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SAMPLING AND ANALYSIS PLAN AREA OF CONCERN 572 (AOC 572) ZONE E WITH
TRANSMITTAL CNC CHARLESTON SC
10/24/2001
CH2M HILL

AOC 572 Zone E

SAMPLING and ANALYSIS PLAN (RO)



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October 24, 2001

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

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: Sampling and Analysis Plan for AOC 572, Zone E

Dear Mr. Scaturo:

Enclosed please find four copies of the Sampling and Analysis Plan for AOC 572, Zone E of the Charleston Naval Complex (CNC). This Sampling Plan has been prepared to complete the RCRA Facility Investigation (RFI) activities and to provide information that can be used to make decisions regarding the need for corrective measures at the site.

Please contact me if you have any questions or comments.

Sincerely,

CH2M HILL



Dean Williamson, P.E.

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

Sampling Plan

Area of Concern 572, Zone E

**Charleston Naval Complex
North Charleston, SC**

Prepared for
**U.S. Navy Southern Division
Naval Facilities Engineering Command**

Prepared by
CH2M-Jones

October 2001

Contract N62467-99-C-0960

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1 Acronyms and Abbreviations

2	AOC	area of concern
3	BCT	BRAC Cleanup Team
4	BEQ	benzo(a)pyrene equivalent
5	BRAC	Base Realignment and Closure Act
6	BRC	background reference concentration
7	CNC	Charleston Naval Complex
8	COC	chemical of concern
9	COPC	chemical of potential concern
10	CSAP	Comprehensive Sampling and Analysis Plan
11	DAF	dilution attenuation factor
12	DET	Environmental Detachment Charleston
13	EGIS	Environmental Geographic Information System
14	EnSafe	EnSafe Inc.
15	EPA	U.S. Environmental Protection Agency
16	ft bls	feet below land surface
17	FRE	fixed-point risk evaluation
18	GPS	Global Positioning System
19	IM	interim measure
20	MCL	maximum contaminant level
21	mg/kg	milligram per kilogram
22	PPE	personal protective equipment
23	RBC	risk-based concentration
24	RCRA	Resource Conservation and Recovery Act
25	RFA	RCRA Facility Assessment
26	RFI	RCRA Facility Investigation
27	SCDHEC	South Carolina Department of Health and Environmental Control
28	SPLP	synthetic precipitation leaching procedure
29	SSL	soil screening level
30	SVOC	semivolatile organic compound
31	TDS	total dissolved solids
32	VOC	volatile organic compound

1 1.0 Introduction

2 1.1 Background

3 Previous investigations in the vicinity of Area of Concern (AOC) 572 in Zone E of the
4 Charleston Naval Complex (CNC) have indicated the presence of benzo(a)pyrene
5 equivalents (BEQs), lead, tin, and antimony in soil above their respective chemical of
6 potential concern (COPC) screening criteria. CH2M-Jones has prepared this Sampling and
7 Analysis Plan (SAP) to complete the RCRA Facility Investigation (RFI) activities and to
8 provide information that can be used to make decisions regarding the need for corrective
9 measures. Figure 1-1 illustrates the location of Zone E within the CNC. Figure 1-2 is an
10 aerial photograph of AOC 572.

11 1.2 Organization of the SAP

12 This SAP consists of the following sections, including this introductory section:

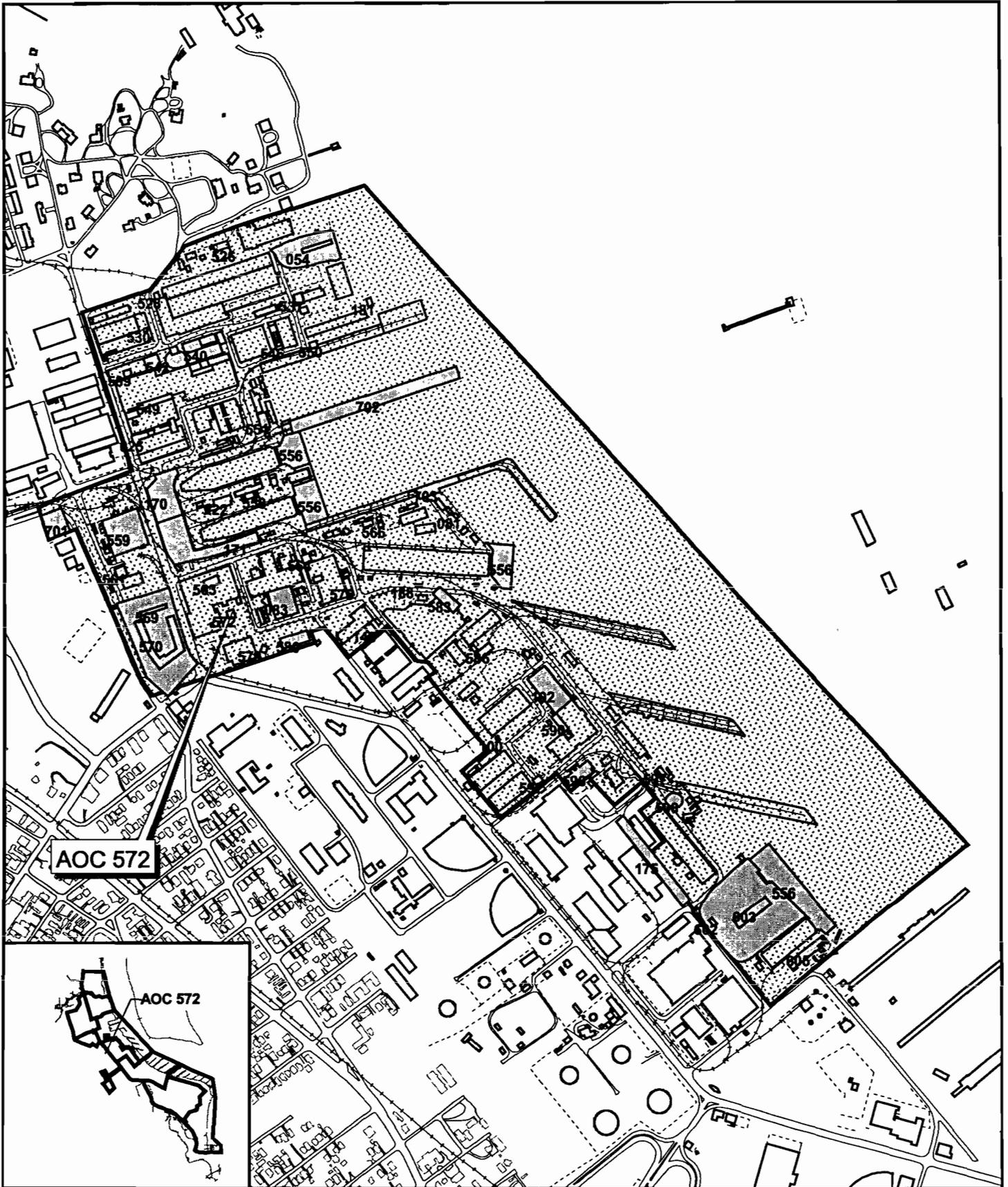
13 **1.0 Introduction** — Presents the purpose of the SAP and background information regarding
14 the site.

