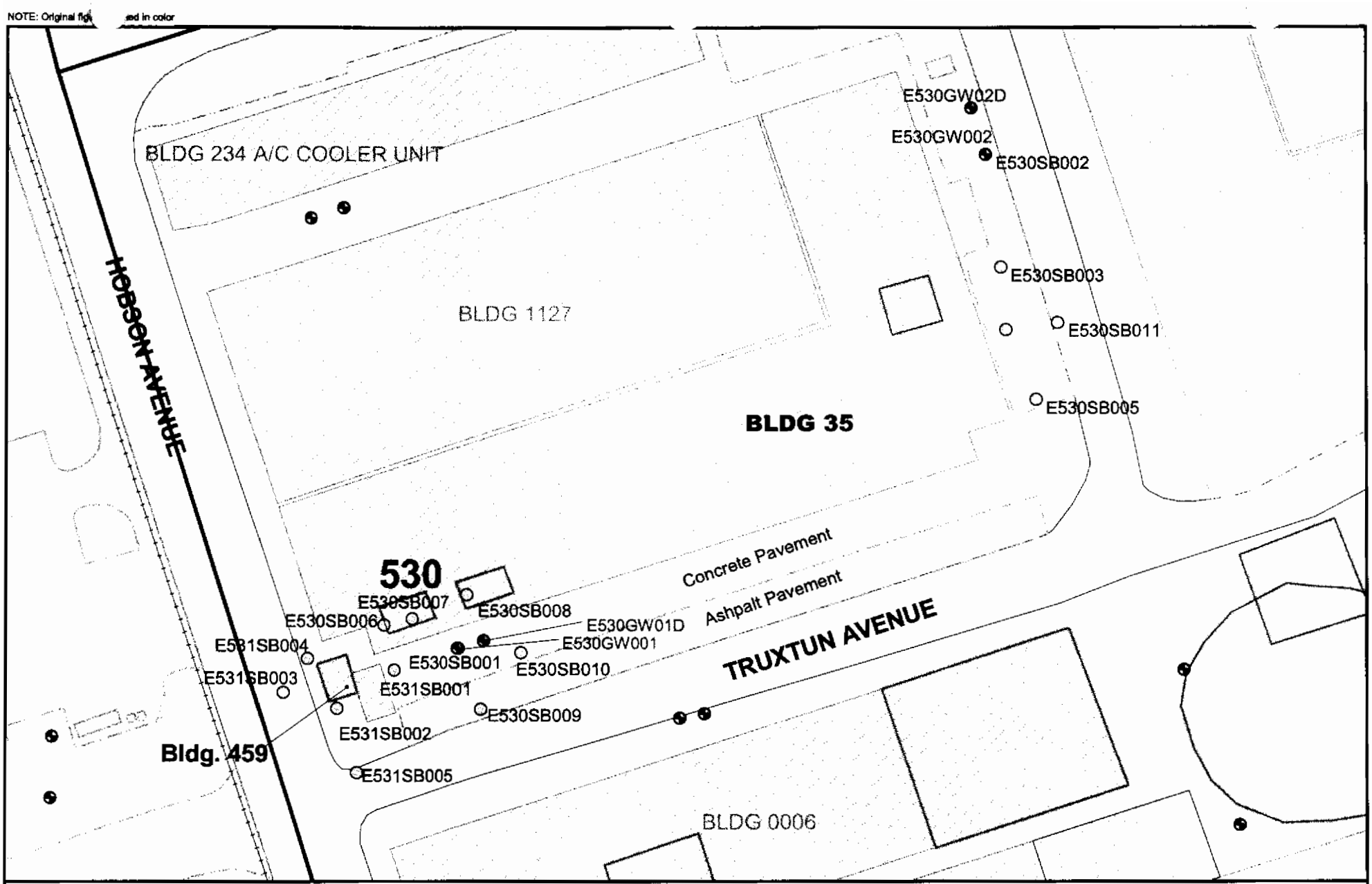


Figure 2-1
RFI Sampling Locations
AOCs 530/531
Charleston Naval Complex

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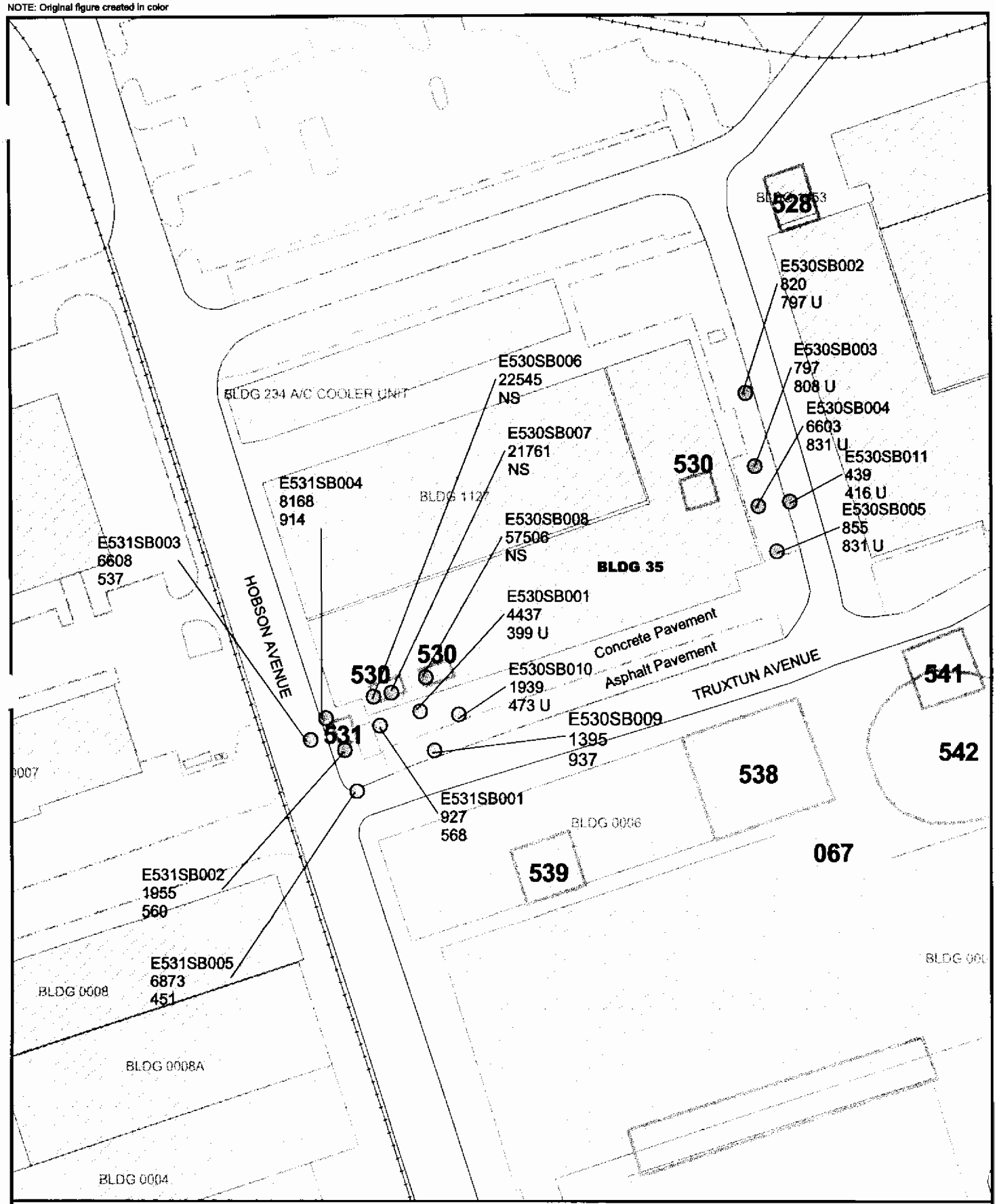

RFI Soil Boring Location
6873 Surface Soil BEQ Conc (ug/kg)
451 Subsurface Soil BEQ Conc (ug/kg)
NS Not Sampled

Pavement
Roads
AOC Boundary
SWMU Boundary
Buildings

N

0 70 140 Feet

1 inch = 115 feet

Figure 2-2
Soil BEQ Concentrations
AOC 530 and 531, Zone E
Charleston Naval Complex

CH2MHILL

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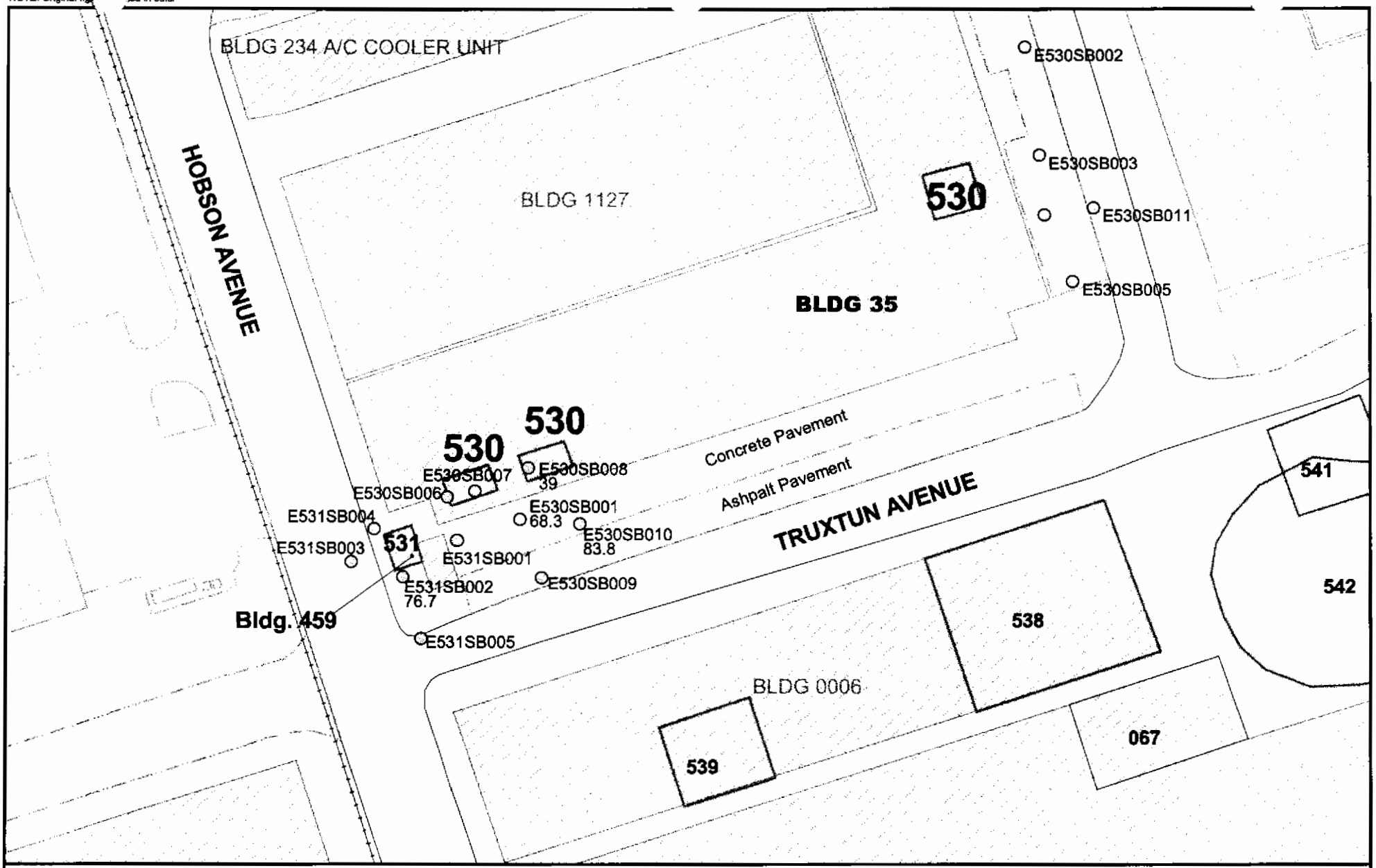

