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INTERIM MEASURE WORK PLAN SOIL DELINEATION AND EXCAVATION AT E569SB005  
AREA OF CONCERN 569 (AOC 569) ZONE E CNC CHARLESTON SC  
2/26/2003  
CH2M HILL

# INTERIM MEASURE WORK PLAN

## Soil Delineation and Excavation at E569SB005 AOC 569, Zone E



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

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

*CH2M Jones*

*February 2003*

*Contract N62467-99-C-0960*



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February 26, 2003

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

Re: Interim Measure Work Plan (Revision 0) – AOC 569, Zone E

Dear Mr. Scaturo:

Enclosed are two copies of the Interim Measure Work Plan (Revision 0) for AOC 569 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, should you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

# INTERIM MEASURE WORK PLAN

## Soil Delineation and Excavation at E569SB005 AOC 569, Zone E



***Charleston Naval Complex  
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PREPARED BY  
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*February 2003*

*Revision 0  
Contract N62467-99-C-0960  
158814.ZE.PR.01*

**Certification Page for Interim Measure Work Plan (Revision 0) —  
AOC 569, Zone E**

**Soil Delineation and Excavation at E569SB005**

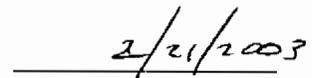
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

P.E. No. 21428



Dean Williamson, P.E.



Date

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# 1 Acronyms and Abbreviations

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2	AOC	Area of concern
3	BEQ	Benzo[a]pyrene equivalent
4	BTEX	Benzene, toluene, ethylbenzene, and xylenes
5	CMSWP	Corrective Measures Study Work Plan
6	CNC	Charleston Naval Complex
7	COC	Chemical of concern
8	COPC	Chemical of potential concern
9	DAF	Dilution attenuation factor
10	EGIS	Environmental Geographic Information System
11	EnSafe	EnSafe Inc.
12	EPA	U.S. Environmental Protection Agency
13	ESDSOPQAM	Environmental Services Division <i>Standard Operating Procedures and</i>
14		<i>Quality Assurance Manual</i>
15	ft bls	Feet below land surface
16	HI	Hazard index
17	IM	Interim measure
18	IMCR	Interim Measure Completion Report
19	IMWP	Interim Measure Work Plan
20	mg/kg	Milligrams per kilogram
21	PCE	Tetrachloroethene
22	PPE	Personal protective equipment
23	QC	Quality control
24	RBC	risk-based concentration
25	RCRA	Resource Conservation and Recovery Act
26	RFI	RCRA Facility Investigation
27	RFIRA	RFI Report Addendum
28	SCDHEC	South Carolina Department of Health and Environmental Control

# 1 **Acronyms and Abbreviations, Continued**

---

- |   |     |                          |
|---|-----|--------------------------|
| 2 | SSL | Soil screening level     |
| 3 | TCE | Trichloroethene          |
| 4 | UST | Underground storage tank |



# 1.0 Introduction

---

## 1.1 Purpose of the Interim Measure Work Plan

This Interim Measure Work Plan (IMWP) presents the proposed technical approach to the removal of soils contaminated with benzene, toluene, ethylbenzene, and xylene (BTEX) at the RFI soil boring location E569SB005, located within Area of Concern (AOC) 569 in Zone E of the Charleston Naval Complex (CNC).

Specifically, the proposed IM activities involve excavating surface soils with benzene and ethylbenzene, and subsurface soils with concentrations of BTEX above their soil screening levels (SSLs) (based on a dilution attenuation factor [DAF]=1) around E569SB005.

## 1.2 Site Background and Setting

### 1.2.1 AOC 569

AOC 569 is a former gas station and oil storehouse previously housed in Building 1279 in Zone E of the CNC, as shown in Figure 1-1. The gas station was constructed in 1944 and consisted of two pumps and two 2,500-gallon underground storage tanks (USTs). In 1986, an additional 3,000-gallon UST was installed. During 1992, the site was demolished and the three USTs were removed by the Navy. During the tank closure activities, the tanks were pumped out and removed and the vent lines were filled. The contaminated soil was excavated and confirmatory soil samples were collected from the tank excavation area. The site was then backfilled with soil and resurfaced with asphalt. These activities are documented in a report titled *Investigation of Underground Contamination, Charleston Naval Shipyard – Building 1279* (LandRec, 1992).

## 1.3 Previous Investigations

### 1.3.1 RCRA Facility Investigation (RFI) -1996-98

As part of the Zone E RFI, soil and groundwater investigations were conducted at AOCs 569, 570, and 578 from 1996 to 1998. Figure 1-2 presents an aerial view of the site. The activities conducted at this site under the RFI are described in the *Zone E RFI Report, Revision 0* (EnSafe, 1997). Figure 1-3 shows the locations of the RFI soil and groundwater sampling.

### 1.3.2 Additional Soil and Groundwater Sampling - 2002

CH2M-Jones conducted additional soil and groundwater investigations during March and April 2002, to further delineate the nature and extent of antimony, benzene, chromium, ethylbenzene, lead, toluene, thallium and xylenes in soils, and tetrachloroethene (PCE) and trichloroethene (TCE) in groundwater.

Three RFI soil boring locations E569SB004 (which showed elevated thallium concentrations in subsurface soil), E569SB005 (which showed elevated BTEX and carbon tetrachloride concentrations in subsurface soil), and E578SB001 (which showed elevated antimony, chromium, and lead) were resampled during April 2002 to verify the elevated concentrations of these chemicals, and the new borings were respectively identified as E569SB004b, E569SB005b, and E578SB001b. At these resampling locations, surface and subsurface samples were collected from the 0 to 1 ft below land surface (bls) and 3 to 5 ft bls depth intervals and analyzed for organic and inorganic analytes whose concentrations in soil were being verified.

Additional details of the soil and groundwater investigations at the site and the chemical of potential concern (COPC) screening are included in the *RFI Report Addendum and CMS Work Plan, AOCs 569, 570, and 578, Revision 0* (CH2M-Jones, 2002).