15 **2.0 Site Background and Conditions** — Provides a brief description of AOC 572 and the
16 findings of previous RFI activities.

17 **3.0 Proposed Sampling and Analysis** — Describes the investigative approach and program
18 for delineation of chemicals of potential concern (COPCs) for the RFI.

19 **4.0 References** — Lists the references used in this document.

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



 Zone E Boundary
 SWMU/AOC Within Zone E Boundary



0 800 1600 Feet

1 inch = 800 feet

Figur 1-1
 Zone E Within CNC
 AOC 572, Zone E
 Charleston Naval Complex

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



- ∨ Roads
- AOC Boundary
- SWMU Boundary
- Buildings



0 50 100 Feet

1 inch = 50 feet

Figur 1-2
Site Map
AOC 572, Zone E
Charleston Naval Complex

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1 **2.0 Site Background and Conditions**

2 **2.1 Site Background and Setting**

3 AOC 572 is a former electrical motor steam cleaning area. It is a discrete area located within
4 an asphalt-paved parking lot south of Building 177. While in operation, no containment
5 structures were associated with the activities carried out at the site. Wastewater drained
6 directly from the site to the storm sewer. No additional information could be found
7 regarding the operating practices of the site. The area is zoned for industrial use (M-2).

8 As identified in RCRA Facility Assessment (RFA) documentation, the materials of concern for
9 AOC 572 include volatile organic compounds (VOCs), petroleum hydrocarbons, and heavy
10 metals.

11 In 1998, an interim measure (IM) was conducted by the Environmental Detachment
12 Charleston (DET) for AOC 699, which included the storm sewer system associated with
13 AOC 572. The activities conducted for the IM included hydro-blast cleaning of the three
14 catch basins and associated interconnecting piping in the immediate vicinity of AOC 572.
15 The IM activities are documented in a report titled *Interim Measure Completion Report for*
16 *AOC 699 Storm Drain Cleaning* (U.S. Naval Detachment [Detachment], 1999).

17 **2.2 RFI Investigation Results**

18 **2.2.1 Soil Investigation**

19 As part of the RFI field investigation, surface soil samples (0 to 1 foot below land surface [ft
20 bls]) and co-located subsurface soil samples (3 to 5 ft bls) were collected in two sampling
21 events (see Figure 2-1 for sample locations). Samples from the first sampling event were
22 analyzed for VOCs, semivolatile organic compounds (SVOCs), and metals. Samples from
23 the second sampling event were analyzed for SVOCs and metals. No duplicate samples
24 were collected during either of the sampling events.

25 **Surface Soil**

26 In the *Zone E RFI Report, Revision 0* (EnSafe Inc. [EnSafe], 1997), surface soil sample
27 analytical results were evaluated relative to the U.S. Environmental Protection Agency
28 (EPA) Region III risk-based concentration (RBC) limits. Based on the analysis presented in

1 the RFI Report, BEQs exceeded their screening criteria. BEQs were identified as chemicals of
2 concern (COCs) based on exceedances of the industrial land use RBC of 0.78 milligrams per
3 kilogram (mg/kg) at three sample locations. However, two sample locations only slightly
4 exceeded the base-wide anthropogenic background value of 1.3 mg/kg for surface soils, and
5 both were collected from the 0 to 1-ft bls interval beneath the asphalt cover.

6 **Subsurface Soil**

7 Subsurface soil sample analytical results were evaluated relative to the EPA Region III
8 unrestricted and industrial RBCs and EPA generic soil screening levels (SSLs), with a
9 dilution attenuation factor (DAF) of 10. Based on the risk assessment presented in the *Zone E*
10 *RFI Report, Revision 0*, no constituents were identified as COCs.

