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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORK
PLAN ADDENDUM FOR ZONE E CNC CHARLESTON SC
12/1/1999
ENSAFE

DRAFT

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
CTO-029



ZONE E
RCRA FACILITY INVESTIGATION WORK PLAN
ADDENDUM

SOUTHDIV CONTRACT
NUMBER: N62467-89-D-0318

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA



Prepared by:

ENSAFE INC.
5724 SUMMER TREES DRIVE
MEMPHIS, TENNESSEE 38134
(901) 372-7962

December 1, 1999
Revision: 0

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DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

P.O. BOX 190010

2155 EAGLE DRIVE

NORTH CHARLESTON, S.C. 29419-9010

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Code 18B1
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Mr. John Litton, P.E.
Director, Division of Hazardous and Infectious Waste Management
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

Subj: SUBMITTAL OF DRAFT ZONE E RCRA FACILITY INVESTIGATION
WORK PLAN ADDENDUM

Dear Mr. Litton:

The purpose of this letter is to submit the Draft Zone E RCRA Facility Investigation Workplan Addendum for Naval Base Charleston. The Workplan is submitted to fulfill the requirements of condition II.E.1 of the RCRA Part B permit issued to the Navy by the South Carolina Department of Health and Environmental Control and U.S. Environmental Protection Agency.

We request that the Department and the EPA review the addendum and provide comment or approval as appropriate. If you should have any questions, please contact Matthew Humphrey or myself at (803) 743-9985 and (803) 820-5525 respectively.

Sincerely,

A handwritten signature in black ink that reads "M.A. Hunt".

M.A.HUNT, P.E.
BRAC Environmental Coordinator
BRAC Division

Encl:

(1) Draft Zone E RFI Workplan Addendum, December 1, 1999

Copy to:

SCDHEC (3)

USEPA (Dann Spariosu)

SOUTHNAVFACENGCOM (Matthew Hunt)

CSO Naval Base Charleston (Amy Daniel)

DRAFT

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to the Synthetic Precipitation Leaching Procedure (SPLP). TOC and SPLP analytical results will be used to calculate site-specific SSLs and to determine whether additional monitoring wells will be needed.

Additional soil boring, monitoring well, and direct-push technology (DPT) vertical profile sample locations proposed for each site are based on existing boring and well locations, data gaps, and surface and subsurface obstructions such as utilities, building foundations, and pilings. Site-specific figures also show locations to be sampled if the additional sampling locations do not define the extent of contamination. All samples will be collected in accordance with the procedures outlined in the *Final Comprehensive RFI Work Plan* and *Final Zone E RFI Work Plan*.

Several sites along the northern and center portion of Zone E exhibited elevated concentrations of contaminants in both shallow and deep groundwater. Specifically, volatile organic compounds (VOCs) have been identified in two distinct areas of Zone E which seem to indicate a plume of solvent-type contaminants. A series of DPT vertical profile points will be installed in these Zone E areas to delineate the plume of groundwater contaminants. The sites along the northern portion include SWMU 25, SWMU 70/AOC 549, SWMU 65, and supplemental well locations NBCEGDE17D and NBCEGDE26D. The sites in the center portion include SWMU 172, AOC 563, and AOCs 569/570. Figure 1.2 shows the proposed DPT vertical profile sample locations. The vertical profile groundwater sampling technique is described below.

Groundwater vertical profiling is used to collect water quality data at discrete intervals within an aquifer to determine the vertical distribution of dissolved contaminants and other geochemical parameters. Scientists can use these discrete vertical samples to study plume morphology and composition and identify preferred hydrologic flowpaths, which is especially advantageous in seemingly homogenous aquifers.