### 1.3.3 Summary of Soil COCs

Based on the additional sampling and COPC screening conducted during the preparation of the RFI Report Addendum and CMS Work Plan (RFIRA/CMSWP) for these sites during 2002, benzo[a]pyrene equivalents (BEQs), benzene, and ethylbenzene in surface soil, and BTEX in subsurface soil were identified as chemicals of concern (COCs) in site soil.

This IMWP describes the removal of soil at E569SB005 where exceedances of SSLs were detected for BTEX during the RFI and April 2002 sampling events, as indicated below:

#### Surface Soil

- During the April 2002 sampling, benzene was detected in the surface soil sample at this location at a concentration of 0.68 milligrams per kilogram (mg/kg), which exceeds the generic SSL (with a DAF=1) for benzene of 0.002 mg/kg. During the RFI, the surface soil sample from this location showed a benzene detection of 0.002 mg/kg, which equals its SSL.

- 1 • During the April 2002 sampling, ethylbenzene was detected at 1.53 mg/kg, above its  
2 generic SSL (with a DAF=1) of 0.7 mg/kg. During the RFI, the surface soil sample from  
3 this location showed a detection of 0.003 mg/kg, which is below the SSL.

#### 4 **Subsurface Soil**

- 5 • During the April 2002 sampling, benzene was detected in the subsurface soil sample at  
6 boring location E569SB005 at a concentration of 0.428 mg/kg, which exceeds the generic  
7 SSL (with a DAF=1) for benzene of 0.002 mg/kg. During the RFI, the surface soil sample  
8 from this location showed a benzene detection of 10 mg/kg, above its SSL.
- 9 • During the April 2002 sampling, ethylbenzene was detected at 19.3 mg/kg, above its  
10 generic SSL (with a DAF=1) of 0.7 mg/kg. During the RFI, the surface soil sample from  
11 this location showed a detection of 170 mg/kg, below its SSL.
- 12 • During the April 2002 sampling, toluene was detected in the subsurface soil sample at  
13 this location at a concentration of 3.17 mg/kg, which exceeds the generic SSL (with a  
14 DAF=1) for toluene of 0.6 mg/kg. During the RFI, the surface soil sample from this  
15 location showed a benzene detection of 220 mg/kg, above its SSL.
- 16 • During the April 2002 sampling, xylenes (total) were detected in the subsurface soil  
17 sample at this location at a concentration of 44.2 mg/kg, which exceeds the generic SSL  
18 (with a DAF=1) for xylenes of 9 mg/kg. During the RFI, the surface soil sample from  
19 this location showed a benzene detection of 800 mg/kg, above the SSL.

20 Table 1-1 shows the RFI and April 2002 surface and subsurface soil detections for benzene,  
21 ethylbenzene, toluene and xylenes.

22 The soil boring location E569SB005 is within the footprint of the former UST excavation. The  
23 continued presence of BTEX (which are typically associated with the presence of petroleum  
24 products) at this location, indicates that there could potentially be localized residual  
25 petroleum contamination in soil associated with the former presence of the USTs at this  
26 location, and that a small amount of contaminated soil may have remained at this location  
27 subsequent to the UST removal and associated soil excavation in 1992.

## 28 **1.4 Organization of the Interim Measure Work Plan**

29 This IMWP consists of the following five sections, including this introductory section:

30 **1.0 Introduction** — Presents the purpose of the IMWP and background information  
31 regarding the site.

- 1 **2.0 Technical Approach for Soil Delineation and Excavation** — Provides a brief
- 2 description of the technical approach for the IM.
- 3 **3.0 Waste Management and Disposal** — Describes the procedures for waste management
- 4 and disposal.
- 5 **4.0 Interim Measure Completion Report** — Describes the contents of the IM Completion
- 6 Report (IMCR).
- 7 **5.0 References** — Lists the references used in this document.
- 8 All tables and figures appear at the end of their respective sections.

**TABLE 1-1**

Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
 Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Benzene</b>	<b>Surface Soil</b>					12	0.002	NA
	E569SB001	569SB00101	0.006	U	10/13/1995			
	E569SB002	569SB00201	0.006	U	10/13/1995			
	E569SB003	569SB00301	0.006	U	10/13/1995			
	E569SB004	569SB00401	0.006	U	10/13/1995			
	E569SB005	569SB00501	0.002	J	10/13/1995			
	E570SB003	570SB00301	0.005	U	11/14/1995			
	E570SB004	570SB00401	0.006	U	11/15/1995			
	E570SB005	570SB00501	0.005	UJ	01/16/1996			
	E570SB006	570SB00601	0.006	UJ	01/16/1996			
	E570SB007	570SB00701	0.006	UJ	01/16/1996			
	E570SB008	570SB00801	0.005	UJ	01/16/1996			
	E570SB009	570SB00901	0.005	UJ	01/16/1996			
	E570SB010	570SB01001	0.005	U	01/16/1996			
	E570SB011	570SB01101	0.006	U	11/20/1995			
	E570SB012	570SB01201	0.005	U	11/15/1995			
	E570SB013	570SB01301	0.006	U	11/06/1995			
	E570SB014	570SB01401	0.006	U	11/06/1995			
	E570SB015	570SB01501	0.006	U	11/14/1995			
	E578SB001	578SB00101	0.005	U	05/16/1996			
	E578SB004	578SB00401	0.005	UJ	05/16/1996			
E578SB005	578SB00501	0.006	U	05/16/1996				
E578SB006	578SB00601	0.006	UJ	05/16/1996				
E569SB005b	569SB00501b	0.68	=	04/25/2002				
<b>Benzene</b>	<b>Subsurface Soil</b>					12	0.002	NA
	E569SB001	569SB00102	0.006	U	10/13/1995			
	E569SB002	569SB00202	0.006	U	10/13/1995			
	E569SB003	569SB00302	0.006	U	10/13/1995			
	E569SB005	569SB00502	10	=	10/13/1995			