11 **2.2.2 Groundwater Investigation**

12 Three shallow monitoring wells were installed and sampled as part of the RFI investigation
13 (see Figure 2-2). The groundwater samples were analyzed for VOCs, SVOCs, metals,
14 chlorides, sulfates, and total dissolved solids (TDS). Constituents detected in the
15 groundwater samples were evaluated relative to maximum contaminant levels (MCLs). In
16 the absence of an MCL, the EPA Region III tap water RBCs were used. Groundwater was
17 sampled during four sampling events, but the RFI report focused exclusively on the
18 findings from the first sampling event. Based on the risk assessment presented in the *Zone E*
19 *RFI Report, Revision 0*, no constituents were identified as COCs in groundwater.

20 **2.2.3 Sediment Investigation**

21 One sediment sample was collected and sampled as part of the RFI investigation (see Figure
22 2-1). The sediment sample was collected from what appears to be a drop culvert catch basin
23 and analyzed for VOCs, SVOCs, and metals. Constituents detected in the sediment sample
24 were evaluated relative to industrial soil RBCs. Arsenic exceeded its industrial soil RBC
25 limit, but was not carried forward in the risk assessment presented in the *Zone E RFI Report,*
26 *Revision 0*.

27 Subsequent to the RFI field investigation, the sediments that were present in catch basins at
28 AOC 572 were addressed in the IM for AOC 699 conducted by the Environmental
29 Detachment Charleston (DET) in 1999. As a result, these sediments are no longer present at
30 this site.

1 **2.2.4 RFI Risk Summary**

2 The *Zone E RFI Report, Revision 0* report noted that the area is currently industrialized, and
3 that there were no current residential properties for consideration in the risk assessment. As
4 a result, all risk evaluation activities were based on potential future unrestricted land use
5 and current industrial scenarios. The detailed presentation of the risk assessment for AOC
6 572 is presented in Section 10.36 of the *Zone E RFI Report, Revision 0*, and summarized in the
7 subsections below. The risk assessment used a fixed-point risk evaluation (FRE)
8 methodology.

9 **Soils**

10 At AOC 572, the COPCs identified for future unrestricted land use for surface soils included
11 BEQs and lead. For future industrial workers, BEQs were identified as COPCs in surface
12 soil. The risk assessment concluded that surface soils presented excessive cancer risks from
13 BEQs under the unrestricted land use exposure scenario, as a result of potential exposure.

14 Lead was not identified as a COC in the screening process presented in the *Zone E RFI*
15 *Report, Revision 0*, although it was present in soils at concentrations that exceeded the
16 residential RBC of 400 mg/kg and was identified as a COPC. Lead was excluded as a COC
17 in the RFI risk assessment because the future land use scenario did not include residential
18 land uses. The risk assessment exclusion of lead appears to have been based on the mean
19 concentration of lead, which was less than 400 mg/kg. As a result, the conclusions
20 presented in the RFI report indicated that lead was not a COC based on an unrestricted land
21 use scenario.