RFI Soil Boring Location
68.3 Surface Soil Arsenic Conc. (mg/kg)

Railroads
Pavement
Roads - Lines
Buildings
AOC Boundary
SWMU Boundary

N

0 40 80 Feet

1 inch = 52 feet

Figure 2-3
Surface Soil Arsenic Concentrations
AOCs 530 and 531, Zone E
Charleston Naval Complex

CH2MHILL

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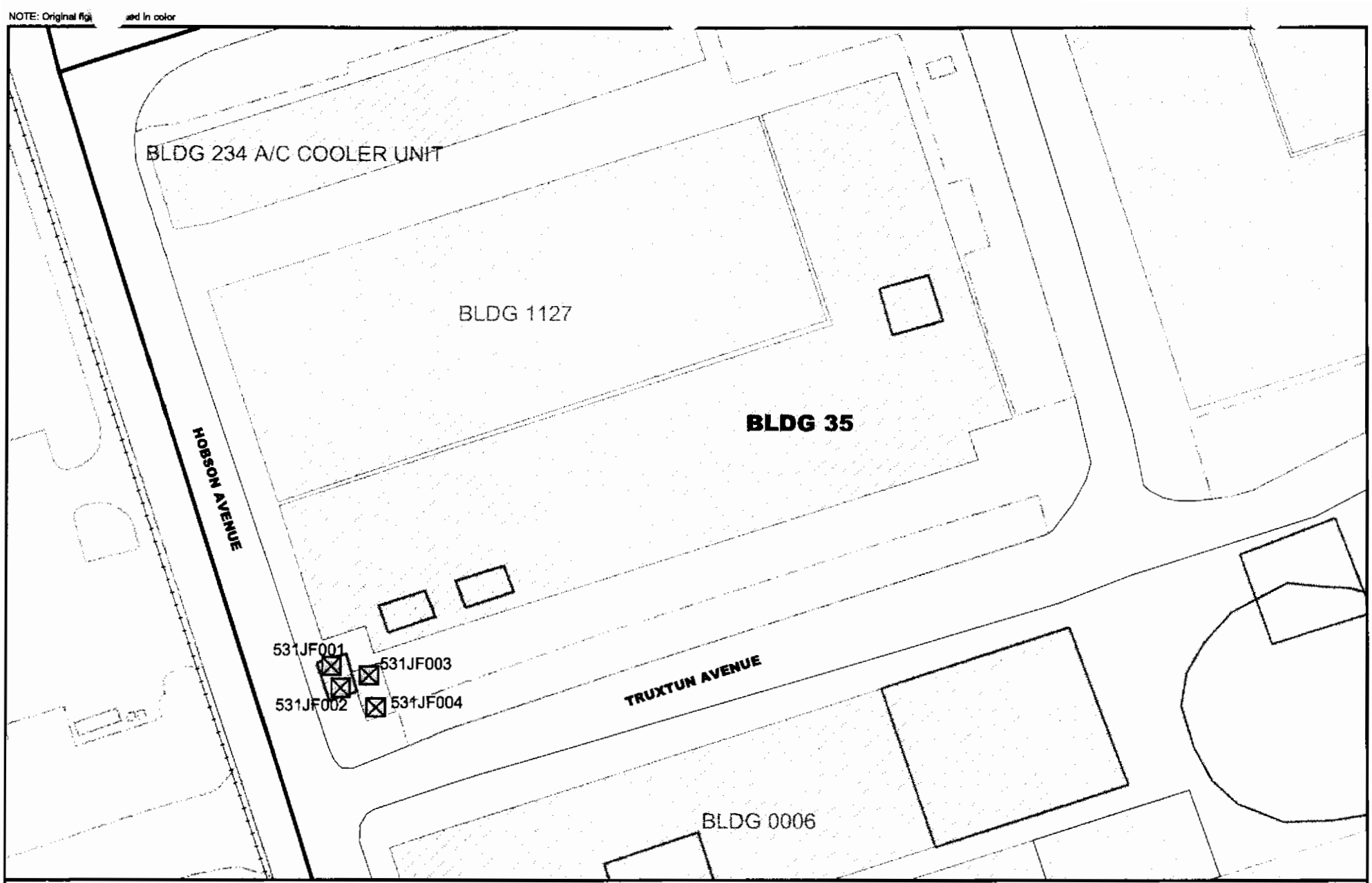

Figure 2-4
Wipe Sampling Locations
AOCs 530/531, Zone E
Charleston Naval Complex

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Section 3.0

3.0 Summary of Interim Measures and UST/AST Removals at AOCs 530/531

3.1 UST/AST Removals

There is no indication of a UST being present at either of these sites. The RFI cited a 1986 UST Registration document which indicated the presence of a 20,000-gallon fuel oil UST at AOC 531. However, a review of available maps and documents by CH2M-Jones did not reveal the presence of a UST at this site or indicate a UST removal and closure.

3.2 Interim Measures

There were no IMs conducted at the site.

Section 4.0

4.0 Summary of Additional Investigations

No additional investigations have been conducted at AOCs 530/531 since the RFI field investigations conducted by EnSafe during the period of 1995-1997.

Section 5.0

5.0 COPC/COC Refinement

The *Zone E RFI Report, Revision 0* identified arsenic and BEQs as surface soil COCs for AOCs 530/531, and arsenic and 1,1-dichloroethene (1,1-DCE) as shallow groundwater COCs for AOC 530 for the future industrial land use scenario. The nature of occurrence and the relevance of these chemicals at these sites are further discussed below.

5.1 Surface Soil

5.1.1 Arsenic

The main contributor to surface soil risk was arsenic, based on detections in 14 out of 16 samples, all of which exceeded the residential RBC. Table 5-1 lists detected arsenic concentrations in surface soils. The range of background values for arsenic in Zone E is from 0.4 mg/kg to 67.5 mg/kg. Three locations exceeded the upper bound of the range of background values of 67.5 mg/kg. These were at E530SB001 at 68.3 mg/kg, E530SB010 at 83.8 mg/kg and E531SB002 at 76.6 mg/kg (see Figure 2-3, and Table 5-1). Both of these samples are located on the outer edge of the site boundary next to the roadway.

The recent background concentration sampling effort conducted at the CNC for arsenic and BEQs along the railroad lines indicated a distribution of elevated concentrations of arsenic in surface soils around railroad lines and paved areas. These elevated arsenic concentrations most likely occurred due to use of arsenic-containing pesticides. The range of arsenic concentrations detected in these samples was between 1.9 mg/kg and 92 mg/kg. Details of this study can be found in the *Technical Memorandum: Results from Additional Background Sampling of the CNC Railroad Lines and Naval Annex (Zone K)* (CH2M-Jones, 2001).

Figure C-1 in Appendix C shows the presence of historic railroad lines at the site from the Public Works Map of the CNC dated June 30, 1928. The lines were located in areas where the higher detections of arsenic were found during the RFI. These railroad line locations appear to have been paved over in subsequent Public Works Maps from the late 1930s and later, and currently remain paved over with concrete and asphalt.

The arsenic concentrations detected at AOCs 530/531 in the surface soil are within this range, indicating that the arsenic detections found below the concrete and asphalt pavement at this site could be related to routine application in the past of arsenic-containing pesticides along these former railroad lines, which were later paved over. There is no

indication from information on past site uses that arsenic was used during Building 35 operations or that the presence of arsenic in the soils is related to releases from the AOCs. Arsenic was not detected above screening criteria in the subsurface soil; therefore, it is not a leachability concern at these sites.

Though detected arsenic concentrations in surface soils are not associated with past operations at at AOCs 530/531, arsenic has been retained as a COC in surface soil as requested by EPA, after review of the *RFI Report Addendum for AOCs 530/531, Revision 0* (CH2M-Jones, 2002).

5.1.2 BEQs

The areas with elevated BEQ concentrations at AOCs 530/531 are located within or adjacent to historic railroad lines described in Section 5.1.1 above, and are present under the concrete and/or asphalt pavement of Buildings 35 and 459. The range of railroad background BEQ concentrations detected during the recent BEQ sampling along the railroad lines was from 87 µg/kg to 5,133 µg/kg. Some of the surface soil BEQ concentrations detected at AOCs 530/531 exceed the upperbound of this range (see Figure 2-2 and Table 5-2). The area with the elevated BEQ concentrations above background are located either under concrete/asphalt pavement or under the loading dock area. Thus, there is no direct contact with these soils at the present time.

Because BEQs are present above the sitewide BRC, BEQs in surface soil are considered COCs for both the unrestricted and industrial land use scenarios.

It should be noted that there were no exceedances of the CNC BEQ screening goal in subsurface soils and BEQs were not identified as subsurface COCs at this site during the RFI. Additionally, BEQ compounds were not detected above screening criteria in the groundwater, indicating that the BEQs detected in surface soils do not pose a threat to groundwater via leaching.