**TABLE 1-1**  
 Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Benzene</b>	<b>Subsurface Soil</b>					12	0.002	NA
	E570SB003	570SB00302	0.006	U	11/14/1995			
	E570SB004	570SB00402	0.006	U	11/15/1995			
	E570SB005	570SB00502	0.006	UJ	01/16/1996			
	E570SB006	570SB00602	0.005	UJ	01/16/1996			
	E570SB008	570SB00802	0.005	UJ	01/16/1996			
	E570SB009	570SB00902	0.006	UJ	01/16/1996			
	E570SB011	570SB01102	0.006	U	11/20/1995			
	E570SB012	570SB01202	0.005	U	11/15/1995			
	E570SB013	570SB01302	0.005	U	11/06/1995			
	E570SB014	570SB01402	0.005	U	11/06/1995			
	E570SB015	570SB01502	0.005	U	11/14/1995			
	E578SB001	578SB00102	0.005	U	05/16/1996			
	E578SB002	578SB00202	0.005	U	05/16/1996			
	E578SB003	578SB00302	0.005	U	05/16/1996			
	E578SB004	578SB00402	0.005	U	05/16/1996			
	E578SB005	578SB00502	0.005	U	05/16/1996			
	E578SB006	578SB00602	0.006	U	05/16/1996			
	E569SB005b	569SB00502b	<b>0.428</b>	J	04/25/2002			
<b>Ethylbenzene</b>	<b>Surface Soil</b>					780	0.7	NA
	E569SB001	569SB00101	0.006	U	10/13/1995			
	E569SB002	569SB00201	0.006	U	10/13/1995			
	E569SB003	569SB00301	0.006	UJ	10/13/1995			
	E569SB004	569SB00401	0.006	U	10/13/1995			
	E569SB005	569SB00501	0.003	J	10/13/1995			
	E570SB003	570SB00301	0.005	U	11/14/1995			
	E570SB004	570SB00401	0.006	U	11/15/1995			
	E570SB005	570SB00501	0.005	UJ	01/16/1996			
	E570SB006	570SB00601	0.006	UJ	01/16/1996			

**TABLE 1-1**  
 Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
Ethylbenzene	Surface Soil					780	0.7	NA
	E570SB007	570SB00701	0.006	UJ	01/16/1996			
	E570SB008	570SB00801	0.005	UJ	01/16/1996			
	E570SB009	570SB00901	0.005	UJ	01/16/1996			
	E570SB010	570SB01001	0.005	U	01/16/1996			
	E570SB011	570SB01101	0.006	U	11/20/1995			
	E570SB012	570SB01201	0.005	U	11/15/1995			
	E570SB013	570SB01301	0.006	U	11/06/1995			
	E570SB014	570SB01401	0.006	U	11/06/1995			
	E570SB015	570SB01501	0.006	U	11/14/1995			
	E578SB001	578SB00101	0.005	U	05/16/1996			
	E578SB005	578SB00501	0.006	U	05/16/1996			
	E578SB006	578SB00601	0.006	UJ	05/16/1996			
	E569SB005b	569SB00501b	1.53	=	04/25/2002			
Ethylbenzene	Subsurface Soil					780	0.7	NA
	E569SB001	569SB00102	0.006	U	10/13/1995			
	E569SB002	569SB00202	0.006	U	10/13/1995			
	E569SB003	569SB00302	0.006	U	10/13/1995			
	E569SB005	569SB00502	170	=	10/13/1995			
	E570SB003	570SB00302	0.006	U	11/14/1995			
	E570SB004	570SB00402	0.006	U	11/15/1995			
	E570SB005	570SB00502	0.006	UJ	01/16/1996			
	E570SB006	570SB00602	0.005	UJ	01/16/1996			
	E570SB008	570SB00802	0.005	UJ	01/16/1996			
	E570SB009	570SB00902	0.006	UJ	01/16/1996			
	E570SB011	570SB01102	0.006	U	11/20/1995			
	E570SB012	570SB01202	0.001	J	11/15/1995			
	E570SB013	570SB01302	0.005	U	11/06/1995			
	E570SB014	570SB01402	0.005	U	11/06/1995			

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 Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Ethylbenzene</b>	<b>Subsurface Soil</b>					780	0.7	NA
	E570SB015	570SB01502	0.005	U	11/14/1995			
	E578SB001	578SB00102	0.005	U	05/16/1996			
	E578SB002	578SB00202	0.005	U	05/16/1996			
	E578SB003	578SB00302	0.005	U	05/16/1996			
	E578SB004	578SB00402	0.005	U	05/16/1996			
	E578SB005	578SB00502	0.005	U	05/16/1996			
	E578SB006	578SB00602	0.006	U	05/16/1996			
	E569SB005b	569SB00502b	19.3	=	04/25/2002			
<b>Toluene</b>	<b>Surface Soil</b>					1,600	0.6	NA
	E569SB001	569SB00101	0.006	U	10/13/1995			
	E569SB002	569SB00201	0.006	U	10/13/1995			
	E569SB003	569SB00301	0.006	UJ	10/13/1995			
	E569SB004	569SB00401	0.006	U	10/13/1995			
	E569SB005	569SB00501	0.005	U	10/13/1995			
	E570SB003	570SB00301	0.005	U	11/14/1995			
	E570SB004	570SB00401	0.006	U	11/15/1995			
	E570SB005	570SB00501	0.005	UJ	01/16/1996			
	E570SB006	570SB00601	0.007	J	01/16/1996			
	E570SB007	570SB00701	0.006	UJ	01/16/1996			
	E570SB008	570SB00801	0.005	UJ	01/16/1996			
	E570SB009	570SB00901	0.005	UJ	01/16/1996			
	E570SB010	570SB01001	0.005	U	01/16/1996			
	E570SB011	570SB01101	0.006	U	11/20/1995			
	E570SB012	570SB01201	0.005	U	11/15/1995			
	E570SB013	570SB01301	0.006	U	11/06/1995			
	E570SB014	570SB01401	0.006	U	11/06/1995			
	E570SB015	570SB01501	0.006	U	11/14/1995			
	E578SB001	578SB00101	0.005	U	05/16/1996			