22 The only COC identified based on a future industrial land use scenario were BEQs.

23 No subsurface soil COCs were identified.

24 **Groundwater**

25 No COPCs or COCs were identified in groundwater at this site.

NOTE: Original figure created in color

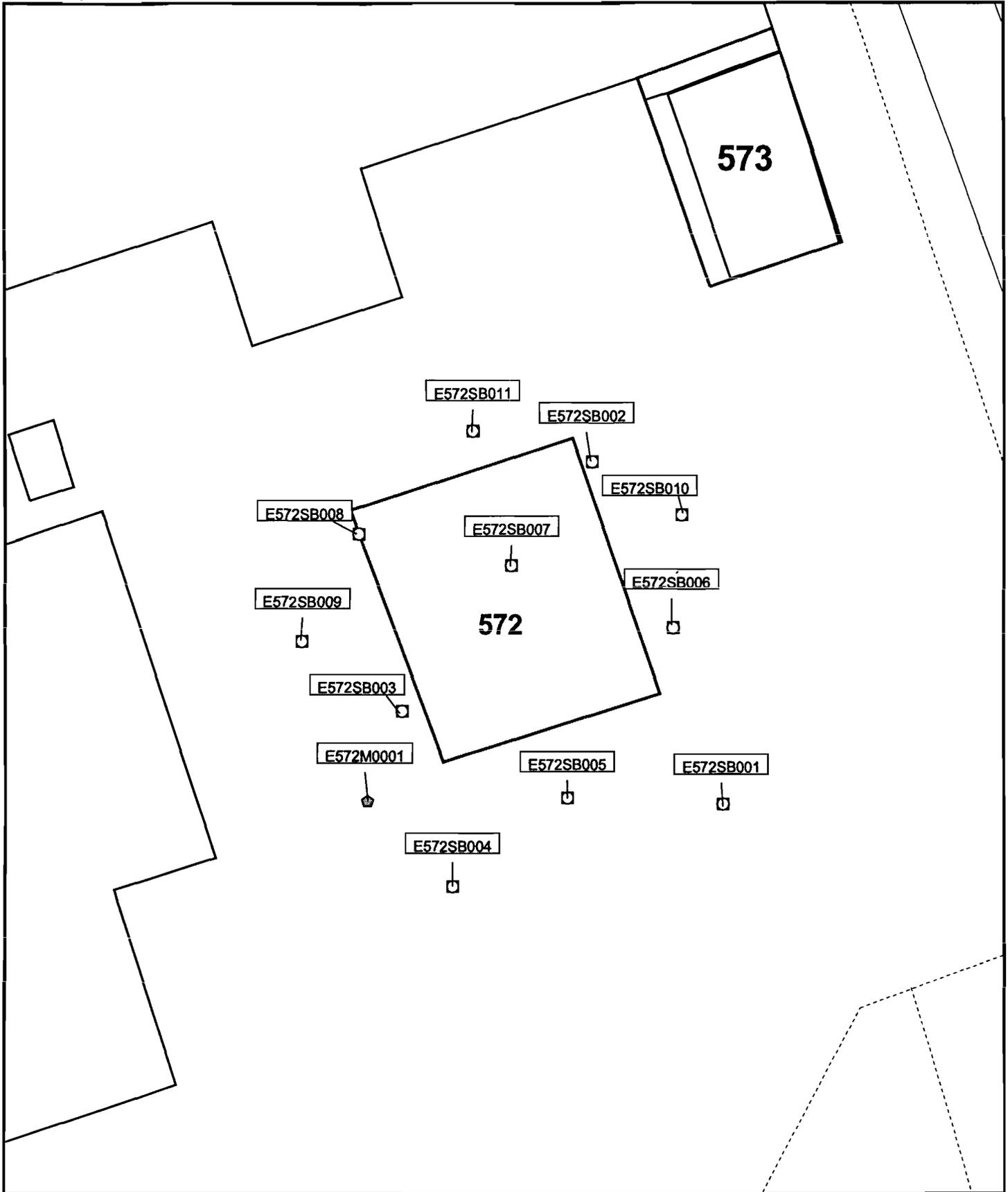
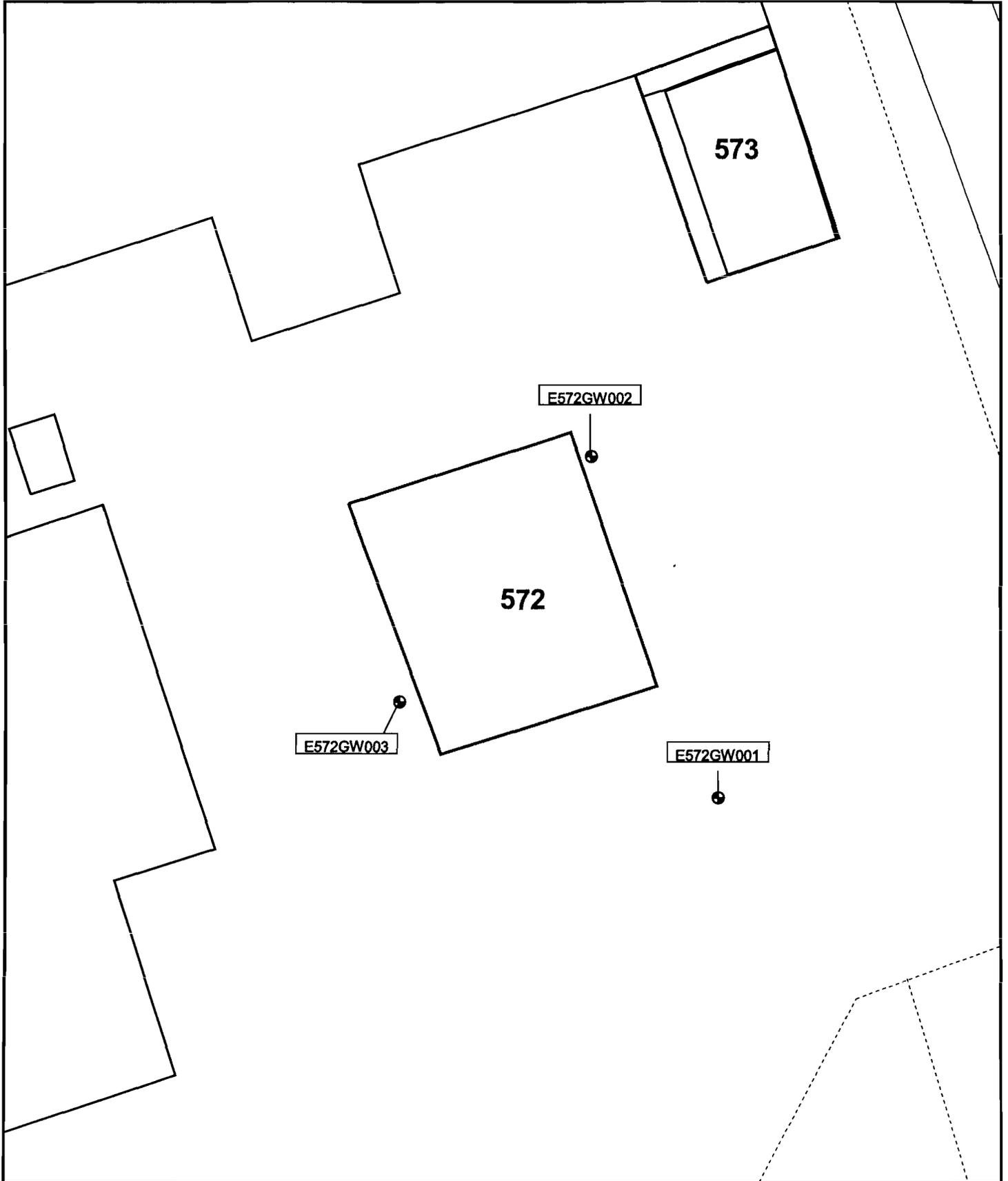


Figure 2-1

Historical Surface Soil, Subsurface Soil, and Sediment Location Map
AOC 572, Zone E
Charleston Naval Complex