1.0 INTRODUCTION 1

As part of the U.S. Navy Comprehensive Long-term Environmental Action Navy (CLEAN) 2
program, this Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work 3
plan addendum has been prepared for Zone E solid waste management units (SWMUs) and areas 4
of concern (AOCs) requiring further investigation at Charleston Naval Complex (CNC). This 5
addendum outlines sampling and analysis requirements specific to Zone E sites and is to be used 6
in conjunction with the more general *Final Comprehensive RFI Work Plan* (EnSafe/Allen & 7
Hoshall, 1994) and *Final Zone E RFI Work Plan* (EnSafe/Allen & Hoshall, 1995) for CNC. 8

This work plan addendum describes the level of effort deemed necessary to complete the 9
delineation of contaminants of potential concern (COPCs) identified at several SWMUs and AOCs 10
(*Draft Zone E RFI Report*, EnSafe, November 1997), as shown on Figure 1.1. Data from the 11
adjacent zones shown on Figure 1.1 will be used to assist in characterizing Zone E. The proposed 12
scope of work described herein was discussed at the October 1999 scoping and project team 13
meeting. This addendum presents the rationale for selection of soil borings and monitoring wells, 14
which is to define the area where contaminants exceed screening criteria. Sampling will continue 15
until the extent of any contamination is determined, which is defined as the horizontal and vertical 16
area in which COPC concentrations in investigated media exceed either risk-based concentrations 17
(RBCs), soil screening levels (SSLs), maximum contaminant levels (MCLs), or background 18
concentrations, whichever is appropriate. 19

This addendum also focuses on an additional 11 AOCs and SWMUs where no investigative 20
activities were conducted during the initial phase of the RFI. These sites were included in Zone E 21
during the RCRA Facility Assessment (RFA), which was not yet completed when the Zone E RFI 22
was conducted. Additional soil samples will also be collected at several Zone E locations where 23
contaminants exceed SSLs and no monitoring wells are present. These locations will be sampled 24
and analyzed for total organic carbon (TOC) and contaminants that exceeded their SSLs according 25

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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

The following abbreviations, acronyms, and units of measurement are used in this report.

1,2-DCE	1,2-dichloroethene
AOC	Area of Concern
AST	Aboveground Storage Tank
BAP	Benzo(a)pyrene
BEQ	Benzo(a)pyrene Equivalent
bgs	Below ground surface
CIA	Controlled Industrial Area
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMCOC	Contaminant Migration Contaminants of Concern
CMS	Corrective Measures Study
CNC	Charleston Naval Complex
CNSY	Charleston Naval Shipyard
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CSAP	Comprehensive Sampling and Analysis Plan
CSI	Confirmatory Sampling Investigation
DAF	Dilution Attenuation Factor
DDT	Dichlorodiphenyl-trichloroethane
DPT	Direct Push Technology
DQO	Data Quality Objectives
E/A&H	EnSafe/Allen & Hoshall
IM	Interim Measure
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
NA	Not Applicable
ND	Not Detected
NFI	No Further Investigation
ng/kg	Nanogram per kilogram
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene

QA/QC	Quality Assurance/Quality Control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SCDHEC	South Carolina Department of Health and Environmental Control
SOUTHDIV	Southern Division Naval Facilities Engineering Command
SPLP	Synthetic Precipitation Leaching Procedure
SSL	Soil Screening Levels
SVOA	Semivolatile Organic Analysis
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
$\mu\text{g}/\text{kg}$	Microgram per kilogram
$\mu\text{g}/\text{L}$	Microgram per liter

Vertical profiles may be obtained with a DPT rig using several sampling methodologies. The Waterloo Profiler™ has been demonstrated at several CNC sites to be the most suitable and productive sampler currently available for vertical profiles in sand and silty sand aquifers. Unlike more conventional DPT groundwater sampling techniques, the Profiler can collect samples at numerous depths in a single borehole without being decontaminated between sampling depths. The Profiler consists of a stainless steel tip with six small, screened holes or ports connected to a fitting inside the tool, which attaches to the end of the DPT drill rod. Teflon tubing attached to the internal fitting extends up the inside of the drill rod to the surface, where it enters a vacuum stainless steel sampling system operated by a peristaltic pump. As a result, groundwater samples only come into contact with stainless steel or Teflon prior to collection in glass 40-milliliter vials. After sample collection, the peristaltic pump is reversed and deionized water is pumped through the tubing and out the Profiler's sampling ports. This creates a hydraulic barrier as the drill rod is advanced to the next sampling depth, minimizing vertical cross-contamination. The positive pressure also prevents clogging of the sampling ports by fine-grained sediments as the drill rod is advanced. When the target depth is encountered, the pump is reversed and groundwater is purged through the sampling system. To ensure that a representative sample is collected, water clarity and other water quality parameters such as pH, conductivity, and temperature are monitored.