**TABLE 1-1**  
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 Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Toluene</b>	<b>Surface Soil</b>					1,600	0.6	NA
	E578SB005	578SB00501	0.006	U	05/16/1996			
	E578SB006	578SB00601	0.006	UJ	05/16/1996			
	E569SB005b	569SB00501b	0.093	J	04/25/2002			
<b>Toluene</b>	<b>Subsurface Soil</b>					1,600	0.6	NA
	E569SB001	569SB00102	0.006	U	10/13/1995			
	E569SB002	569SB00202	0.006	U	10/13/1995			
	E569SB003	569SB00302	0.006	U	10/13/1995			
	E569SB005	569SB00502	220	=	10/13/1995			
	E570SB003	570SB00302	0.006	U	11/14/1995			
	E570SB004	570SB00402	0.006	U	11/15/1995			
	E570SB005	570SB00502	0.006	UJ	01/16/1996			
	E570SB006	570SB00602	0.005	UJ	01/16/1996			
	E570SB008	570SB00802	0.005	UJ	01/16/1996			
	E570SB009	570SB00902	0.006	UJ	01/16/1996			
	E570SB011	570SB01102	0.006	U	11/20/1995			
	E570SB012	570SB01202	0.001	J	11/15/1995			
	E570SB013	570SB01302	0.005	U	11/06/1995			
	E570SB014	570SB01402	0.005	U	11/06/1995			
	E570SB015	570SB01502	0.005	U	11/14/1995			
	E578SB001	578SB00102	0.005	U	05/16/1996			
	E578SB002	578SB00202	0.005	U	05/16/1996			
	E578SB003	578SB00302	0.005	U	05/16/1996			
	E578SB004	578SB00402	0.005	U	05/16/1996			
	E578SB005	578SB00502	0.005	U	05/16/1996			
	E578SB006	578SB00602	0.006	U	05/16/1996			
	E569SB005b	569SB00502b	3.17	=	04/25/2002			
<b>Xylenes (Total)</b>	<b>Surface Soil</b>					16,000	9	NA
	E569SB001	569SB00101	0.006	U	10/13/1995			

**TABLE 1-1**  
 Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Xylenes (Total)</b>	<b>Surface Soil</b>					16,000	9	NA
	E569SB002	569SB00201	0.006	U	10/13/1995			
	E569SB003	569SB00301	0.006	UJ	10/13/1995			
	E569SB004	569SB00401	0.006	U	10/13/1995			
	E569SB005	569SB00501	0.005	U	10/13/1995			
	E570SB003	570SB00301	0.005	U	11/14/1995			
	E570SB004	570SB00401	0.006	U	11/15/1995			
	E570SB005	570SB00501	0.005	UJ	01/16/1996			
	E570SB006	570SB00601	0.006	UJ	01/16/1996			
	E570SB007	570SB00701	0.006	UJ	01/16/1996			
	E570SB008	570SB00801	0.005	UJ	01/16/1996			
	E570SB009	570SB00901	0.005	UJ	01/16/1996			
	E570SB010	570SB01001	0.005	U	01/16/1996			
	E570SB011	570SB01101	0.006	U	11/20/1995			
	E570SB012	570SB01201	0.005	U	11/15/1995			
	E570SB013	570SB01301	0.006	U	11/06/1995			
	E570SB014	570SB01401	0.006	U	11/06/1995			
	E570SB015	570SB01501	0.006	U	11/14/1995			
	E578SB001	578SB00101	0.005	U	05/16/1996			
	E578SB005	578SB00501	0.006	U	05/16/1996			
E578SB006	578SB00601	0.006	UJ	05/16/1996				
E569SB005b	569SB00501b	0.207	J	04/25/2002				
<b>Xylenes (Total)</b>	<b>Subsurface Soil</b>					16,000	9	NA
	E569SB001	569SB00102	0.006	U	10/13/1995			
	E569SB002	569SB00202	0.006	U	10/13/1995			
	E569SB003	569SB00302	0.006	U	10/13/1995			
	E569SB005	569SB00502	800	=	10/13/1995			
	E570SB003	570SB00302	0.006	U	11/14/1995			

**TABLE 1-1**  
 Detected Concentrations of Benzene, Ethylbenzene, Toluene, and Xylenes (Total) in Surface and Subsurface Soils  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

Analyte	Station ID	Sample ID	Concentration (mg/kg)	Qualifier	Date Collected	EPA Region III Residential RBC <sup>a</sup>	SSL (DAF=1) <sup>b</sup>	Zone E Range of Background Concentrations
<b>Xylenes (Total)</b>	<b>Subsurface Soil</b>					16,000	9	NA
	E570SB004	570SB00402	0.001	J	11/15/1995			
	E570SB005	570SB00502	0.006	UJ	01/16/1996			
	E570SB006	570SB00602	0.005	UJ	01/16/1996			
	E570SB008	570SB00802	0.005	UJ	01/16/1996			
	E570SB009	570SB00902	0.006	UJ	01/16/1996			
	E570SB011	570SB01102	0.006	U	11/20/1995			
	E570SB012	570SB01202	0.005	U	11/15/1995			
	E570SB013	570SB01302	0.005	U	11/06/1995			
	E570SB014	570SB01402	0.003	J	11/06/1995			
	E570SB015	570SB01502	0.005	U	11/14/1995			
	E578SB001	578SB00102	0.005	U	05/16/1996			
	E578SB002	578SB00202	0.005	U	05/16/1996			
	E578SB003	578SB00302	0.005	U	05/16/1996			
	E578SB004	578SB00402	0.005	U	05/16/1996			
	E578SB005	578SB00502	0.005	U	05/16/1996			
	E578SB006	578SB00602	0.006	U	05/16/1996			
	E569SB005b	569SB00502b	<b>44.2</b>	=	04/25/2002			

Concentrations in bold and outlined text exceed the appropriate screening criteria.

<sup>a</sup>U.S. Environmental Protection Agency (EPA) Region III residential risk-based concentration (RBC) used, with a hazard index (HI)=0.1 for noncarcinogenic chemicals.