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NOTE: Original figure created in color



- Groundwater Sample
- Buildings
- - - Fence
- ≡ Railroads
- ≡ Roads
- ▭ AOC Boundary
- - - SWMU Boundary

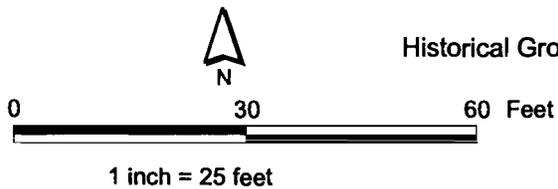


Figure 2-2
Historical Groundwater Sample Location Map
AOC 574, Zone E
Charleston Naval Complex

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1 **3.0 Proposed Sampling and Analysis**

2 Based on an evaluation of the data collected during the RFI and a comparison to COPC
3 screening criteria currently used by the Base Realignment and Closure Act (BRAC) Cleanup
4 Team (BCT), two constituents in surface soil require further delineation (lead and BEQs; see
5 Figure 3-1) and three subsurface soil constituents require further delineation (antimony,
6 lead, and tin; see Figure 3-2). Thus, the additional delineation sampling will focus on these
7 parameters. A full evaluation and presentation of the COPC screening against current
8 criteria, as well as a COPC/COC refinement analysis, will be provided in an RFI Report
9 Addendum after collection and analyses of the samples proposed herein.

10 **3.1 Surface and Subsurface Soil**

11 **3.1.1 Visual Inspection**

12 The elevated concentrations of lead and tin in the subsurface soils at two locations suggest
13 the potential presence of a waste source material. Therefore, visual investigation by the
14 advancement of hand auger borings will be conducted at sample locations E572SB002 and
15 E572SB006 to investigate whether there is an obvious source of these elevated levels. If a
16 visible source material, such as blasting media, is observed, then the visual inspection will
17 be extended in 25-foot step-outs until the potential source material is no longer identifiable.

18 **3.1.2 Analytical Sampling**

19 Analytical samples will be collected to address two points: source characterization and
20 assessment of the nature and extent of contamination.

21 **Source Characterization Sampling**

22 Source characterization samples will be collected at the two RFI sample locations where lead
23 and tin were found at elevated concentrations (E572SB002 and E572SB006). Samples at these
24 two locations will be collected from intervals of 0 to 1 ft bls, 1 to 3 ft bls, and 3 to 5 ft bls.
25 These six samples will be analyzed for lead, antimony, tin, and organotins (see Table 3-1).

26 In addition, samples from the 3 to 5 ft bls interval will be analyzed by synthetic precipitation
27 leaching procedure (SPLP) to assess the extent to which metals in the soil are leachable.

1 **Assessment of Nature and Extent of Contamination**

2 Additional surface and subsurface soil samples will be collected for laboratory evaluation at
3 the locations shown in Figure 3-3 to assess the nature and extent of contamination. The
4 analyses to be performed on these samples is also presented in Figure 3-3. If any of these
5 delineation samples exceed the screening criteria, then additional soil samples will be
6 collected farther out to complete the delineation.

7 The samples will be collected using hand augers and the sampling will be performed in
8 accordance with the *Environmental Services Division Standard Operating Procedures and Quality*
9 *Assurance Manual* (ESDSOPQAM) (EPA, 1996).

10 For all nature and extent sample locations, samples will be collected from the following
11 depths:

- 12 • 0 to 1 ft bls (below any pavement present)
- 13 • 3 to 5 ft bls

14 **3.2 Groundwater**

15 No COPCs were identified for groundwater in the vicinity of AOC 572. However, the three
16 existing wells at AOC 572 (see Figure 2-2) have not been sampled since 1996. Therefore,
17 these wells will be sampled as part of this field investigation. Groundwater samples will be
18 analyzed for lead, tin, antimony, and organotins (see Table 3-1).

19 **3.3 Sediment**

20 Sediment was addressed under the IM conducted by the DET. Therefore, no affected
21 sedimentary media reportedly remain at AOC 572, and no further investigation is necessary
22 for the three drop culverts.

23 **3.4 Sampling and Analysis Plan**

24 All investigative work will be performed in accordance with the Comprehensive Sampling
25 and Analysis Plan (CSAP) portion of the *Final Zone E RFI Work Plan, Revision 1*
26 (EnSafe/Allen & Hoshall, 1995). All samples will be analyzed for the associated COPC(s)
27 identified by media as listed in Table 3-1.

1 **3.5 Health and Safety**

2 CH2M-Jones places significant emphasis on the health and safety of our personnel, our
3 subcontractors, and the local community. Once all personnel have arrived on site as part of
4 the mobilization phase of the SAP, a project briefing and health and safety orientation meet-
5 ing will be held. All work completed as part of this SAP will be performed in accordance
6 with the CH2M-Jones Site-Specific Health and Safety Plan (CH2M-Jones, 2000).

7 Personnel working at the site will be required to comply with Level D personal protective
8 equipment (PPE) requirements, as specified in the Health and Safety Plan.

9 **3.6 Site Clearance**

10 Soil boring locations will be marked or staked in the field using coordinates derived from
11 the CNC Environmental Geographic Information System (EGIS) tool and utilizing Global
12 Positioning System (GPS) equipment.

13 To prepare for the start of onsite operations, CH2M-Jones will notify the necessary agencies
14 and departments regarding planned activities at the project site.