Compared to conventional monitoring, a vertical profile's advantage is that it reduces the amount of bias inherent in the averaging of clean and contaminated groundwater drawn into a monitoring well. The profile identifies discrete lenses within the aquifer that may transmit most of the contaminants, providing critical data for any treatment alternative. Even as screening data, the vertical profile can be used to select the intervals to monitor with conventional monitoring wells and customized screen lengths.

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2.0 AOCs/SWMUs REQUIRING ADDITIONAL INVESTIGATIVE ACTIVITIES 1

2.1 SWMU 21, Old Paint Storage Area; SWMU 54, Former Abrasive Blasting Area 2

SWMUs 21 and 54, at the northern end of Zone E, directly adjacent to the Cooper River, have 3
been grouped for investigative purposes because SWMU 21 appears to be completely encompassed 4
within SWMU 54. Figure 1.1 shows site locations and Figure 2.1 shows site features. 5
SWMU 21, a 20-foot by 180-foot concrete pad, was constructed in 1942 to store containerized 6
paint wastes from ship repair and overhaul operations. SWMU 54 is the area south of 7
Building 223 formerly used for abrasive blasting of ship components and hull sections. Ship 8
components and anchor chains were also painted in this area. The dates of operation are not 9
known. 10

SWMU 21 was the subject of two other investigative efforts before the current RFI. The first 11
effort entailed limited sampling to obtain RCRA closure and analysis of spent blast media and 12
paint chips for Extraction Procedure (EP) Toxicity Characteristic. The second sampling in the fall 13
of 1993 included soil, groundwater, and sediment as a prelude to the current RFI field activities. 14
Samples collected at SWMU 21 also included portions of the area now identified as SWMU 54. 15
Samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), and the 16
Target Analyte List (TAL) of inorganics using SW-846 methodologies. As outlined in the 17
sampling strategy presented in the *Final Comprehensive RFI Work Plan*, these contaminants were 18
compared with USEPA Region III RBCs to identify COPCs for the human health assessment. 19
Several COPCs were identified in both soil and sediment, and the scope of the current RFI was 20
expanded to include further investigative activities at these two sites. 21

In 1996, spent blast grit was excavated during an interim measures (IM) removal action conducted 22
by the Navy Detachment. The excavation was determined complete based only on visual 23
evidence; confirmation sampling was not conducted following removal activities. Section 10.2 24
of the *Draft Zone E RFI Report* and the Navy Detachment *Interim/Stabilization Measure for* 25

SWMU 21 and SWMU 54 Completion Report (February 11, 1997) provide additional information 1
for these activities. 2

2.1.1 Previous Field Work 3

Soil 4

Soil borings were advanced within the SWMU 21/SWMU 54 area to assess the extent of COPCs 5
identified in the two previous sampling events. Soil was sampled in one round from the locations 6
shown in Figure 2.1. The *Final Zone E RFI Work Plan* proposed collecting 37 soil samples from 7
the upper interval (0 to 1 foot below ground surface [bgs]) and 37 samples from the lower-interval 8
(3to 5 feet bgs). Soil samples were also collected at the upper and lower intervals from the 9
three shallow monitoring well locations proposed at this site. All proposed upper-interval samples 10
were collected, while only 35 of the proposed 40 lower-interval samples were collected. At 11
SWMU 54, five lower-interval samples were not collected due to subsurface obstructions 12
(large rocks) below 2 feet bgs. 13