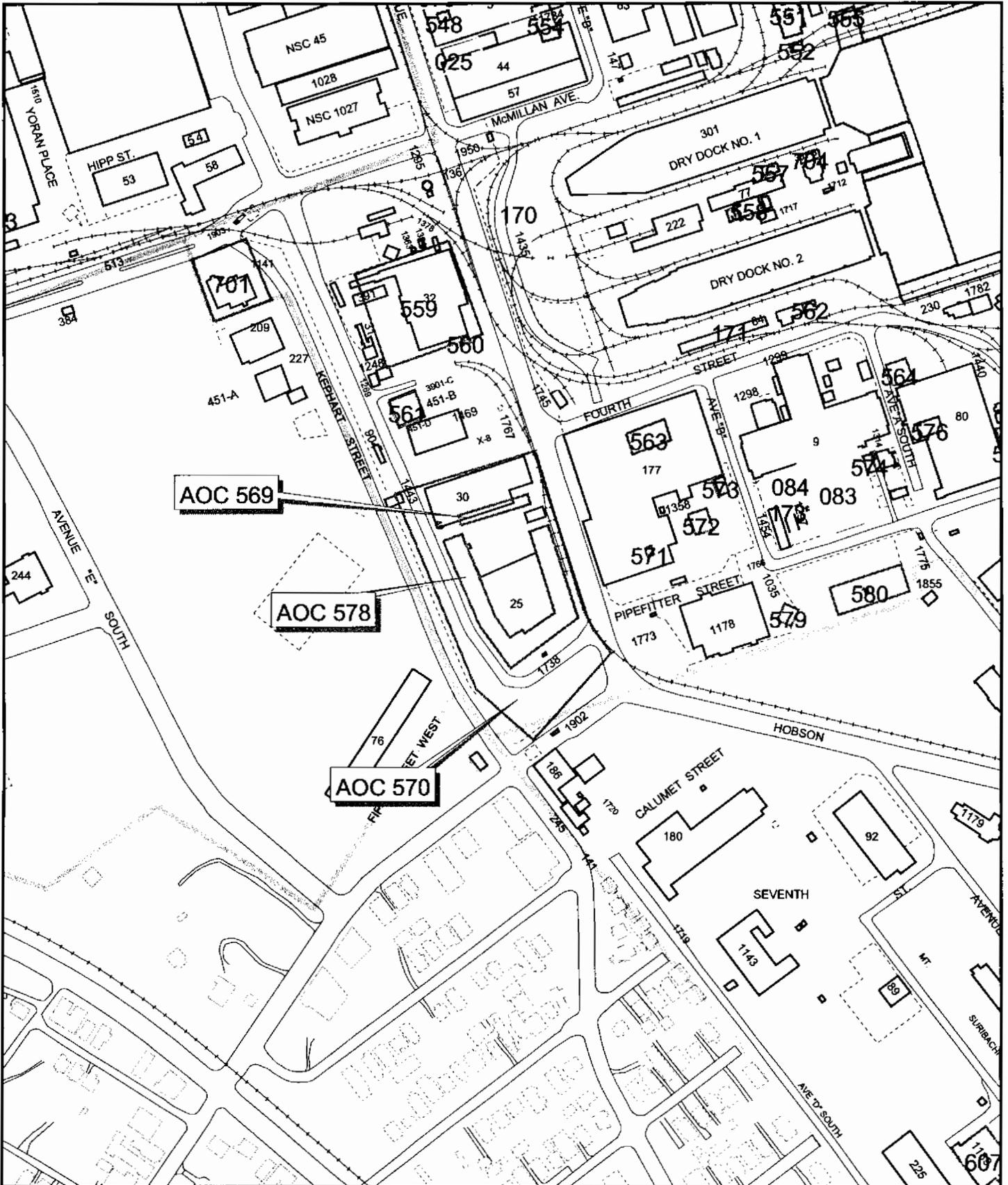
<sup>b</sup>Generic soil screening level (SSL), based on a dilution attenuation factor (DAF)=1.

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

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

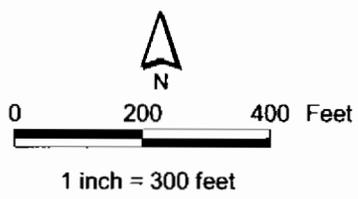
U Indicates that the concentration was not detected.

UJ Indicates that the concentration was not detected, the reported value is an estimated detection limit.