15 CH2M-Jones will examine the site for existing water, electrical, natural gas, telephone, and
16 other utility lines that are potential hazards at the site. Utilities will be clearly marked and
17 identified.

18 **3.7 Waste Management and Disposal**

19 Four waste streams will be generated as part of this SAP: pavement debris, soil cuttings,
20 decontamination wastes, and used PPE. Soil cuttings will be characterized in accordance
21 with South Carolina Hazardous Waste Management Regulations (South Carolina
22 Department of Health and Environmental Control [SCDHEC] R.61-79.261) and disposed of
23 in accordance with all applicable regulations and permits. Decontamination wastes and
24 used PPE will also be disposed in accordance with applicable regulations.

25 Pavement debris will be transported offsite for disposal either by asphalt recycling or
26 landfilled as demolition debris. Offsite transportation and disposal will be performed by
27 properly permitted and licensed subcontractors.

28 **3.8 Equipment Decontamination**

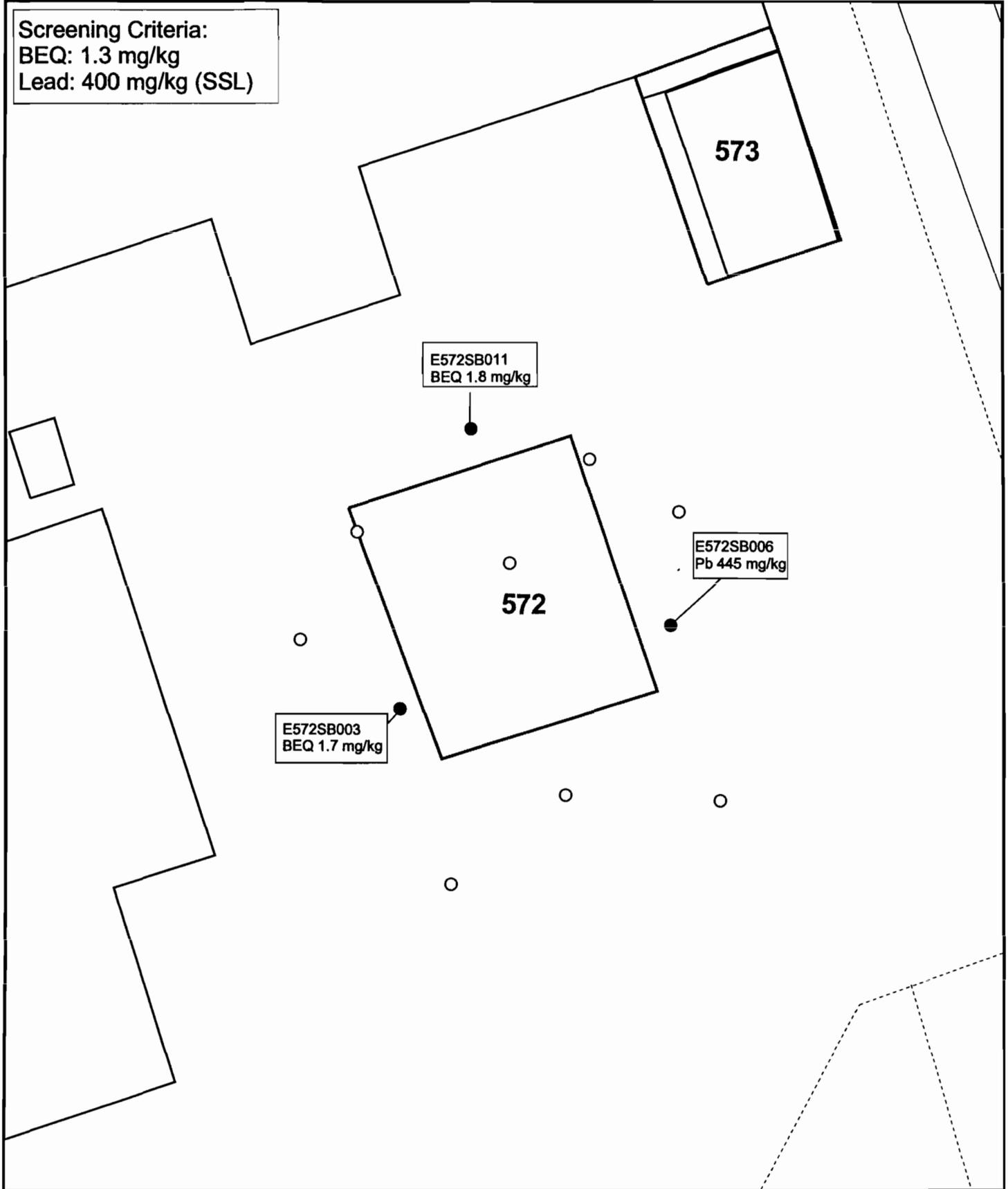
29 Decontamination of personnel, sampling and removal equipment, and materials will be in
30 accordance with the CH2M-Jones Site-Specific Project Health and Safety Plan.