5.2 Groundwater

5.2.1 Arsenic

The RFI report considered arsenic as a COC based on the detections of arsenic above the EPA Region III tap water RBC in shallow groundwater at AOC 530. The detections of arsenic in the shallow well RFI samples ranged from 2.7 µg/L to 29.7 µg/L, all of which are below the MCL for arsenic of 50 µg/L. Each of the wells were monitored four times and the maximum detected arsenic was from the first sampling event in one well (530GW001).

Arsenic detections in the later sampling events are likely from background occurrence. The groundwater background arsenic levels at CNC are included in *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in Background Soil and Groundwater at the CNC* (CH2M-Jones, 2001). Table 5-3 shows detections of arsenic in groundwater at the site. Based on the information presented above, the groundwater arsenic is not a COC for this site.

5.2.2 1,1-DCE

The RFI report considered 1,1-DCE as a COC at AOC 530 based on its detection in one shallow groundwater monitoring well E530GW001 at 1 µg/L, above the EPA Region III tap water RBC of 0.044 milligram per liter (mg/L), during the first sampling event. However, three subsequent sampling events did not show 1,1-DCE above laboratory detection limits, and this one-time detection is below the MCL of 7 µg/L for 1,1-DCE. Based on the above discussions, 1,1-DCE is not a COC in groundwater at AOC 530 and there are no other organic constituents identified as COPCs/COCs in groundwater.

5.3 COC Summary

Arsenic and BEQs are identified as COCs in surface soil for the unrestricted and industrial land use scenario. No other COCs for any media or land use scenario were identified.

TABLE 5-1
Detected Arsenic Concentrations in Surface Soils
RFI Report Addendum and CMS Work Plan, AOCs 530/531, Zone E, Charleston Naval Complex

Station ID	Sample ID	Arsenic Concentration (mg/kg)	Qualifier	Date Collected
Industrial RBC		**3.8**		
Residential RBC		**0.43**		
Zone E Maximum Background Concentration		**68**		
E530SB001	530SB00101	68.30	=	01/09/1996
E530SB003	530SB00301	3.20	=	01/09/1996
E530SB004	530SB00401	3.50	=	01/09/1996
E530SB006	530SB00601	5.80	=	01/11/1996
E530SB007	530SB00701	8.20	=	01/11/1996
E530SB008	530SB00801	39.00	=	01/11/1996
E530SB009	530SB00901	3.90	=	09/14/1996
E530SB010	530SB01001a	83.80	=	09/14/1996
E530SB011	530SB01101	1.70	=	09/12/1996
E531SB001	531SB00101	2.90	J	10/27/1995
E531SB002	531SB00201	76.70	J	10/27/1995
E531SB003	531SB00301	2.00	J	10/27/1995
E531SB005	531SB00501	6.50	=	09/15/1996

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

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

TABLE 5-2
Detected BEQ Concentrations in Surface Soils
RFI Report Addendum and CMS Work Plan, AOCs 530/531, Zone E, Charleston Naval Complex

Station ID	Sample ID	BEQ Concentrations as reported in the *Zone E RFI Report, Rev. 0* (µg/kg)	BEQ Concentrations based on current method[a] (µg/kg)
CNC BEQ Screening Goal			**1,304**
E530SB001	530SB00101	4,437	4,437
E530SB004	530SB00401	6,603	6,603
E530SB006	530SB00601	22,370	22,545
E530SB007	530SB00701	21,596	21,761
E530SB008	530SB00801	57,300	57,506
E530SB009	530SB00901	1,394	1,395
E530SB010	530SB01001a	1937	1,939
E531SB002	531SB00201	1955	1,955
E531SB003	531SB00301	6604	6,608
E531SB004	531SB00401	8,170	8,168
E531SB005	531SB00501	6,873	6,873

[a] BEQ calculation method based on *Background PAHs Study Report, Technical Information for Development of Background BEQ Values* (CH2M-Jones, February 2001).

J	Indicates an estimated value. One or more quality control (QC) parameters were outside control limits or the value was detected below the laboratory's quantification limit.
U	Indicates that the concentration was not detected.

TABLE 5-3
Detected Arsenic and Thallium Concentrations in Shallow Groundwater
RFI Report Addendum and CMS Work Plan, AOCs 530/531, Zone E, Charleston Naval Complex

Station ID	Sample ID	Result µg/L	Qualifier	Date Collected
ARSENIC				
EPA Region III Tap Water RBC		**0.045**		
MCL		**50.000**		
E530GW001	530GW00101	24.20	=	05/01/1996
E530GW001	530GW00102	7.10	J	12/10/1996
E530GW001	530GW00103	8.40	J	02/25/1997
E530GW002	530GW00104	2.70	J	12/11/1996
E530GW002	530GW00201	2.90	J	02/25/1997
E530GW001	530GW00202	9.70	U	08/08/1996
E530GW002	530GW00203	2.70	U	05/01/1996
E530GW002	530GW00204	5.90	U	08/08/1996
THALLIUM				
EPA Region III Tap Water RBC		**0.26**		
MCL		**2.00**		
E530GW001	530GW00101	2.70	U	05/01/1996
E530GW001	530GW00102	2.70	U	12/10/1996
E530GW001	530GW00103	4.40	J	02/25/1997
E530GW002	530GW00104	5.00	U	12/11/1996
E530GW002	530GW00201	3.10	U	02/25/1997
E530GW001	530GW00202	2.70	U	08/08/1996
E530GW002	530GW00203	2.90	J	05/01/1996
E530GW002	530GW00204	5.00	U	08/08/1996

µg/L Micrograms per liter

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

MCL Maximum Contaminant Level

U Indicates that the concentration was not detected.

Section 6.0

6.0 Summary of Information Related to Site Closeout Issues

6.1 RFI Status

The *Zone E RFI Report, Revision 0* (EnSafe, 1997) addressed SWMUs/AOCs within Zone E of the CNC, including AOCs 530/531.

In accordance with the RFI completion process, if a determination of No Further Investigation (NFI) is made upon completion of the RFI, then a site may proceed to either NFA status or to a CMS. The RFI for AOCs 530/531 identified COCs for surface soils and shallow groundwater. Based on the discussion presented in Section 5.0 above, arsenic and BEQs in surface soil are considered a COC at AOCs 530/531.

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

6.2 Presence of Inorganics in Groundwater

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

There were no detections of antimony in shallow or deep wells above the laboratory detection limits. There were no detections of arsenic above the MCL in samples from the shallow or deep groundwater monitoring wells. Intermittent detections of thallium in shallow and deep groundwater at the site above the MCL do not point to a site-specific source, but can be attributed to natural occurrence. Table 5-3 shows thallium concentrations from the RFI groundwater sampling at AOC 530. Further evaluation of this issue is not warranted.

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

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

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

No direct connection from these sites to the storm sewers are known to exist. No COCs requiring further evaluation are present at the site. Based on these findings, further evaluation of this issue is not warranted.

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

The nearest railroad line to AOCs 530/531 is approximately 300 feet north of the site. There is no known linkage between AOCs 530/531 and the investigated railroad lines of AOC 504, so further evaluation of this issue is not warranted. However, it likely that the former railroads at the site resulted in elevated detections of some chemicals at this site.

6.6 Potential Migration Pathways to Surface Water Bodies at the CNC

The nearest surface water body to AOCs 530/531 is the Cooper River, which lies approximately 1,000 feet east of the site. The only potential migration pathway from the site to surface water is via overland flow via stormwater runoff. The entire site is covered with buildings and pavement, which eliminates contact of surface soil with stormwater. Similarly, runoff directed to the storm sewer system, which discharges to the Cooper River, does not contact the surface soil. Since the BEQ detections at the site are under concrete and asphalt pavement, no further evaluation of a potential pathway for contaminant migration via stormwater runoff is warranted.

6.7 Potential Contamination in Oil/Water Separators (OWSs)

There are no OWSs associated with AOCs 530/531. In addition, there is no reference to an OWS at the site in the *Oil Water Separator Data* report, Department of the Navy, September 2000. Therefore, further evaluation of this issue is not warranted.

6.8 Land Use Control (LUC)

The CNC BCT has agreed that all of Zone E will have at least some land use controls and restrictions. At a minimum, these land use controls are likely to include restrictions against residential land use. Site specific land use controls are also expected to be required at specific sites within Zone E depending on the results of the site-specific investigations. At AOCs 530 and 531, land use controls are expected to be applied due to the presence of COCs in surface soil. The specific land use controls will be identified in a CMS for these sites.

Section 7.0

7.0 Recommendations

The *Zone E RFI Report, Revision 0* identified arsenic and BEQs in surface soils and arsenic and 1,1-DCE in shallow groundwater as the COCs for the AOCs 530/531 site. Based on an evaluation of the data and site conditions as discussed herein, arsenic and BEQs in surface soil are identified as COCs for the unrestricted and industrial land use scenarios. A CMS is recommended for this site to address the arsenic and BEQs. Section 8.0 of this RFI Report Addendum presents a CMS Work Plan.

Section 8.0

8.0 CMS Work Plan

Arsenic and BEQs were identified as COCs in surface soil. Because there is no exposed surface soil at the site with BEQs or arsenic, there is currently no unacceptable exposure or risk from these COCs; however, it is feasible that in the future, should site conditions change, some exposure could occur. Therefore, a CMS should be conducted to evaluate potential corrective measures and identify an appropriate remedy for the site.

This section presents a focused CMS work plan. Media cleanup standards are identified for COCs and potential remedies that should be evaluated are also presented.

8.1 Remedial Action Objectives

Remedial action objectives (RAOs) are medium-specific goals that the remedial actions are designed to accomplish in order to protect human health and the environment by preventing or reducing exposures under current and future land use conditions. The RAOs identified for the surface soil at AOCs 530/531 are being chosen to prevent ingestion and direct/dermal contact with surface soil containing COCs at unacceptable levels. No remedial actions are required for subsurface soil or groundwater at AOCs 530/531.

8.2 Remedial Goal Options and Media Cleanup Standards

Throughout the process of remediating a hazardous waste site, a risk manager uses a progression of increasingly acceptable site-specific media levels in considering remedial alternatives. Under the RCRA program, remedial goal options (RGOs) and media cleanup standards (MCSs) are developed at the end of the risk assessment in the RFI/Remedial Investigation (RI) programs, before completion of the CMS.