- Railroads
- Fence
- Roads
- AOC Boundary
- SWMU Boundary
- Buildings

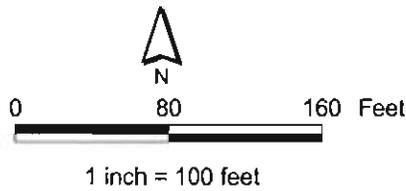
Zone Boundary



**Figure 1-1**  
 Location of Combined AOC 569 in Zone E  
 Combined AOC 569, Zone E  
 Charleston Naval Complex

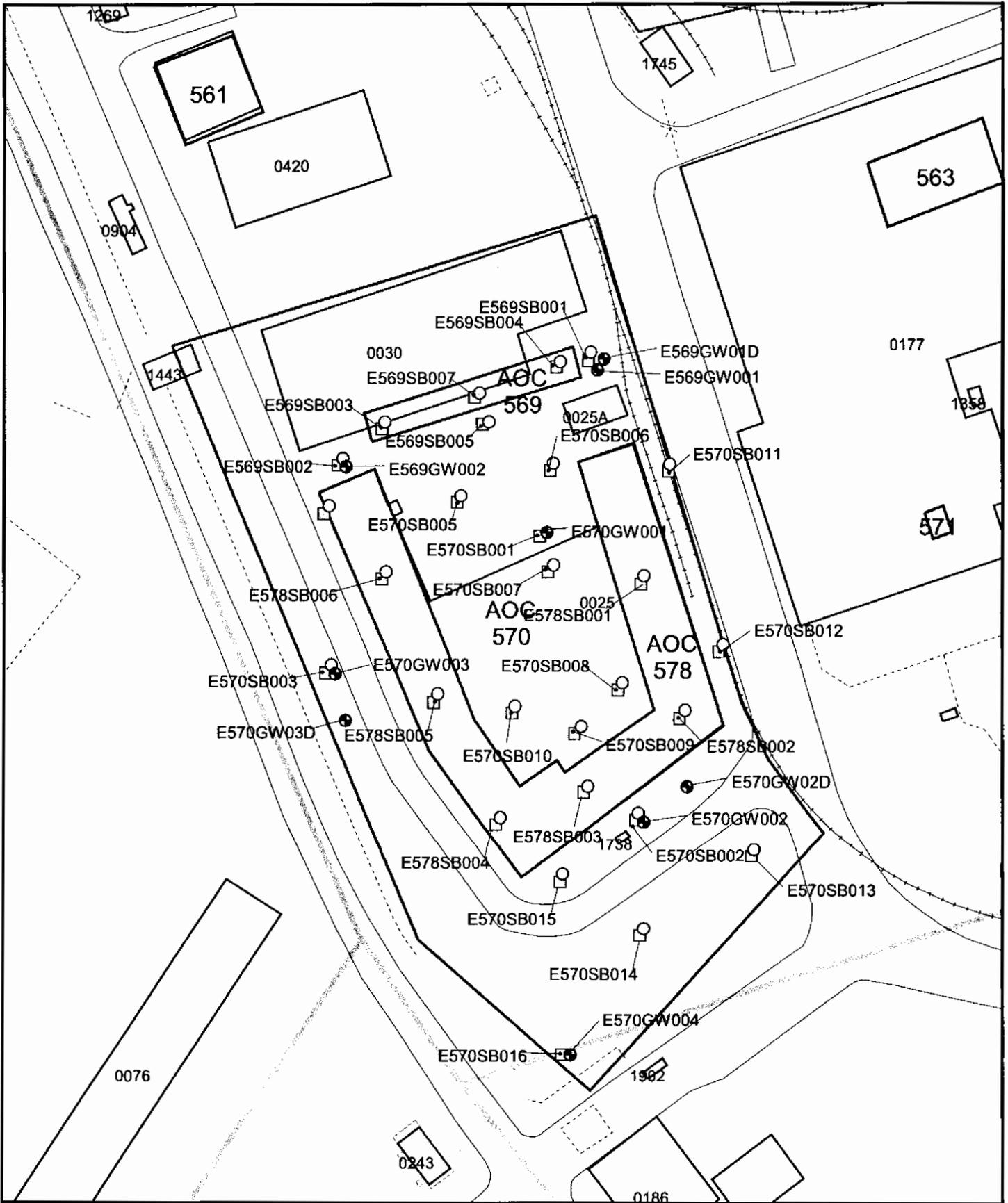


-  Fence
-  Roads
-  AOC Boundary
-  SWMU Boundary
-  Buildings
-  Zone Boundary

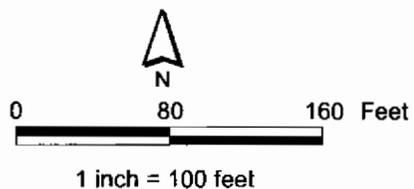


**Figure 1-2**  
AOC 569 , 570, and 578  
Site Map  
Charleston Naval Complex

**CH2MHILL**



- Groundwater Monitoring Well
- Surface Soil
- Subsurface Soil
- ▬ Railroads
- ▬ Fence
- ▬ Roads
- ▬ AOC Boundary
- ▬ SWMU Boundary
- ▬ Buildings
- ▬ Zone Boundary



**Figure 1-3**  
RFI Sampling Locations  
AOCs 569, 570, and 578, Zone E  
Charleston Naval Complex

## **Section 2.0**

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## 2.0 Technical Approach for Soil Delineation and Excavation

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This section outlines the technical approach to the delineation and removal of surface and subsurface soils at the location of the RFI soil boring E569SB005. Soils at this location showed detections of benzene, ethylbenzene, toluene and xylenes above their respective SSLs.

### 2.1 Target Cleanup Levels

The COCs in soil identified for removal in this IM are benzene and ethylbenzene for surface soil, and BTEX in subsurface soil.

The site-specific SSLs for the paved and unpaved scenarios were calculated for benzene, ethylbenzene, toluene and xylenes, and are included in Table 2-1. The following site-specific SSLs (for the unpaved scenario) will be the target cleanup levels for the soil COCs at the site:

- Benzene: 0.078 mg/kg
- Ethylbenzene: 61.8 mg/kg
- Toluene: 44.97 mg/kg
- Xylene: 882 mg/kg

### 2.2 Pre-Excavation Sampling and Contaminant Delineation

Prior to the commencement of excavation activities, the former soil boring locations will be surveyed and staked in the field using coordinates derived from the CNC Environmental Geographic Information System (EGIS) tool.

At the location where soil excavation will be performed, a 10-ft x 10-ft excavation footprint will be laid out, and four delineation samples will be collected, one on each side of the excavation footprint. At each location, samples will be collected at three depth intervals (0 to 1 ft bls, 1 to 3 ft bls and 3 to 5 ft bls). These samples will be analyzed to verify the concentrations of BTEXs. Analytical results from the delineation sampling will be evaluated to determine the horizontal extent of excavation at each location. If any of these delineation samples exceeds the target cleanup levels for the COC being removed at that location, additional soil samples will be collected farther out to complete the delineation.

1 The final excavation limits will be determined based on these analytical results. Should  
2 analytical results indicate that site-specific SSLs are not exceeded, the need for excavation  
3 will be re-evaluated, with the possibility that no excavation will be necessary.

4 Typical initial excavation footprint and delineation sampling locations are shown on Figure  
5 2-1. Table 2-2 shows the sample identifiers and parameters. Table 2-3 shows coordinates for  
6 the proposed sampling locations, which are derived from the surveyed location of  
7 E569SB005 included in the CNC EGIS.

## 8 **2.3 Excavation of Soils**

### 9 **2.3.1 Excavation**

10 At E569SB005, excavation will be performed based on delineation sampling to a depth of 5 ft  
11 bls, using a backhoe or similar equipment. The excavation area is currently covered with  
12 asphalt pavement. This pavement will be removed before the 5 ft-deep excavation is  
13 commenced. The initial excavation footprint may be larger than 10 ft x 10 ft if the pre-  
14 excavation delineation sampling indicates the presence of COCs in surface soils outside the  
15 initial 10 ft x 10 ft footprint.

16 Excavated material stockpiles will be placed in staging areas within the AOC 569 boundary.  
17 These stockpile areas will be prepared and maintained in accordance with applicable  
18 regulations.

### 19 **2.3.2 Site Restoration**

20 Based on the prior delineation of contamination limits, the excavations will be backfilled  
21 with clean soil soon after the contaminated soil is removed, and the asphalt pavement will  
22 be restored to original conditions.