TABLE 3-1
 Analytical Summary for Supplemental Sampling Activities
 Sampling and Analysis Plan, AOC 572, Zone E, Charleston Naval Complex

Constituent	Number of Sample Points	Analytes	Analytical Methods
Surface and Subsurface – Source Locations			
E572SB002 and E572SB006	2, with 3 depth intervals at each location (0–1 ft bls, 1–3 ft bls, and 3–5 ft bls)	Total lead	SW-846 6010
		Total antimony	SW-846 6010
		Total tin	SW-846 6010
		Organotins	Organotins
		SPLP metals	SW-846 1312/SW-846 6010
Surface and Subsurface Soils – Nature and Extent			
Lead	7	Lead	SW-846 6010
BEQs	5	SVOCs	SW-846 8270
Antimony	6	Antimony	SW-846 6010
Tin	7	Tin	SW-846 6010
Groundwater			
Groundwater	3	Total lead	SW-846 6010
		Antimony	SW-846 6010
		Tin	SW-846 6010
		Organotins	Organotins

NOTE: Original figure created in color

Screening Criteria:
BEQ: 1.3 mg/kg
Lead: 400 mg/kg (SSL)



- Non-Exceedance
- Exceedance
- Fence
- Roads
- ▭ AOC Boundary
- ▭ SWMU Boundary

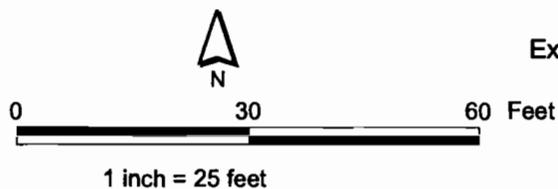
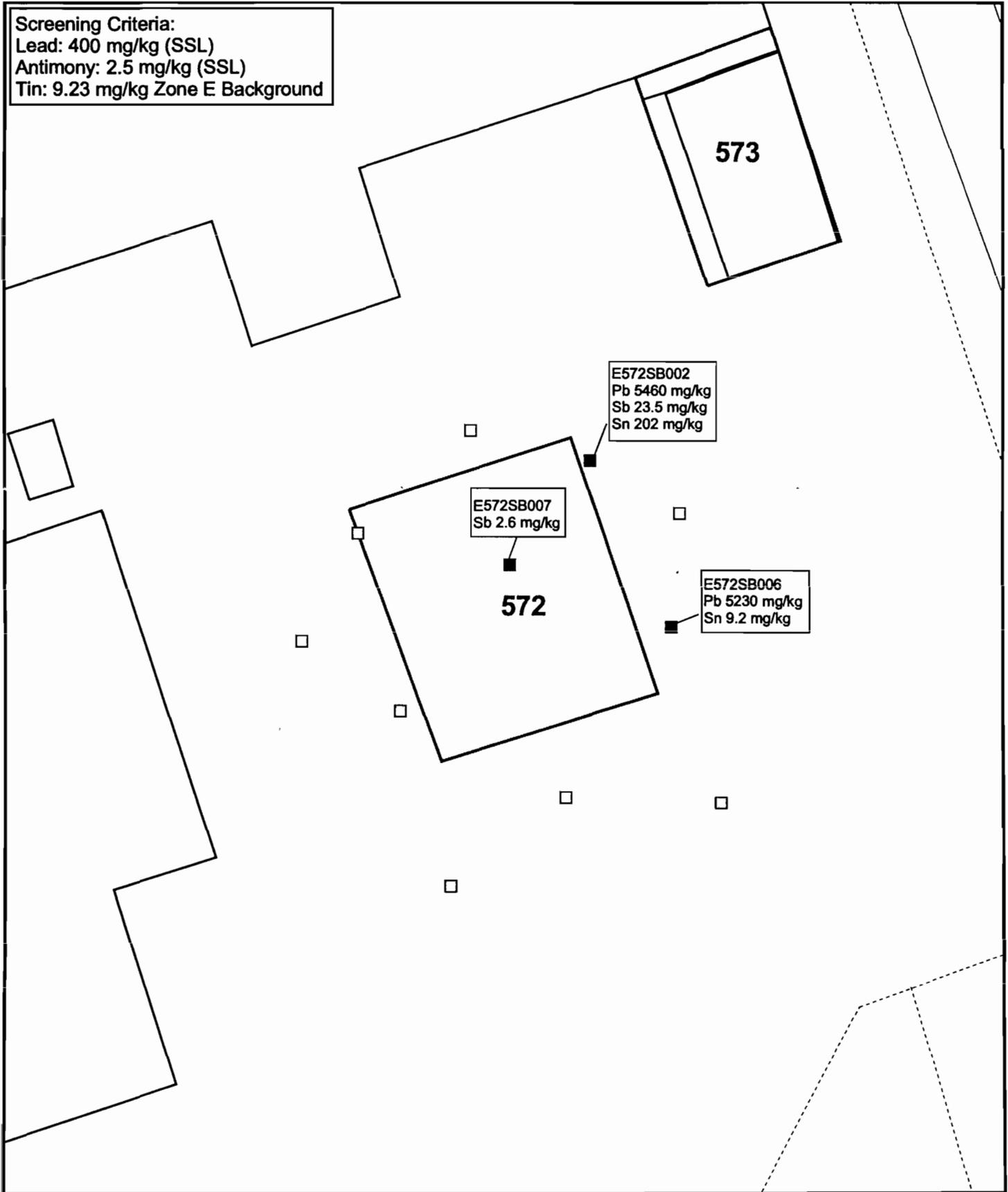


Figure 3-1
Exceedances in Surface Soil Map
AOC 572, Zone E
Charleston Naval Complex

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NOTE: Original figure created in color

Screening Criteria:
Lead: 400 mg/kg (SSL)
Antimony: 2.5 mg/kg (SSL)
Tin: 9.23 mg/kg Zone E Background



- Non-Exceedance
- Exceedance
- - - Fence
- ∩ Roads
- ▭ AOC Boundary
- ▭ SWMU Boundary