RGOs can be based on a variety of criteria, such as specific incremental lifetime cancer risk (ILCR) levels (e.g., 1E-04, 1E-05, or 1E-06), HI levels (e.g., 0.1, 1.0, 3.0), or site background concentrations. For a particular RGO, specific MCSs can be determined as target concentration values. Achieving these MCSs is accepted as demonstrating that RGOs and RAOs have been achieved. Achieving these goals should promote the protection of human health and the environment, while achieving compliance with applicable state and federal standards.

The exposure media of concern for AOCs 530/531 is surface soil impacted by arsenic and BEQs, though they have not been attributed to site operations at these two RCRA units. Because AOCs 530/531 is located within a highly developed area of the CNC and there are no surface water bodies in the immediate vicinity of the site, ecological exposures were not considered applicable for evaluation.

The general vicinity around AOCs 530/531 within Zone E has elevated concentrations of arsenic and BEQs in some areas, making it unfit for unrestricted (i.e., residential) land use in the future. For BEQs, the target MCS for surface soil should be the site-wide BRC of 1,304 µg/kg, which was developed by the BCT. For arsenic within Zone E, the MCS is the range of background arsenic concentrations. A MCS will be met if the statistical estimates of site concentrations are similar to statistical estimates of background concentrations. For point comparisons between the site and background, detected concentrations at the site may be compared with the Zone E range of background concentrations. The maximum background arsenic concentration for surface soil in Zone E of 67.5 mg/kg is thus a practical MCS for this area of Zone E. Other potential RGOs, such as the 1E-06 ILCR level, were considered but regarded as not applicable because the site background concentrations of arsenic and BEQs are significantly greater than this level. The background levels of arsenic and BEQs in this area preclude the suitability of this area for future unrestricted land use.

8.3 Potential Remedies to Evaluate

Because of the small size of this site and the relatively small quantity of contaminated surface soil, the list of practicable remedial alternatives for this site is limited. The two presumptive remedies that will be evaluated as part of the CMS include:

- Soil excavation and offsite disposal
- Land use controls

8.4 Focused CMS Approach

The focused CMS will consist of the following tasks that will be performed in the order presented below:

1. The corrective measure alternatives described above will be screened using several criteria and decision factors.
2. A preferred corrective measure alternative will be selected.

3. The CMS and preferred corrective measure alternative will be documented in the CMS report.

8.5 Approach to Evaluating Corrective Measure Alternatives

According to the RCRA permit issued by SCDHEC (SCDHEC, 1998), the alternatives will be evaluated with the following five standards:

1. Protecting human health and the environment.
2. Attaining media cleanup standards (RGOs).
3. Controlling the source of releases to minimize future releases that may pose a threat to human health and the environment.
4. Complying with applicable standards for the management of wastes generated by remedial activities.
5. Other factors include (a) long-term reliability and effectiveness; (b) reduction in toxicity, mobility, or volume of wastes; (c) short-term effectiveness; (d) implementability; and (e) cost.

Each of the five standards is defined in more detail below:

1. **Protecting human health and the environment.** The alternatives will be evaluated on the basis of their ability to protect human health and the environment. The ability of an alternative to achieve this standard may or may not be independent of its ability to achieve the other four standards. For example, an alternative may be protective of human health, but may not be able to attain the MCSs if the MCSs are not directly tied to protecting human health.

2. **Attaining media cleanup standards (RGOs).** The alternatives will be evaluated on the basis of their ability to achieve the RGOs defined in this CMS Work Plan. Another aspect of this standard is the timeframe to achieve the RGOs. Estimates of the timeframe for the alternatives to achieve RGOs will be provided.

3. **Controlling the source of releases.** This standard deals with the control of releases of contamination from the source (the area in which the contamination originated).

4. **Complying with applicable standards for management of wastes.** This standard deals with the management of wastes derived from implementing the alternatives, for example, treatment or disposal of excavated material. The soil removal alternative will be designed to comply with all applicable standards for management of remediation

wastes. Consequently, this standard will not be explicitly included in the detailed evaluation presented in the CMS but will be part of a work plan specific to the removal action should a removal action become the chosen alternative.

5. **Other factors.** Five other factors are to be considered if an alternative is found to meet the four standards described above. These other factors are as follows:

   a. Long-term reliability and effectiveness

   The two alternatives will be evaluated on the basis of their reliability, and the potential impact should the chosen alternative fail. In other words, a qualitative assessment will be made as to the chance of the alternative's failure and the consequences of that failure.

   b. Reduction in the toxicity, mobility, or volume of wastes

   Alternatives with technologies that reduce the toxicity, mobility, or volume of the contamination will be generally favored over those that do not. Consequently, a qualitative assessment of this factor will be performed for each alternative.

   c. Short-term effectiveness

   Alternatives will be evaluated on the basis of the risk they create during the implementation of the remedy. Factors that may be considered include fire, explosion, and exposure of workers to hazardous substances.

   d. Implementability

   The alternatives will be evaluated for their implementability by considering any difficulties associated with conducting the alternatives (such as the construction disturbances they may create), operation of the alternatives, and the availability of equipment and resources to implement the technologies comprising the alternatives.

   e. Cost

   A net present value of each alternative will be developed. These cost estimates will be used for the relative evaluation of the alternatives, not to bid or budget the work. The estimates will be based on information available at the time of the CMS and on a conceptual design of the alternative. They will be "order-of-magnitude" estimates with a generally expected accuracy of -50 percent to +50 percent for the scope of action described for each alternative. The estimates will be categorized into capital costs and operations and maintenance costs for each alternative.

In addition to the criteria described above, the alternatives will be evaluated for their ability to achieve all contractual obligations of CH2M-Jones and the Navy.

8.6 Focused CMS Report

A focused CMS Report will be prepared to present the identification, development, and evaluation of potential corrective measures for AOCs 530/531. A proposed outline of the report, as shown in Table 8-1, provides an example of the report format and content.

TABLE 8-1
Outline of Focused CMS Report for AOCs 530/531
RFI Report Addendum & CMS Work Plan, AOC 530/531 Zone F, Charleston Naval Complex

Section No.	Section Title
1.0	**Introduction**
1.1	Corrective Measures Study Purpose and Scope
1.2	Report Organization
1.3	Background Information
1.3.1	Facility Description
1.3.2	Site History and Background
1.3.2.1	Nature and Extent of Contamination
1.3.2.2	Summary of Risk Assessment
2.0	**Remedial Goal Objectives**
3.0	**Detailed Analysis of Focused Alternatives**
3.1	Approach
3.2	Evaluation Criteria
3.3	Description of Alternatives
3.3.1	Alternative 1: Soil removal and Offsite Disposal
3.3.2	Alternative 2: Land Use Controls
3.4	Detailed Analysis of Alternatives
3.4.1	Analysis of Alternative 1
3.4.2	Analysis of Alternative 2
3.5	Comparative Analysis of Alternatives
4.0	**Recommended Remedial Alternative**
5.0	**References**
Appendix A	**Corrective Measure Alternative Cost Estimates**[b]
List of Tables	
List of Figures	

[a] Additional alternatives will be analyzed as found necessary.

[b] Additional appendices will be added, if necessary.

Section 9.0

9.0 References

EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston.* 1997.

EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, NAVBASE Charleston.* July 1995.

EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Revision 1, NAVBASE Charleston.* June 1995.

CH2M-Jones. *Technical Memorandum: A Summary of Inorganic Chemical Concentrations in Background Soil and Groundwater at the CNC.* 2001.

CH2M-Jones. *Technical Memorandum: Results from Additional Background Sampling of the CNC Railroad Lines and Naval Annex (Zone K). CNC.* August 2001.

South Carolina Department of Health and Environmental Control, Final RCRA Part B Permit No.

Appendix A

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
Volatile Organic Compounds (ug/kg)						
1,1,2,2-Tetrachloroethane	530SB001	6.00	ND	3200	NA	NA
Acetone	530SB001	24.00	17.50	780000	NA	NA
	530SB002	68.00	11.00			
	530SB003	41.00	25.00			
	530SB004	60.00	20.00			
	530SB005	480.00	35.00			
Methylene chloride	530SB001	4.00	2.00	85000	NA	NA
	530SB002	1.00	ND			
	530SB003	ND	1.00			
	530SB004	2.00	2.00			
Toluene	530SB001	ND	1.00	1600000	NA	NA
	530SB004	6.00	2.00			
	530SB005	3.00	1.00			
	530SB008	2.00	ND			
Trichlorofluoromethane	530SB001	ND	1.00	2300000	NA	NA
Vinyl acetate	530SB001	ND	11.00	7800000	NA	NA
Xylene (Total)	530SB008	2.00	ND	16000000	NA	NA
Semi-volatile Compounds (ug/kg)						
2,4-Dimethylphenol	530SB001	88.00	ND	160000	NA	NA
2-Methylnaphthalene	530SB001	560.00	76.00	NA	NA	NA
	530SB006	10000.00	NS			
	530SB007	7800.00	NS			
	530SB008	8000.00	NS			
	530SB010	94.00	ND			
Acenaphthene	530SB001	390.00	ND	470000	NA	NA
	530SB004	250.00	ND			
	530SB006	5700.00	NS			
	530SB007	2400.00	NS			
	530SB008	11000.00	NS			
	530SB009	ND	210.00			
	530SB010	38.00	ND			
Acenaphthylene	530SB001	280.00	ND	310000	NA	NA
	530SB006	2000.00	NS			
	530SB007	2300.00	NS			
	530SB009	43.00	ND			
	530SB010	180.00	ND			
Anthracene	530SB001	730.00	ND	23000000	NA	NA
	530SB004	1700.00	ND			
	530SB006	11000.00	NS			
	530SB007	5200.00	NS			
	530SB008	32000.00	NS			
	530SB009	110.00	350.00			
	530SB010	180.00	ND			
Benzo(a)anthracene	530SB001	3400.00	360.00	880	NA	NA
	530SB004	7200.00	ND			
	530SB006	20000.00	NS			
	530SB007	15000.00	NS			
	530SB008	49000.00	NS			