All soil samples were submitted for analysis at data quality objective (DQO) Level III for SVOCs, 14
metals, and organotins. In addition, one upper-interval sample and six lower-interval samples 15
were submitted for VOC analysis due to high organic vapor analyzer (OVA) readings and/or a 16
strong petroleum odor indicating possible free product. Nine upper-interval samples selected as 17
duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, including the 18
suite of analyses proposed for the site. The samples were also analyzed for a more comprehensive 19
list of VOCs (where applicable), SVOCs, herbicides, hexavalent chromium, organophosphorus 20
pesticides, and dioxins. The soil data, summarized in Section 10.2.2 and Appendix H of the 21
Draft Zone E RFI Report, were reviewed to determine if they satisfied the RFI requirement for 22
delineating the nature and extent of contamination. Soil data gaps identified during this review 23
are discussed in Section 2.1.2 below. 24

Groundwater

Three shallow monitoring wells were installed and sampled twice during the field investigation to assess groundwater quality. Three existing wells, installed during the previous SWMU 21 investigation, were also sampled twice during the field investigation. Only two of the shallow wells (NBCE021003 and NBCE054002) were sampled during each of the four quarterly sampling events. The other four wells – NBCE021001, NBCE021002, NBCE054001, and NBCE0543 – were removed during the Navy Detachment’s IM. Groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides/polychlorinated biphenyls (PCBs), metals, cyanide, chlorides, sulfates, total dissolved solids (TDS), and organotins at DQO Level III. One duplicate sample was submitted for Appendix IX analyses at DQO Level IV, which includes the parameters listed above plus a more comprehensive list of VOCs and SVOCs, as well as herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins. The groundwater data are summarized in Section 10.2.2 and Appendix H of the *Draft Zone E RFI Report*.

2.1.2 Data Gaps

Surface Soil

During the IM removal, the Navy Detachment excavated the visible spent abrasive blast residue to eliminate it as a source of contamination. No confirmation soil sampling was conducted after the IM removal, and thus it has not been determined whether the contaminants that exceeded screening levels have been removed from SWMUs 21 and 54.

Subsurface Soil

Previous investigation of SWMUs 21 and 54 indicated SVOCs and metals exceeding their SSLs. The sample location where the most contaminants exceeded SSLs in previous sampling events (location 054SB035) was selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and determine the need for additional monitoring wells. The soil samples will

be analyzed for TOC, and SVOCs and metals according to the SPLP method. After calculation of the site-specific SSLs, additional data gaps may be identified and additional sampling required. Results of the site-specific SSL calculation and the subsequent screening results for contaminant migration contaminants of concern (CMCOCs) will be presented in the *Final Zone E RFI Report*.

Groundwater

Groundwater data for site shallow monitoring wells were reviewed for contaminant detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. Based on this review, it was determined antimony, nickel, and thallium exceeded their MCLs throughout the four quarterly sampling events in one of the two remaining monitoring wells (NBCE054002).

2.1.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.1 summarizes sample matrices and proposed analytical parameters.

Ten additional soil borings are proposed to confirm whether metals contamination was eliminated in surface and subsurface soil during the 1996 IM removal. Samples will be collected from the upper interval (0-1' bgs) at each boring and analyzed for metals at DQO Level III. To calculate site-specific SSLs and to determine if additional monitoring wells are needed, soil samples will be collected from the upper (0 - 1' bgs) and lower intervals (3 - 5' bgs) at one location (054SB035) and analyzed for TOC, and for SVOCs and metals according to the SPLP method. Also, the two shallow monitoring wells remaining at the site (NBCE021003 and NBCE054002) will be re-sampled for metals to determine if the IM removal has affected metal concentrations in shallow groundwater. Each proposed sample location is illustrated on Figure 2.1. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

Zone E RFI Work Plan Addendum
 Charleston Naval Complex
 Section 2 – AOCs/SWMUs Requiring Additional Investigative Activities
 Revision No. 0