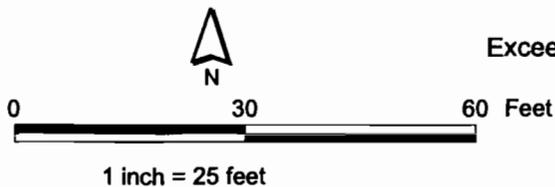
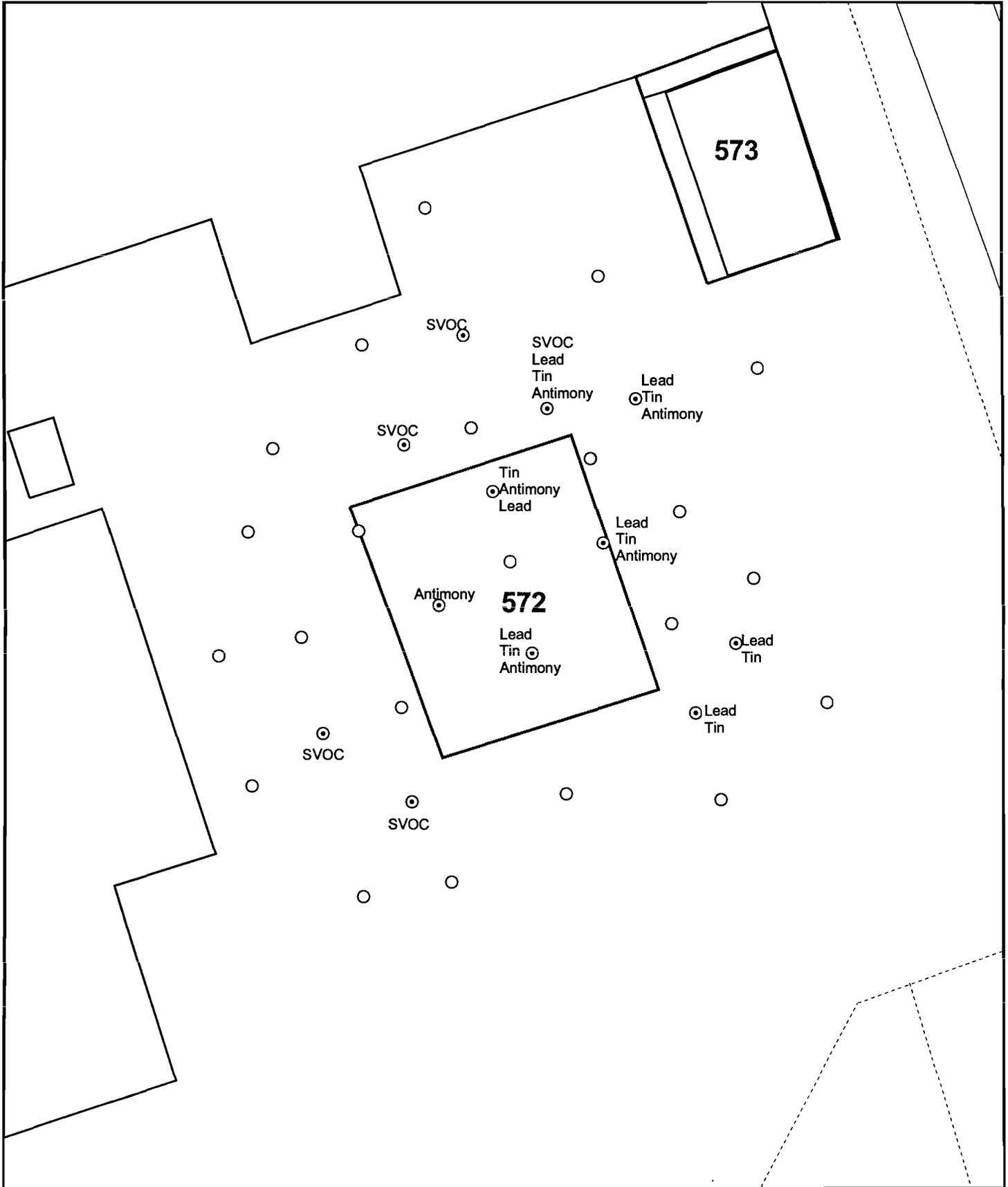


Figure 3-2
Exceedances in Subsurface Soil Map
AOC 572, Zone E
Charleston Naval Complex

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- ⊙ Proposed Soil Sample
- Potential Step Out Locations
- RFI Soil Sample
- - - Fence
- == Roads
- ▭ AOC Boundary



0 30 60 Feet

1 inch = 25 feet

Figure 3-3
Proposed Surface and Subsurface Soil Sample Location Map
AOC 572, Zone E
Charleston Naval Complex

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1 4.0 References

- 2 EnSafe Inc. *Zone E RFI Report, Revision 0, NAVBASE Charleston*. November 1997.
- 3 EnSafe Inc./Allen & Hoshall. *Final RCRA Facility Assessment, Naval Base Charleston*. June
4 1995.
- 5 EnSafe Inc./Allen & Hoshall. *Final Zone E RFI Work Plan, Naval Base Charleston*. Revision 1.
6 June 1995.
- 7 EnSafe Inc. *Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) Report*.
8 July 1995.
- 9 U.S. Naval Detachment. *Interim Measure Completion Report for AOC 699 Storm Drain Cleaning*.
10 March 1999.
- 11 U.S. Environmental Protection Agency (EPA). *Environmental Services Division Standard*
12 *Operating Procedures and Quality Assurance Manual (ESDSOPQAM)*. 1996.