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	530SB009	670.00	660.00			
	530SB010	1000.00	ND			
Benzo(a)pyrene	530SB001	2900.00	465.00	88	NA	NA
	530SB004	4200.00	ND			
	530SB006	15000.00	NS			
	530SB007	14000.00	NS			
	530SB008	38000.00	NS			
	530SB009	900.00	620.00			
	530SB010	1200.00	ND			
Benzo(b)fluoranthene	530SB001	3000.00	445.00	880	NA	NA
	530SB004	3900.00	ND			
	530SB009	940.00	ND			
	530SB010	1200.00	ND			
Benzo(g,h,i)perylene	530SB001	2000.00	355.00	310000	NA	NA
	530SB003	ND	200.00			
	530SB004	2300.00	ND			
	530SB006	10000.00	NS			
	530SB007	10000.00	NS			
	530SB008	18000.00	NS			
	530SB009	700.00	540.00			
	530SB010	940.00	ND			
Benzo(k)fluoranthene	530SB001	2400.00	345.00	8800	NA	NA
	530SB004	4700.00	ND			
	530SB006	16000.00	NS			
	530SB007	22000.00	NS			
	530SB008	57000.00	NS			
	530SB009	610.00	690.00			
	530SB010	950.00	ND			
Benzoic acid	530SB009	66.00	ND	31000000	NA	NA
	530SB010	70.00	ND			
bis(2-Ethylhexyl)phthalate (BEHP)	530SB001	ND	300.00	4600	NA	NA
Chrysene	530SB001	3400.00	440.00	88000	NA	NA
	530SB004	6000.00	ND			
	530SB006	20000.00	NS			
	530SB007	16000.00	NS			
	530SB008	46000.00	NS			
	530SB009	720.00	650.00			
	530SB010	1100.00	ND			
Dibenz(a,h)anthracene	530SB001	650.00	143.50	88000	NA	NA
	530SB004	930.00	ND			
	530SB006	4400.00	NS			
	530SB007	5000.00	NS			
	530SB008	12000.00	NS			
	530SB009	270.00	180.00			
	530SB010	430.00	ND			
Dibenzofuran	530SB001	320.00	ND	31000	NA	NA
	530SB004	110.00	ND			
	530SB006	4000.00	NS			
	530SB007	2800.00	NS			
	530SB008	10000.00	NS			

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	530SB009	ND	75.00			
	530SB010	42.00	ND			
Fluoranthene	530SB001	5600.00	765.00	3100000	NA	NA
	530SB004	12000.00	ND			
	530SB006	45000.00	NS			
	530SB007	32000.00	NS			
	530SB008	90000.00	NS			
	530SB009	1500.00	2100.00			
	530SB010	1600.00	ND			
Fluorene	530SB001	280.00	ND	310000	NA	NA
	530SB004	240.00	ND			
	530SB006	6800.00	NS			
	530SB007	3500.00	NS			
	530SB008	12000.00	NS			
	530SB009	ND	140.00			
	530SB010	52.00	ND			
Indeno(1,2,3-cd)pyrene	530SB001	2200.00	375.00	880	NA	NA
	530SB004	3100.00	ND			
	530SB006	7900.00	NS			
	530SB007	8600.00	NS			
	530SB008	18000.00	NS			
	530SB009	570.00	430.00			
	530SB010	780.00	ND			
Naphthalene	530SB001	350.00	ND	310000	NA	NA
	530SB006	6100.00	NS			
	530SB007	5300.00	NS			
	530SB008	23000.00	NS			
	530SB010	61.00	ND			
Phenanthrene	530SB001	3300.00	305.00	310000	NA	NA
	530SB004	6100.00	ND			
	530SB006	55000.00	NS			
	530SB007	21000.00	NS			
	530SB008	100000.00	NS			
	530SB009	490.00	1700.00			
	530SB010	480.00	ND			
Pyrene	530SB001	5000.00	545.00	230000	NA	NA
	530SB004	12000.00	ND			
	530SB006	45000.00	NS			
	530SB007	26000.00	NS			
	530SB008	74000.00	NS			
	530SB009	1200.00	1500.00			
	530SB010	1500.00	ND			
Dioxin/Dibenzofuran (ng/kg)						
1234678-HpCDD	530CB001	NS	2.83	NA	NA	NA
123678-HxCDF	530CB001	NS	1.90	NA	NA	NA
OCDD	530CB001	NS	31.90	NA	NA	NA
OCDF	530CB001	NS	7.23	NA	NA	NA
Total Hepta-Dioxins	530CB001	NS	3.29	NA	NA	NA
Total Hepta-Furans	530CB001	NS	10.40	NA	NA	NA

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
Total Hexa-Furans	530CB001	NS	11.20	NA	NA	NA
Total Penta-Furans	530CB001	NS	10.30	NA	NA	NA
Total Tetra-Furans	530CB001	NS	1.82	NA	NA	NA
Inorganic Compounds (mg/kg)						
Aluminum (Al)	530SB001	4050.00	3790.00	7800	26000	41100
	530SB002	2930.00	1910.00			
	530SB003	3900.00	2860.00			
	530SB004	3060.00	2560.00			
	530SB005	3320.00	3000.00			
	530SB006	3310.00	NS			
	530SB007	4950.00	NS			
	530SB008	7650.00	NS			
	530SB009	4670.00	3580.00			
	530SB010	4280.00	4040.00			
	530SB011	2310.00	3130.00			
Antimony (Sb)	530SB001	3.50	1.31	3.1	1.77	1.6
	530SB006	2.60	NS			
	530SB007	2.20	NS			
	530SB008	1.40	NS			
Arsenic (As)	530SB001	68.30	6.80	0.43	23.9	19.9
	530SB003	3.20	ND			
	530SB004	3.50	ND			
	530SB006	5.80	NS			
	530SB007	8.20	NS			
	530SB008	39.00	NS			
	530SB009	3.90	0.92			
	530SB010	83.80	1.60			
	530SB011	1.70	0.79			
Barium (Ba)	530SB001	118.00	17.35	550	130	94.1
	530SB002	14.70	7.40			
	530SB003	ND	14.00			
	530SB004	15.60	15.40			
	530SB005	9.70	15.80			
	530SB006	79.90	NS			
	530SB007	101.00	NS			
	530SB008	117.00	NS			
	530SB009	23.50	6.90			
	530SB010	53.80	12.20			
Beryllium (Be)	530SB001	0.25	0.15	0.15	1.7	2.71
	530SB002	0.18	ND			
	530SB003	0.32	0.19			
	530SB004	0.18	0.19			
	530SB005	0.17	0.19			
	530SB006	0.27	NS			
	530SB007	0.29	NS			
	530SB008	0.41	NS			
Cadmium (Cd)	530SB001	1.10	ND	3.9	1.5	0.96
	530SB004	0.30	ND			
	530SB006	5.60	NS			

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	530SB007	7.20	NS			
	530SB008	7.60	NS			
	530SB009	0.06	ND			
	530SB010	0.61	ND			
	530SB011	0.25	0.05			
Calcium (Ca)	530SB001	1270.00	584.50	NA	NA	NA
	530SB002	584.00	202.00			
	530SB003	4600.00	778.00			
	530SB004	712.00	463.00			
	530SB005	711.00	580.00			
	530SB006	10900.00	NS			
	530SB007	5570.00	NS			
	530SB008	17800.00	NS			
	530SB009	1240.00	438.00			
	530SB010	1500.00	622.00			
	530SB011	138000.00	ND			
Chromium (Cr)	530SB001	9.00	4.60	39	94.6	75.2
	530SB002	2.50	2.10			
	530SB003	3.90	2.70			
	530SB004	4.00	2.90			
	530SB005	4.00	3.00			
	530SB006	32.60	NS			
	530SB007	30.40	NS			
	530SB008	19.50	NS			
	530SB009	4.80	3.50			
	530SB010	5.50	4.10			
	530SB011	4.70	2.40			
Cobalt (Co)	530SB001	1.70	0.72	470	19	14.9
	530SB002	0.36	0.31			
	530SB003	1.40	0.46			
	530SB004	37.50	1.80			
	530SB005	2.00	2.20			
	530SB006	2.20	NS			
	530SB007	2.20	NS			
	530SB008	2.50	NS			
	530SB009	0.68	ND			
	530SB010	0.93	ND			
	530SB011	3.30	ND			
Copper (Cu)	530SB001	41.90	6.15	310	66	152
	530SB002	1.30	0.46			
	530SB003	5.70	17.10			
	530SB004	35.80	1.90			
	530SB005	3.30	2.10			
	530SB006	236.00	NS			
	530SB007	209.00	NS			
	530SB008	181.00	NS			
	530SB009	9.00	0.99			
	530SB010	21.20	0.91			
	530SB011	3.90	ND			
Iron (Fe)	530SB001	13000.00	2165.00	2300	NA	NA

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	530SB002	2180.00	1390.00			
	530SB003	2190.00	2170.00			
	530SB004	2540.00	2000.00			
	530SB005	1550.00	2090.00			
	530SB006	6770.00	NS			
	530SB007	7740.00	NS			
	530SB008	10700.00	NS			
	530SB009	3360.00	1190.00			
	530SB010	5660.00	1710.00			
Lead (Pb)	530SB001	543.00	41.25	400	265	173
	530SB002	3.60	1.30			
	530SB003	11.00	4.50			
	530SB004	41.00	4.00			
	530SB005	9.50	8.30			
	530SB006	638.00	NS			
	530SB007	1060.00	NS			
	530SB008	1050.00	NS			
	530SB009	42.00	3.70			
	530SB010	279.00	6.60			
	530SB011	15.60	13.80			
Magnesium (Mg)	530SB001	213.00	139.50	NA	NA	NA
	530SB002	108.00	91.60			
	530SB003	249.00	125.00			
	530SB004	403.00	102.00			
	530SB005	97.70	114.00			
	530SB006	618.00	NS			
	530SB007	502.00	NS			
	530SB008	1750.00	NS			
	530SB009	260.00	117.00			
	530SB010	196.00	163.00			
	530SB011	1330.00	ND			
Manganese (Mn)	530SB001	107.00	16.20	180	302	881
	530SB002	49.30	10.50			
	530SB003	86.10	49.40			
	530SB004	54.60	53.00			
	530SB005	28.20	45.60			
	530SB006	107.00	NS			
	530SB007	94.00	NS			
	530SB008	138.00	NS			
	530SB009	37.90	7.30			
	530SB010	50.50	9.60			
Mercury (Hg)	530SB001	4.10	0.40	2.3	2.6	1.59
	530SB003	0.12	ND			
	530SB004	0.08	ND			
	530SB005	0.03	ND			
	530SB006	9.10	NS			
	530SB007	8.70	NS			
	530SB008	5.60	NS			
	530SB009	0.39	ND			
	530SB010	3.00	0.07			