23 The sampling procedures will be performed in accordance with the *Environmental Services*  
24 *Division Standard Operating Procedures and Quality Assurance Manual* (ESDSOPQAM) (EPA,  
25 1996). The appropriate health and safety guidelines prescribed for excavations by CH2M-  
26 Jones at other RCRA sites at the CNC will be followed during this excavation.

Table 2-1  
 Leachate Transport Analysis Model  
 Charleston Naval Complex  
 Zone E - AOC 569, 570, and 578

Parameter	Methylene chloride	Benzene	Toluene	Ethylbenzene	Xylene
<b>Chemical Specific Input Parameters</b>					
Cw = Target groundwater concentration MCL (mg/L)	5.00E-03	5.00E-03	1.00E+00	7.00E-01	1.00E+01
H = Henry's Law Constant, dimensionless	8.98E-02	2.28E-01	2.72E-01	3.23E-01	2.13E-01
Kd = Soil-water sorption coefficient (cm <sup>3</sup> water / g soil = Koc x foc where koc = organic carbon-water sorption coefficient, (cm <sup>3</sup> (ml) water) / (g soluble organic carbon) foc = Fraction of organic content, dimensionless	4.33E-01 0.037	2.18E+00 5.89E+01	6.73E+00 1.82E+02	1.34E+01 3.63E+02	1.34E+01 3.63E+02
<b>Site Specific Input Parameters</b>					
Sw = Width of Source Parallel to Groundwater Flow Direction (Impacted soil zone)	70.1 m	230 ft			
da = Aquifer Thickness	7.6 m	25 ft			
d = Groundwater Mixing Zone thickness (paved)	7.51 m	24.6 ft			
(unpaved)	7.62 m	25.0 ft			
I = Groundwater Gradient		5.2E-03 (unitless)			
Ks = Saturated Hydraulic Conductivity	1112.5 m/yr	3450 ft/yr			
θw = Volumetric Water Content of Soil Pore Space	0.3 cm <sup>3</sup> vapor/cm <sup>3</sup> soil	0.3 in <sup>3</sup> vapor/in <sup>3</sup> soil			
θv = Volumetric Vapor Content of Soil Pore Space	0.15 cm <sup>3</sup> vapor/cm <sup>3</sup> soil	0.15 in <sup>3</sup> vapor/in <sup>3</sup> soil			
ρs = Soil Bulk Density	1.5 g/cm <sup>3</sup>	93.64 lb <sub>m</sub> /ft <sup>3</sup>			
qi = Water Infiltration Rate (paved)	0.0086 m/yr	0.0283 ft/yr			
(unpaved)	0.1372 m/yr	0.4500 ft/yr			
Partition Term, Cw/Csoil, (L/kg)		6.42E-01	2.40E+00	6.96E+00	1.37E+01
Dilution Term, dimensionless (paved)		8.64E+01	8.64E+01	8.64E+01	8.64E+01
(unpaved)		6.46E+00	6.46E+00	6.46E+00	6.46E+00
Csoil/Cw = Partition term * Dilution term (mg/kg / mg/L) = L/kg (paved)		5.55E+01	2.08E+02	6.02E+02	1.18E+03
(unpaved)		4.15E+00	1.55E+01	4.50E+01	8.82E+01
<b>Calculated Site Specific Target Level for Soil</b>					
Csoil calculated source soil concentration (SSL, mg/kg) Cw*(partition term)*(dilution term) (paved)		0.277	1.038	601.728	826.738
(unpaved)		0.021	0.078	44.976	61.794

Cw Is the MCL from EPA National Drinking Water Standards (March 2001) or US EPA Region III RBCs (October, 2000).  
 H from Table 36 of the Soil Screening Guidance; Technical Background Document (EPA, 1996).  
 Kd = koc x foc.  
 koc from Table 39 of the Soil Screening Guidance; Technical Background Document (EPA, 1996).  
 foc calculated as the mean foc from TOC measurements from Zone E.  
 Sw Estimated as the distance along gw flow path (length, SW-NE) of AOC 570 (230 ft).  
 d is calculated as  $M = (0.0112 L^2)^{0.5} + da(1 - e^{-L/(Ks \cdot da)})$  or da, whichever is less.  
 da Is based on top of Ashley (-20 ft, GIS) and nearest isocontour line for groundwater level (5 ft msl, GIS).  
 I Calculated from isocontour groundwater map for Zone E ((4.82-3.99)/134 ~ 0.006, CH2MHill, 2002).  
 Ks Based on CH2MHill's hydraulic conductivity theme in the GIS (10 ft/d).  
 θw Is the default value presented in the Soil Screening Guidance: User's Guide (EPA, 1996)  
 θv is calculated as total porosity (0.45, assumed) - θw (0.3) = 0.15.  
 ρs is the default value presented in the Soil Screening Guidance: User's Guide (EPA, 1996)  
 qi Is a derived value (unpaved, 5.4 in/yr or paved, 0.34 in/yr) based on annual precipitation, evapo-transportation, and runoff coefficient values for the Charleston area.

**TABLE 2-2**  
 Analytical Summary for Supplemental Soil Sampling Activities  
 Interim Measure, Work Plan, AOC 569, Zone E, Charleston Naval Complex

New Sample ID	Number of Sample Locations	Analytes
<b>Surface and Subsurface Soils – Nature and Extent</b>		
E569SB008	1 location, with 3 depth intervals*	BTEX
E569SB009	1 location, with 3 depth intervals*	BTEX
E569SB010	1 location, with 3 depth intervals*	BTEX
E569SB011	1 location, with 3 depth intervals*	BTEX