Table 2.1
SWMUs 21 and 54 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
054SCS01 - 054SCS10	Soil (0-1' bgs)	10	Metals	Confirmation samples for IM soil removal.
054SB035	Soil (0-1' bgs) (3-5' bgs)	1	*SPLP Metals and SVOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
NBCE021003, NBCE054002	Groundwater	2	Metals	Re-sample to determine if metal concentrations were affected by IM removal action.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

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2.2 SWMU 22, Old Plating Shop Wastewater Treatment System (WWTS); SWMU 25, Building 44, Old Plating Operation; and AOC 554, Paint Shop, Former Building 1003

SWMUs 22 and 25 and AOC 554, northwest of the intersection of McMillan and Hobson Avenues in Zone E, have been grouped for investigative purposes based on their proximity to one another and the similarity of materials likely to be present. Figure 1.1 shows site locations and Figure 2.2 shows site features. SWMU 22, the Old Plating Shop Wastewater Treatment System, was originally constructed in 1972 and consisted primarily of a 5-foot by 5-foot by 8-foot concrete collection sump divided in half. This unit operated until approximately 1983, when the new metal plating waste treatment facility began operation. SWMU 25, an electroplating operation in the southwestern portion of Building 44 (Building 44 Annex) until 1983, housed approximately 40 metal tanks of plating solution. The concrete floor around SWMU 25 showed signs of deterioration prior to the process tank removal in 1992. AOC 554 is the former location of Building 1003, which was used as a paint shop from approximately 1909 to 1940. No additional information is known about this unit's size, design features, or operating practices. SWMUs 22 and 25 have been the subject of previous assessments in conjunction with RCRA closure activities and preliminary RFI field work conducted in the fall of 1993. Media sampled included soil, groundwater, waste material, and equipment. Section 10.3 of the *Draft Zone E RFI Report* provides additional information.

The southwest portion of Building 44 (SWMU 25) was removed by the Navy Detachment during an IM removal action in the spring of 1997. The Building 44 annex and concrete foundation were demolished and removed and soil samples collected to delineate the extent of any contamination under the foundation. A summary of the IM activities, including sample results, is available in the *Completion Report Process Closure/Demolition for SWMU 25 (Building 44 Annex)* (Navy Detachment, June 30, 1997) and the *SWMU 25 Investigation Report* (Navy Detachment, September 14, 1998), which will be documented in the *Final Zone E RFI Report*.

2.2.1 Previous Field Work

Soil

Soil borings were advanced within the SWMU 22/SWMU 25/AOC 554 area to assess the extent of COPCs identified in the two previous sampling events. Soil was sampled in one round from the upper and lower intervals (0 to 1 foot bgs and 3 to 5 feet bgs) at 13 borings advanced during the field investigation. Samples were also collected at the upper and lower intervals from the shallow monitoring well. All proposed upper-interval samples were collected plus 13 of the proposed 14 lower-interval samples. A subsurface obstruction prevented collection of one lower-interval sample at SWMU 25.

All soil samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, pH, and organotins. Three upper-interval samples and one lower-interval sample were selected as duplicates and analyzed at DQO Level IV for Appendix IX analytical parameters, which includes the analytical suite proposed for the site. The samples were also analyzed for a more comprehensive list of VOCs (where applicable), SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. The soil data, summarized in Section 10.3.3 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified during this review are discussed in Section 2.2.2 below.

In addition, soil samples were collected from the upper and lower intervals at 14 locations during the Navy Detachment's IM sampling activities. Results are detailed in the *SWMU 25 Investigation Report* (Navy Detachment, September 14, 1998) and will be included in the *Final Zone E RFI Report*.

Groundwater

One shallow monitoring well was installed and sampled four times during the investigation to assess groundwater quality. Three existing wells, installed during the previous SWMU 25 investigation, were also sampled four times during the field investigation. Groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins at DQO Level III. No samples were selected as duplicates at this site. The groundwater data are detailed in Section 10.3.5 and Appendix H of the *Draft Zone E RFI Report*.