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
Nickel (Ni)	530SB001	4.80	1.80	160	77.1	.57
	530SB002	1.20	1.00			
	530SB003	2.00	1.30			
	530SB004	8.50	1.60			
	530SB005	1.40	1.80			
	530SB006	28.00	NS			
	530SB007	30.90	NS			
	530SB008	20.30	NS			
	530SB009	2.10	0.96			
	530SB010	3.00	1.20			
	530SB011	3.90	ND			
Potassium (K)	530SB001	186.00	86.70	NA	NA	NA
	530SB002	69.80	49.30			
	530SB003	113.00	78.90			
	530SB004	91.90	52.70			
	530SB005	54.50	69.50			
	530SB006	493.00	NS			
	530SB007	625.00	NS			
	530SB008	729.00	NS			
	530SB011	244.00	ND			
Selenium (Se)	530SB001	0.76	ND	39	1.7	2.4
	530SB006	0.68	NS			
	530SB007	0.73	NS			
	530SB008	0.79	NS			
	530SB010	0.44	ND			
Silver (Ag)	530SB004	1.00	ND	39	NA	NA
	530SB006	4.20	NS			
	530SB007	0.48	NS			
	530SB008	1.20	NS			
Sodium (Na)	530SB001	32.50	18.70	NA	NA	NA
	530SB002	18.50	15.80			
	530SB003	22.50	20.70			
	530SB004	26.00	12.80			
	530SB005	19.90	19.20			
	530SB007	111.00	NS			
	530SB008	80.10	NS			
	530SB009	173.00	205.00			
	530SB010	141.00	173.00			
Thallium (Tl)	530SB001	1.40	ND	0.29	2.8	NA
Tin (Sn)	530SB006	13.20	NS	4700	59.4	9.23
	530SB009	1.30	ND			
	530SB010	13.50	0.80			
Vanadium (V)	530SB001	7.60	2.35	55	94.3	155
	530SB002	2.60	1.90			
	530SB003	3.10	2.70			
	530SB004	4.90	2.30			
	530SB005	1.90	2.50			
	530SB006	11.50	NS			
	530SB007	10.10	NS			
	530SB008	11.90	NS			

Chemicals Detected in Zone E Soil Samples
AOC 530

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	530SB009	6.00	1.70			
	530SB010	5.40	2.50			
	530SB011	3.70	2.30			
Zinc (Zn)	530SB001	596.00	46.55	2300	827	886
	530SB002	5.20	2.20			
	530SB003	25.80	5.90			
	530SB004	94.70	4.50			
	530SB005	15.30	4.70			
	530SB006	744.00	NS			
	530SB007	1490.00	NS			
	530SB008	1170.00	NS			
	530SB009	57.40	3.50			
	530SB010	299.00	7.10			
	530SB011	21.50	9.90			

Notes:
ND: Not Detected
NS: No Sample Taken/Sample Not Analyzed
NA: Not applicable
For compounds detected in both the primary and duplicate sample, the concentration for both detections are averaged and listed as one detection.
For compounds that were detected in only one of the primary or duplicate sample, the value of the detection was used.
* Surface soil samples will be used for human health risk assessment for the Zone E report.

Chemicals Detected in Zone E Soil Samples
AOC 531

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
Volatile Organic Compounds (ug/kg)						
Toluene	531SB003	1.00	ND	1600000	NA	NA
Semi-volatile Compounds (ug/kg)						
2-Chlorophenol	531SB003	80.00	ND	390000	NA	NA
2-Methylnaphthalene	531SB005	39.00	ND	NA	NA	NA
4-Chloro-3-methylphenol	531SB003	95.00	ND	NA	NA	NA
Acenaphthene	531SB003	130.00	ND	470000	NA	NA
	531SB004	150.00	ND			
	531SB005	130.00	ND			
Acenaphthylene	531SB004	86.00	ND	310000	NA	NA
	531SB005	140.00	ND			
Anthracene	531SB002	170.00	ND	23000000	NA	NA
	531SB003	370.00	ND			
	531SB004	1000.00	100.00			
	531SB005	620.00	ND			
Benzo(a)anthracene	531SB001	340.00	130.00	880	NA	NA
	531SB002	1100.00	100.00			
	531SB003	3600.00	92.00			
	531SB004	5200.00	550.00			
	531SB005	4200.00	150.00			
Benzo(a)pyrene	531SB001	430.00	140.00	88	NA	NA
	531SB002	1200.00	100.00			
	531SB003	4100.00	92.00			
	531SB004	5500.00	640.00			
	531SB005	4700.00	200.00			
Benzo(b)fluoranthene	531SB001	560.00	130.00	880	NA	NA
	531SB002	960.00	88.00			
	531SB003	5700.00	140.00			
	531SB004	5500.00	480.00			
	531SB005	6100.00	170.00			
Benzo(g,h,i)perylene	531SB001	310.00	100.00	310000	NA	NA
	531SB002	980.00	ND			
	531SB003	3100.00	91.00			
	531SB004	3400.00	440.00			
	531SB005	2500.00	100.00			
Benzo(k)fluoranthene	531SB001	ND	200.00	8800	NA	NA
	531SB002	1600.00	130.00			
	531SB004	3200.00	550.00			
	531SB005	1900.00	140.00			
Benzoic acid	531SB004	ND	72.00	31000000	NA	NA
	531SB005	40.00	ND			
Chrysene	531SB001	450.00	180.00	88000	NA	NA
	531SB002	1300.00	120.00			
	531SB003	3800.00	94.00			
	531SB004	5600.00	620.00			
	531SB005	4100.00	170.00			
Dibenz(a,h)anthracene	531SB002	450.00	ND	88000	NA	NA
	531SB003	1300.00	ND			
	531SB004	1200.00	120.00			

Chemicals Detected in Zone E Soil Samples
AOC 531

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	531SB005	860.00	ND			
Dibenzofuran	531SB005	55.00	ND	31000	NA	NA
Diethylphthalate	531SB005	73.00	ND	6300000	NA	NA
Fluoranthene	531SB001	720.00	250.00	3100000	NA	NA
	531SB002	2100.00	200.00			
	531SB003	6500.00	ND			
	531SB004	11000.00	1300.00			
	531SB005	7000.00	310.00			
Fluorene	531SB004	100.00	ND	310000	NA	NA
	531SB005	84.00	ND			
Indeno(1,2,3-cd)pyrene	531SB001	280.00	96.00	880	NA	NA
	531SB002	820.00	ND			
	531SB003	2700.00	ND			
	531SB004	3600.00	450.00			
	531SB005	2600.00	120.00			
Naphthalene	531SB005	60.00	ND	310000	NA	NA
Phenanthrene	531SB001	300.00	120.00	310000	NA	NA
	531SB002	850.00	ND			
	531SB003	2200.00	ND			
	531SB004	4500.00	510.00			
	531SB005	2400.00	100.00			
Pyrene	531SB001	540.00	200.00	230000	NA	NA
	531SB002	1800.00	150.00			
	531SB003	6900.00	110.00			
	531SB004	9800.00	1100.00			
	531SB005	6600.00	290.00			
Polychlorinated biphenyls (ug/kg)						
Aroclor-1260	531SB002	110.00	ND	83	NA	NA
	531SB003	82.00	ND			
Inorganic Compounds (mg/kg)						
Aluminum (Al)	531SB001	4540.00	3110.00	7800	26000	41100
	531SB002	1660.00	3420.00			
	531SB003	3290.00	3550.00			
	531SB005	4090.00	3850.00			
Antimony (Sb)	531SB001	0.73	ND	3.1	1.77	1.6
	531SB002	2.60	ND			
	531SB005	0.73	ND			
Arsenic (As)	531SB001	2.90	0.76	0.43	23.9	19.9
	531SB002	76.70	2.00			
	531SB003	2.00	0.69			
	531SB005	6.50	15.20			
Barium (Ba)	531SB001	29.80	7.80	550	130	94.1
	531SB002	12.80	9.10			
	531SB003	16.40	8.50			
	531SB005	34.50	12.60			
Beryllium (Be)	531SB001	0.26	ND	0.15	1.7	2.71
	531SB002	0.21	ND			
	531SB003	0.16	0.12			

Chemicals Detected in Zone E Soil Samples
AOC 531

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	531SB005	0.25	0.13			
Cadmium (Cd)	531SB001	0.19	ND	3.9	1.5	0.96
	531SB002	0.30	ND			
	531SB005	0.25	0.22			
Calcium (Ca)	531SB001	2750.00	428.00	NA	NA	NA
	531SB002	120000.00	993.00			
	531SB003	1630.00	517.00			
	531SB005	20700.00	1250.00			
Chromium (Cr)	531SB001	4.60	3.10	39	94.6	75.2
	531SB002	6.10	6.00			
	531SB003	4.90	3.30			
	531SB004	7.20	8.20			
	531SB005	10.30	4.30			
Cobalt (Co)	531SB001	0.68	ND	470	19	14.9
	531SB002	5.90	ND			
	531SB003	13.70	2.10			
	531SB004	14.70	ND			
	531SB005	1.10	ND			
Copper (Cu)	531SB001	15.80	0.71	310	66	152
	531SB002	23.10	0.94			
	531SB003	9.80	0.86			
	531SB005	58.70	4.60			
Iron (Fe)	531SB001	3490.00	1400.00	2300	NA	NA
	531SB002	18500.00	1400.00			
	531SB003	4300.00	1960.00			
	531SB005	6730.00	1700.00			
Lead (Pb)	531SB001	86.80	2.50	400	265	173
	531SB002	39.80	2.90			
	531SB003	31.20	22.10			
	531SB005	80.90	6.80			
Magnesium (Mg)	531SB001	186.00	74.10	NA	NA	NA
	531SB002	1310.00	136.00			
	531SB003	243.00	109.00			
	531SB005	530.00	172.00			
Manganese (Mn)	531SB001	56.70	9.50	180	302	881
	531SB002	88.70	8.70			
	531SB003	51.20	13.80			
	531SB005	52.10	15.70			
Mercury (Hg)	531SB001	1.30	ND	23	2.6	1.59
	531SB002	0.14	0.05			
	531SB003	0.06	ND			
	531SB004	0.06	ND			
	531SB005	0.82	0.04			
Nickel (Ni)	531SB001	2.10	0.91	160	77.1	57
	531SB002	47.40	1.00			
	531SB003	7.20	2.20			
	531SB005	6.20	1.20			
Potassium (K)	531SB001	304.00	112.00	NA	NA	NA
	531SB002	504.00	64.40			
	531SB003	404.00	ND			

Chemicals Detected in Zone E Soil Samples
AOC 531

Name	ID	Surface Conc.	Subsurface Conc.	RBC (THQ=.1)	Surface UTL	Subsurface UTL *
	531SB005	296.00	ND			
Silver (Ag)	531SB005	5.70	0.27	39	NA	NA
Sodium (Na)	531SB001	23.80	43.60	NA	NA	NA
	531SB002	89.60	25.60			
	531SB003	25.90	ND			
	531SB005	200.00	179.00			
Thallium (Tl)	531SB002	1.20	ND	0.29	2.8	NA
Tin (Sn)	531SB001	3.90	3.00	4700	59.4	9.23
	531SB002	3.60	3.10			
	531SB003	4.00	3.30			
	531SB005	5.70	ND			
Vanadium (V)	531SB001	4.20	1.10	55	94.3	155
	531SB002	3.10	1.90			
	531SB003	9.70	2.20			
	531SB005	7.40	2.50			
Zinc (Zn)	531SB001	88.60	2.40	2300	827	886
	531SB002	57.10	2.50			
	531SB003	16.70	2.20			
	531SB005	152.00	ND			

Notes:
ND: Not Detected
NS: No Sample Taken/Sample Not Analyzed
NA: Not applicable
For compounds detected in both the primary and duplicate sample, the concentration for both detections are averaged and listed as one detection.
For compounds that were detected in only one of the primary or duplicate sample, the value of the detection was used.
* Surface soil samples will be used for human health risk assessment for the Zone E report.