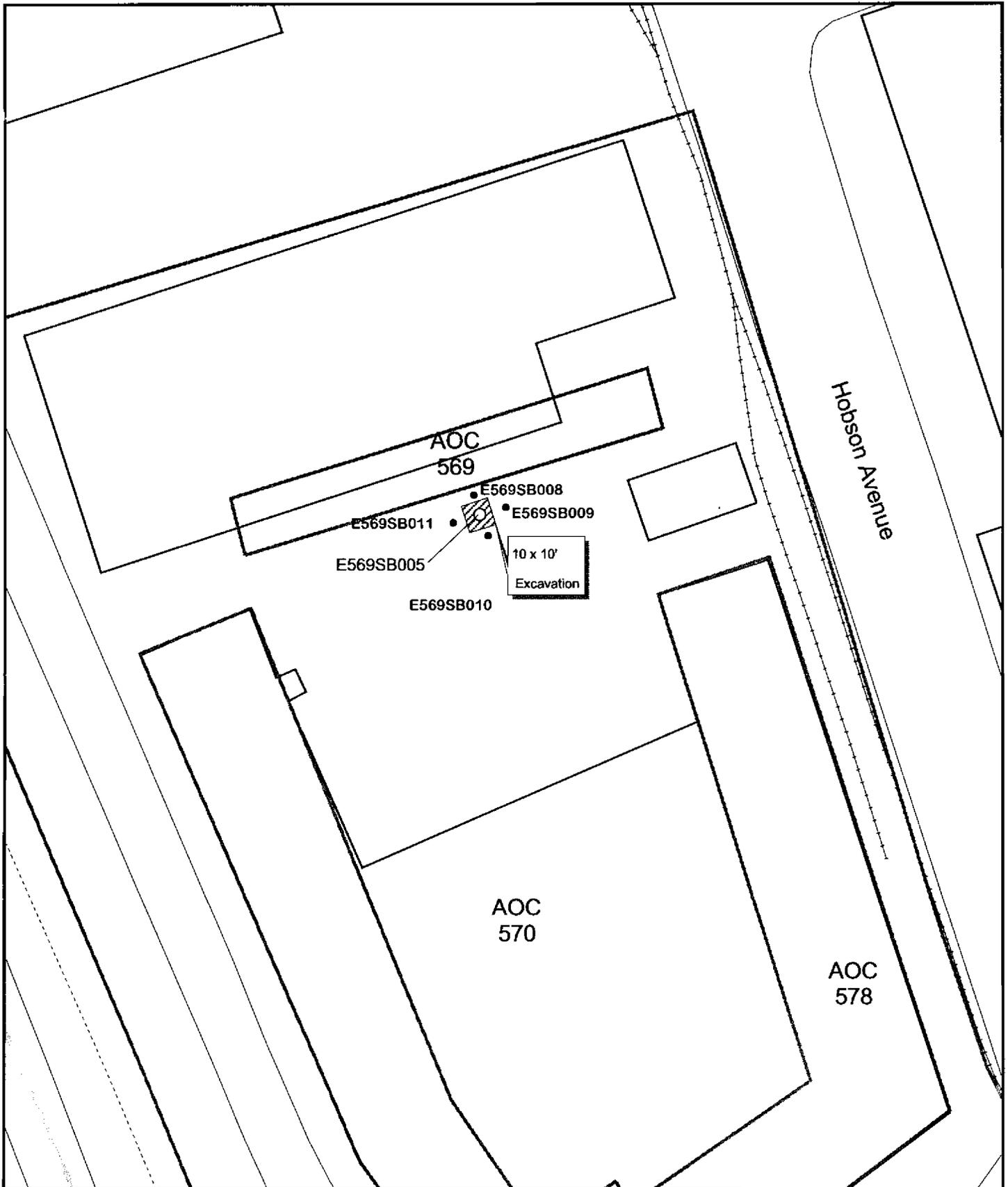
\*Depth intervals are 0 to 1 ft bls, 1 to 3 ft bls, and 3 to 5 ft bls.

BTEX benzene, toluene, ethylbenzene, and xylenes

ft bls feet below land surface

**TABLE 2-3**  
Coordinates for Proposed Sampling Locations  
*Interim Measure Work Plan, AOC 569, Zone E, Charleston Naval Complex*

<b>New Sample ID</b>	<b>Northing</b>	<b>Easting</b>
<b>Soil Borings to be Sampled</b>		
E569SB008	375,495	2,316,718
E569SB009	375,501	2,316,721
E569SB010	375,497	2,316,728
E569SB011	375,491	2,316,724



-  Excavation
-  Zone Boundary
-  AOCs 569 570 578 Locations
-  Buildings
-  Railroads
-  Roads
-  Fence
-  Soil Boring Location
-  Pre-excavation Delineation Sample Location



0 40 80 Feet

1 inch = 50 feet

**Figure 2-1**  
Interim Measure Excavation Location  
AOC 569, Zone E  
Charleston Naval Complex

## **Section 3.0**

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## 1 **3.0 Waste Management and Disposal**

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- 2 The following three waste streams will be generated as part of this IM: excavated soils,  
3 decontamination wastes, and personal protective equipment (PPE). The excavated soils will  
4 be characterized in accordance with South Carolina Hazardous Waste Management  
5 Regulations (Section SCDHEC R.61-79.261), and disposed of in accordance with all  
6 applicable regulations and permits. The decontamination wastes and PPE will also be  
7 disposed of in accordance with regulations.
- 8 Offsite transportation and disposal will be performed by properly permitted and licensed  
9 subcontractors. The materials designated for offsite disposal will be documented, tracked,  
10 and their disposition verified. This information will be reported in the IMCR for AOC 569.

## **Section 4.0**

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## 1 **4.0 Interim Measure Completion Report**

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2 A final report (IMCR) will be submitted within 60 days of receipt of final analytical data.

3 The IMCR will summarize the actions that were taken and provide the following  
4 information:

- 5 • Excavated volumes;
- 6 • Nature and volume of waste generated;
- 7 • Waste transportation and disposal records;
- 8 • Analytical data reports;
- 9 • Site photographs;
- 10 • Problems encountered during the IM and the corrective measures implemented to  
11 correct the problems, if any; and
- 12 • Other information that would be helpful in evaluating the success of the IM.



## 1 **5.0 References**

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- 2 EnSafe Inc. *Zone E RFI Report, NAVBASE Charleston*. Revision 0. November 1997.
- 3 CH2M-Jones. *RFI Report Addendum and CMS Work Plan, AOCs 569, 570 and 578, Zone E, CNC*.
- 4 December 30, 2002.
- 5 LandRec, Inc. for Landmark Construction Company. *Investigation of Underground*
- 6 *Contamination, Charleston Naval Shipyard – Building 1279, North Charleston, South Carolina*.
- 7 August 1992.
- 8 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*
- 9 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.