2.2.2 Data Gaps

Surface Soil

Chromium exceeded its RBC and background concentration in one upper-interval soil sample at boring 025SB009 during the initial phase of the investigation. Soil in this area was excavated during the IM removal action and additional samples indicated lead in surface soil exceeded the industrial cleanup level (1,300 milligrams per kilogram [mg/kg]). Lead contamination has been delineated to the east by soil boring 025SB018, to the west by boring 025SB021, to the north by 025SB022, and to the south by 025SB011.

Subsurface Soil

Previous investigation of SWMUs 22 and 25 and AOC 554 indicated VOCs, SVOCs, pesticides, and metals at concentrations exceeding their SSLs. The location where the most constituents exceeded SSLs in previous sampling events (location 025SB015) was selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The soil samples will be analyzed for TOC, and for VOCs, SVOCs, pesticides, and metals according to the SPLP method. After calculation of the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific

SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for site shallow monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. The volatile organics tetrachloroethene (PCE) and trichloroethene (TCE) exceeded their MCLs in monitoring well NBCE025003 during the third and fourth quarter sampling events and PCE in well NBCE025001 during third quarter sampling only. Inorganics that exceeded their MCLs were antimony, cadmium, chromium, nickel, and thallium. They were detected throughout each quarterly sampling, mainly in monitoring well NBCE025003. Cadmium and chromium also exceeded their MCLs in monitoring well NBCE025002 during each sampling event; chromium and thallium were detected in monitoring well NBCE025004 during one sampling event only.

2.2.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.2 summarizes sample matrices and the proposed analytical parameters.

One additional soil boring is proposed to determine the leaching characteristics of contaminants that exceeded SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 5' bgs) at soil boring 025SB015 and analyzed for TOC, and for VOCs, SVOCs, pesticides, hexavalent chromium, cyanide, and metals according to the SPLP method. All sampling procedures will adhere to the *CNC Final Comprehensive RFI Work Plan*.

In addition, monitoring wells will be re-sampled for VOCs and metals due to temporal variation between sampling events and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will also be installed to

further delineate the solvent plume in the northern portion of Zone E. These results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment alternatives. Each proposed sample location is shown on Figure 2.2. Groundwater vertical profile sample locations are shown on Figure 1.2.

**Table 2.2
 SWMUs 22, 25 and AOC 554 Sampling and Analysis Plan**

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
025SB015	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, VOCs, SVOCs, Pesticides, Hexavalent Chromium, and Cyanide; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
NBCE025001 - NBCE025004	Groundwater	4	VOCs, Metals	Re-sample to determine effect of temporal variation; degradation and attenuation of VOCs; and metal concentrations.
Vertical Profile Samples	Groundwater	Various	VOCs	Vertical profile points will be installed to the west and south to delineate solvent plume.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

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2.3 SWMU 65, Lead Storage (Includes AOC 544, Former Pickling Plant and AOC 546, Galvanizing Shop/Pickling Shop)

SWMU 65, AOC 544, and AOC 546 were combined into one investigation because of their proximity to one another. Figure 1.1 shows site locations and Figure 2.3 shows site features. SWMU 65 was a lead storage area where lead blankets and shielding materials were stored inside on pallets and shelves on a paved area south of Building 221. Scrap lead awaiting disposal was also staged in this area. AOC 544 is the site of a former pickling plant where pickling tanks were covered by a roof from 1940 to 1970, when a single-story structure (Building 221) was built to house the pickling operations. Operations were discontinued in 1984 and the process equipment was removed. AOC 546 was a galvanizing/pickling shop that operated inside former Building 1025 from the early 1920s until 1967. Building 1025 was at Building 3's current location until 1942, when it was relocated southwest of Building 74. No information was found regarding operations there. Both sites are currently covered with pavement or structures. Section 10.6 of the *Draft Zone E RFI Report* provides additional site information.