Chemicals Detected in Zone E Groundwater Samples
AOC 530

Name	Location	Round 1 Conc.	Round 2 Conc.	Round 3 Conc.	Round 4 Conc.	RBC (THQ=.1)	UTL	MCL
Volatile Organic Compounds (ug/l)								
1,1-Dichloroethene	530GW001	1.00	NS	NS	NS	0.044	NA	7
Semi-volatile Compounds (ug/l)								
2-Methylnaphthalene	530GW002	11.00	7.00	4.00	ND	NA	NA	NA
Benzoic acid	530GW002	ND	ND	2.00	ND	15000	NA	NA
Pentachlorophenol	530GW002	ND	ND	2.00	ND	0.56	NA	1
Other Compounds (mg/l)								
Chloride	530GW001	ND	ND	8.00	7.40	NA	NA	NA
	530GW002	ND	ND	5.00	4.70			
	530GW01D	ND	140.00	130.50	122.50			
	530GW02D	ND	129.00	116.00	119.00			
Sulfate	530GW001	ND	ND	0.90	1.10	NA	NA	NA
	530GW002	ND	30.60	23.60	33.40			
	530GW01D	ND	ND	7.45	8.65			
	530GW02D	ND	ND	9.20	9.20			
Total Dissolved Solids (TDS)	530GW001	ND	228.00	132.00	ND	NA	NA	NA
	530GW002	ND	278.00	ND	ND			
	530GW01D	551.50	536.00	504.00	532.00			
	530GW02D	ND	470.00	ND	448.00			
Inorganic Compounds (ug/l)								
Aluminum (Al)	530GW001	553.00	ND	89.10	165.00	3700	2810	NA
	530GW002	790.00	ND	407.00	270.00			
	530GW01D	ND	ND	58.95	26.75		319	
	530GW02D	ND	ND	46.50	12.90			
Arsenic (As)	530GW001	24.20	ND	7.10	8.40	0.05	18.7	50
	530GW002	ND	ND	2.70	2.90			
Barium (Ba)	530GW001	ND	21.30	16.60	17.00	260	211	2000
	530GW002	ND	26.30	22.20	20.30			
	530GW01D	ND	8.60	8.15	7.30		218	
	530GW02D	ND	46.20	23.90	19.50			
Beryllium (Be)	530GW001	0.32	0.31	0.32	ND	0.02	0.43	4
	530GW002	ND	0.32	ND	ND			
	530GW01D	0.43	0.37	ND	0.26		1.2	
Calcium (Ca)	530GW001	36200.00	49700.00	35100.00	43300.00	NA	NA	NA
	530GW002	94000.00	85200.00	80400.00	86100.00			
	530GW01D	66100.00	61900.00	64750.00	62050.00		NA	
	530GW02D	62300.00	65300.00	65000.00	59200.00			
Cobalt (Co)	530GW001	1.20	ND	ND	ND	220	2.5	NA
	530GW002	1.00	ND	ND	ND			
Copper (Cu)	530GW001	ND	ND	1.40	1.60	150	2.7	1300
	530GW002	ND	ND	ND	2.20			
	530GW01D	ND	ND	1.20	1.80		NA	
Iron (Fe)	530GW001	4610.00	3030.00	1240.00	2100.00	1100	NA	NA
	530GW002	2300.00	3400.00	1370.00	991.00			
	530GW01D	182.50	177.00	ND	149.00		NA	
	530GW02D	493.00	556.00	434.00	246.00			
Lead (Pb)	530GW001	2.30	ND	ND	ND	15	4.8	15

Chemicals Detected in Zone E Groundwater Samples
AOC 530

Name	Location	Round 1 Conc.	Round 2 Conc.	Round 3 Conc.	Round 4 Conc.	RBC (THQ=.1)	UTL	MCL
	530GW002	ND	ND	ND	0.93			
Magnesium (Mg)	530GW001	3520.00	5290.00	3940.00	5090.00	NA	NA	NA
	530GW002	3650.00	2900.00	2490.00	2810.00			
	530GW01D	8185.00	7770.00	8165.00	8205.00		NA	
	530GW02D	2860.00	3410.00	2670.00	2390.00			
Manganese (Mn)	530GW001	133.00	172.00	106.00	148.00	84	2560	NA
	530GW002	50.50	41.70	47.30	29.30			
	530GW01D	116.00	109.00	110.00	57.85		869	
	530GW02D	92.00	122.00	103.00	88.50			
Mercury (Hg)	530GW01D	ND	ND	0.30	ND	1100	0.2	0.002
Nickel (Ni)	530GW002	ND	ND	1.40	ND	73	15.2	100
	530GW02D	ND	ND	3.20	ND		42.2	
Potassium (K)	530GW001	ND	5230.00	3980.00	3800.00	NA	NA	NA
	530GW002	ND	4780.00	3760.00	3720.00			
	530GW01D	ND	4775.00	4845.00	4885.00		NA	
Selenium (Se)	530GW001	ND	ND	ND	3.70	18	NA	50
	530GW002	ND	ND	ND	4.30			
Sodium (Na)	530GW001	ND	5980.00	3990.00	4920.00	NA	NA	NA
	530GW002	ND	7000.00	5670.00	5690.00			
	530GW01D	ND	116500.00	117000.00	111500.00		NA	
	530GW02D	ND	99300.00	102000.00	90800.00			
Thallium (Tl)	530GW001	ND	ND	4.40	ND	0.29	5.4	2
	530GW002	ND	ND	2.90	ND			
	530GW01D	ND	ND	3.50	ND		6.5	
	530GW02D	ND	ND	3.80	ND			
Tin (Sn)	530GW001	3.60	ND	ND	ND	2200	NA	NA
Vanadium (V)	530GW001	ND	ND	2.70	3.00	26	11.4	NA
	530GW002	ND	ND	1.30	ND			
Zinc (Zn)	530GW001	14.90	ND	ND	ND	1100	27.3	NA
	530GW01D	5.00	ND	ND	ND			
	530GW02D	42.60	ND	ND	ND		11.8	

Notes:
ND: Not Detected
NS: No Sample Taken/Sample Not Analyzed
NA: Not applicable
For compounds detected in both the primary and duplicate sample, the concentration for both detections are averaged and listed as one detection.
For compounds that were detected in only one of the primary or duplicate sample, the value of the detection was used.

Inferred Groundwater Elevation (ft msl)
Known Groundwater Elevation (ft msl)
Fence
Railroads
Roads
AOC Boundary
ft msl - feet above mean sea level
SWMU Boundary
Buildings
Zone Boundary

N

0 200 400 Feet

1 inch = 200 feet

Figure A-1
Shallow Groundwater Contour Map
AOC 350 and AOC 531, Zone E
Charleston Naval Complex

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File Path: c:\18gis\projects\zone_e\aoc530\apr\aoc530.apr, Date: 17 Dec 2001 11:50, User: NMOUDRY, Figure B-1 Shallow Groundwater Contour Map

Appendix B

Excerpts from Response to Comments from Charles B. Watson, SCDHEC
On the Zone E RFI Report, Revision 0.
Charleston Naval Complex

AOC 530

SCDHEC Comment 13:

The Department recommends adding Lead to the list of Contaminants of Concern in the soils. The report indicates elevated levels in the southwest area. Also, soil borings should be installed closer to the northeast area of AOC 530 if possible.

Navy/EnSafe Response 13:

Lead was detected in all 11 surface soil samples, however, the mean detected concentration for AOC 530 was 336 mg/kg, below its residential clean up level, and no sample exceeded the industrial cleanup level of 1,300 mg/kg. Samples were collected from the closest accessible locations adjacent to AOC 530.

CH2M-Jones Response 13:

Lead has been sufficiently delineated at the site and no additional sampling for lead is warranted.

AOC 531

SCDHEC Comment 14:

Site history reveals the existence of electric transformers and Aroclor-1260 was detected in the first round of soil sampling. The Department therefore recommends the addition of Aroclor-1260 as a Contaminant of Concern.

Navy/EnSafe Response 14:

Aroclor-1260 was detected in 2 surface soil samples but each of these were well below their respective industrial RBCs. These samples were collected in locations where the old PCB-containing transformer were located and where the highest concentrations would be detected.

CH2M-Jones Response 14:

No additional sampling for PCBs is warranted based on sampling conducted during the RFI which indicates that the detections are localized and below screening criteria.

SCDEHC Comment 15:

The first round of soil samples were analyzed for VOCs, SVOCs, PCBs, metals, and pH; however, the second round was analyzed for only SVOCs, metals, and pH. The Department recommends that CMS samples include VOCs and PCBs.

Navy/EnSafe Response 15:
Additional sampling will be conducted for VOCs and PCBs.

CH2M-Jones Response 15:
No VOCs or PCBs were detected in soil samples above screening criteria during the first round. No additional sampling for VOCs or PCBs in soils is warranted.

Excerpts from Responses to Comments from Eric F. Cathcart — SCDHEC
for Draft Zone E RCRA Facility Investigation Report
Charleston Naval Complex

AOC 530

SCDHEC Comment 38:
The RFI report identifies Thallium as "detected in third quarter samples collected from all four monitoring wells at concentrations above its MCL". The Department understands that Thallium exceedances will be addressed in a base wide study.