2.3.1 Previous Field Work

Soil

Soil borings were advanced within the SWMU 65/AOC 544/AOC 546 area to assess the presence of any contamination at these sites during the initial phase of the RFI. Soil was sampled in two rounds from 13 borings advanced during the field investigation, including samples collected at upper and lower intervals (0 to 1 foot bgs and 3 to 5 feet bgs) for the six proposed shallow monitoring well locations. Twelve upper-interval and 10 lower-interval samples were collected during both sampling rounds. Two lower-interval samples at SWMU 65 could not be collected due to subsurface obstructions (large rocks) below 2 feet bgs. One upper- and one lower-interval sample at location 546SB001 could not be collected due to surface and subsurface obstructions (also large rocks). Instead, one sediment sample was collected from a storm drain (catch basin) in the AOC 546 area.

All first-round samples were submitted for analysis at DQO Level III for pH, organotins, and the standard suite of parameters (VOCs, SVOCs, pesticides/PCBs, metals, and cyanide). Two upper-interval and two lower-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the parameters proposed for the site, plus a more comprehensive list of VOCs and SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Second-round sampling was performed at SWMU 65 during the installation of two additional shallow monitoring wells. Second-round samples were collected from both intervals and submitted for analysis of SVOCs and metals only, based on results of first-round sampling. The soil data, summarized in Section 10.6.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified during this review are discussed in Section 2.3.2 below.

Groundwater

One deep and eight shallow groundwater monitoring wells were installed and sampled in two rounds at SWMU 65 and AOCs 544 and 546. All first-round samples were submitted for analysis of VOCs, SVOCs, pesticides/PCBs, metals, cyanide, pH, chlorides, sulfates, TDS, and organotins at DQO Level III. One shallow groundwater sample was duplicated and submitted for analysis at DQO Level IV for the parameters listed above plus a more comprehensive list of VOCs and SVOCs, herbicides, organophosphorus pesticides, dioxin and hexavalent chromium. Second-round monitoring wells were sampled and analyzed for a reduced list of analytical parameters based on first-round analytical results: VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, and TDS. The groundwater data are summarized in Section 10.6.4 and Appendix H of the *Draft Zone E RFI Report*.

2.3.2 Data Gaps

Surface Soil

Two pesticides, aldrin and dieldrin, exceeded their industrial RBCs at soil boring 544SB001. Based on review of the data, these pesticides have been delineated to the north, south, and east by soil borings 065SB006, 544SB002, and 065SB001, respectively. Their extent has not been defined to the west. Figure 2.3 shows where contaminants exceeded screening levels.

Subsurface Soil

Previous investigations of SWMU 65 indicated VOCs, SVOCs, pesticides, and metals exceeding their SSLs. The sample location where the most constituents exceeded SSLs in previous sampling events (location 544SB001) was selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The soil samples will be analyzed for TOC, and for VOCs, SVOCs, pesticides, and metals according to the SPLP method. After calculation of the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for site monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. Organics exceeding their MCLs in shallow monitoring well NBCE065003 were TCE and vinyl chloride. Inorganics exceeding their MCLs were antimony, arsenic, cadmium, chromium, lead, mercury, and thallium, primarily in shallow wells NBCE065003 and NBCE065004. Most were detected in first quarter sampling only; lead exceeded its MCL in NBCE065003 throughout each quarterly sampling event. Lead has been defined to the east by NBCE065002 and

NBCE550001, to the north by NBCE065005/006, to the south by NBCE065007/008, and to the west by NBCE023001 and NBCE543001.

Deep Groundwater

VOCs exceeded RBCs and MCLs in deep well NBCE06504D. TCE exceeded its MCL in the first and second sampling events and vinyl chloride exceeded its MCL each quarter. VOC contamination has been delineated to the west by NBCE02301D, to the northwest by deep well NBCEGDE20D, to the north by NBCEGDE21D, to the northeast by NBCEGDE22D, and to the east by NBCEGDE23D.

2.3.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.3 summarizes sample matrices and proposed analytical parameters.

Soil samples will be collected from the upper (0-1' bgs) and lower interval (3-5' bgs) near location 544SB001 to delineate pesticides (aldrin and dieldrin) exceeding RBCs in surface soil and to determine leaching characteristics of contaminants exceeding SSLs. These results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment alternatives.