Navy/EnSafe Response 38:

A significant number of wells throughout Zone E have shown Thallium concentrations exceeding its MCL of 2 µg/L and its Tap Water RBC of 2.9 µg/L. Discussions are ongoing pertaining to the widespread presence of inorganics in groundwater and how to interpret the significance of that data. A technical memo was submitted to the Project Team to review several months ago and it was briefly discussed at a meeting with SCDHEC in June. At that meeting SCDHEC indicated their review of the memo was not complete and that further discussion should be deferred until that review was complete.

CH2M-Jones Response 38:
Intermittent detections of thallium in groundwater above its MCL have been found basewide at CNC and are attributed to natural occurrence. Past site uses at AOCs 530/531 do not point to a source of thallium at the site. Additionally, thallium was not found above screening criteria in the preceding and succeeding groundwater sampling events at this site.

SCDHEC Comment 39:
The report states on page 10.21-3 that sample data from 531SB001 will be incorporated in the AOC 530 investigation "due to their close proximity" with AOC 531. Figures should be revised to show the location of 531SB001.

Navy/EnSafe Response 39:
Figures in Section 10.21 will be revised to include soil boring 531SB001 in the Final Zone E RFI Report.

CH2M-Jones Response 39:
No additional response.

AOC 531

SCDHEC Comment 40:
The report states on page 10.22-3 that sample data from 530SB006 will be used in the AOC 531 investigation "due to their close proximity" with AOC 530. Figures should be revised to show the location of 530SB006.

Navy/EnSafe Response 40:
Figures in Section 10.22 will be revised to include soil boring 530SB006 in the Final Zone E RFI Report.

CH2M-Jones Response 40:
No additional response.

SCDHEC Comment 41:
The report notes that "a 1986 UST Registration document reports the presence of a 20,000-gallon fuel oil tank". Has the UST and associated piping been removed? The location of the UST should be indicated on the figure.

Navy/EnSafe Response 41:
The Navy was unable to verify whether the UST had been removed prior to and during the implementation of field work. The presence of the UST will be researched and verified and the location will be provided in the Final Zone E RFI Report.

CH2M-Jones Response 41:
Based on a review of available Navy records, no information pertaining to the presence of a UST was found at this site.

SCDHEC Comment 42:
The second and third paragraphs on page 10.22-25 make reference to AOC 530 instead of AOC 531. Please make the necessary revisions.

Navy/EnSafe Response 42:
The revisions will be made and provided in the Final Zone E RFI Report.

CH2M-Jones Response 42:
No additional response.

Appendix C

NOTE: Original figure created in color

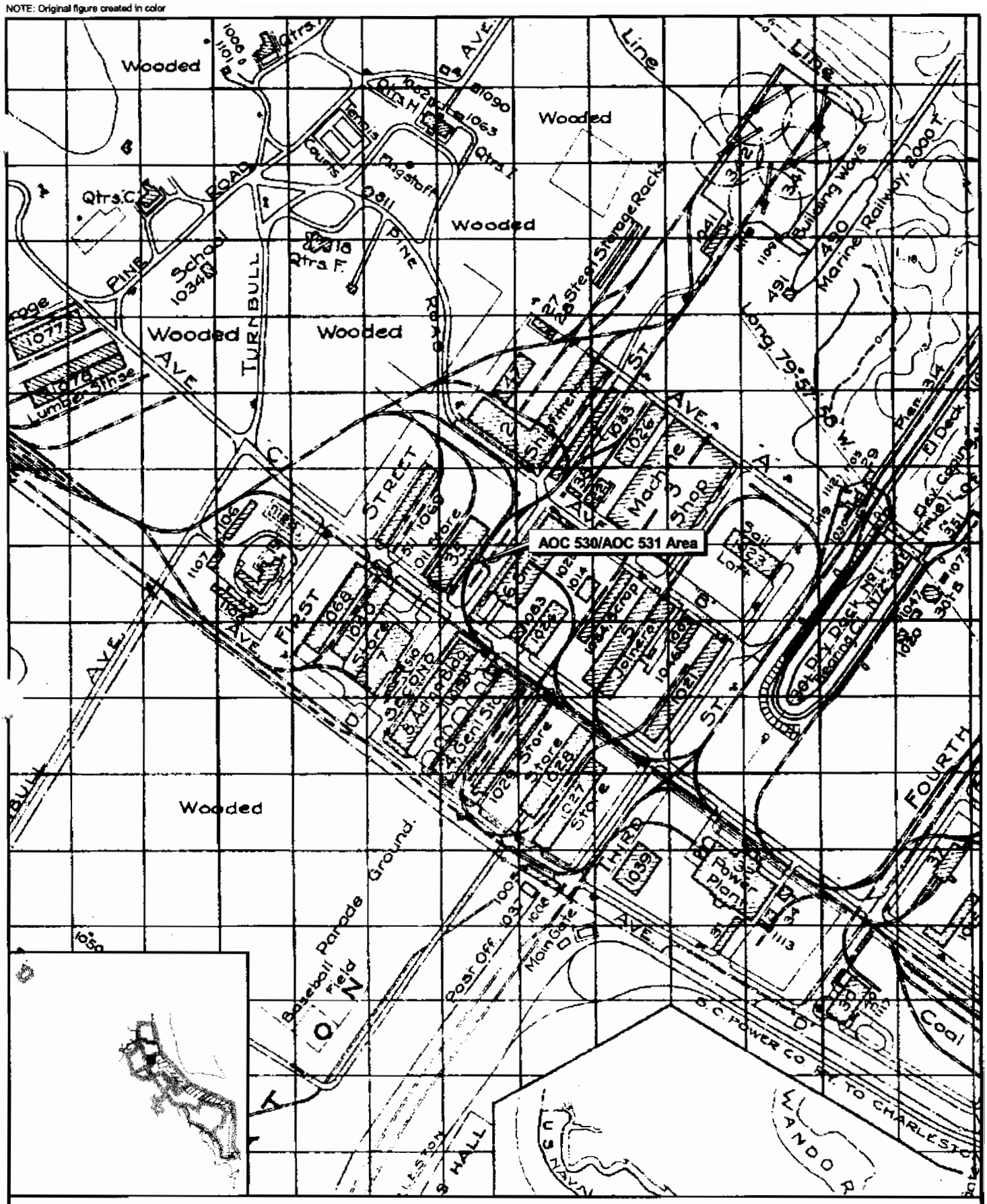

Figure C-1
Historic Railroad Tracks near Bldg. 35
AOCs 530 and 531 Area, Zone E
Charleston Naval Complex

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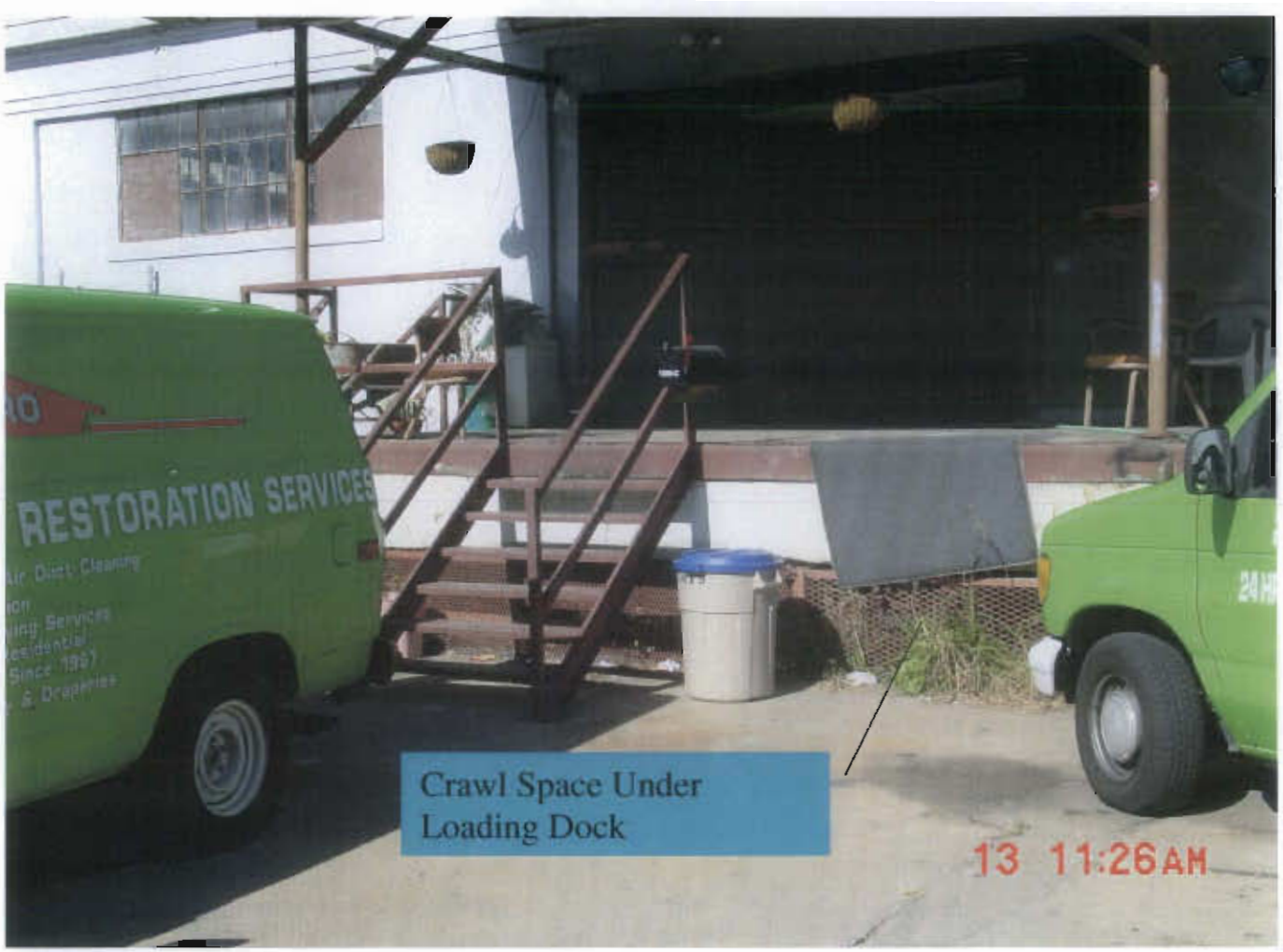

Figure C-2 View of Loading Dock at Building 35 with
Crawl Space Under Loading Dock

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