Monitoring wells at this site will be re-sampled for VOCs and metals due to temporal variation between sampling events and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will also be installed to further delineate VOCs (TCE and vinyl chloride) south and southwest of well NBCE06504D and west of NBCE065003/004, and to further delineate metals exceeding MCLs in shallow groundwater. Proposed sample locations are shown on Figure 2.3. Groundwater vertical profile sample locations are shown on Figure 1.2. All sampling procedures will adhere to the *CNC Final Comprehensive Work Plan*.

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**Table 2.3
 SWMU 65 and AOCs 544 and 546 Sampling and Analysis Plan**

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
544SB001	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, Pesticides, SVOCs, and VOCs; TOC	Determine the potential for leaching to groundwater and delineate pesticide contamination at 544SB001.
NBCE065001 - NBCE065006; NBCE06504D	Groundwater	7	VOCs, Metals	Re-sample to determine effect of temporal variation; degradation and attenuation of VOCs; and metal concentrations.
Vertical Profile Points	Groundwater	Various	VOCs, Metals	Vertical profile points will be installed to the south and southwest to delineate solvent plume.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846

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**2.4 SWMU 70, Building 5 Dip Tank; AOC 548, Hydraulic Elevator, Building 5;
AOC 549, Scrap Yard, Building 5**

SWMU 70 and AOCs 548 and 549 were combined into one investigation because of their proximity to one another and their potential to have similar COPCs. Figure 1.1 shows site locations and Figure 2.4 shows site features. SWMU 70 is a former dip tank at the northwest corner of Building 5 used to treat wood with a fire-retardant chemical. The tank was removed in 1981 when the shop began receiving pre-treated lumber. No information indicated when operations began. AOC 548, an electric hydraulic elevator, is on the western side of Building 5 in a shaft paved with approximately 8 inches of concrete. A container captures hydraulic fluid leaks and returns the fluid to the main reservoir, but this containment system has not been in place throughout the AOC's operation. AOC 549 is the site of a former scrap yard north of Building 5 which operated in the 1920s and 1930s. No information was found regarding AOC 549 operations. This area is currently paved with concrete and asphalt. Section 10.8 of the *Draft Zone E RFI Report* provides additional site information.

2.4.1 Previous Field Work

Soil

Soil borings were advanced within the SWMU 70/AOC 548/AOC 549 area to assess the presence of any contamination at these sites during the initial phase of the RFI. Soil was sampled in two rounds from 23 borings advanced during the field investigation, including samples collected at upper and lower intervals (0 to 1 foot bgs and 3 to 5 feet bgs) for the five proposed shallow monitoring well locations. Twenty-two upper-interval and 21 lower-interval samples were collected during both sampling rounds. One upper- and two lower-interval samples could not be collected due to surface and subsurface obstructions (heavy equipment and machinery).

All first-round samples were submitted for analysis at DQO Level III for pH, organotins and the standard suite of parameters (VOCs, SVOCs, pesticides/PCBs, metals, and cyanide). One

upper-interval sample selected as a duplicate was analyzed at DQO Level IV for Appendix IX 1
analytical parameters, which include the parameters proposed for the site, plus a more 2
comprehensive list of VOCs and SVOCs, herbicides, hexavalent chromium, organophosphorus 3
pesticides, and dioxins. After first-round analytical results were compared with 4
USEPA Region III RBCs (April 1996), second-round samples were submitted for analysis of 5
SVOCs and metals only, based on first-round results. The soil data, which are summarized in 6
Section 10.8.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if 7
they satisfied the requirements for delineating the nature and extent of contamination. Soil data 8
gaps identified during this review are discussed in Section 2.4.2 below. 9

Groundwater

One deep and five shallow monitoring wells were installed and sampled four times during the field 10
investigation to assess groundwater quality at SWMU 70 and AOCs 548 and 549. Groundwater 11
samples were analyzed at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, 12
pH, chlorides, sulfates, TDS, and organotins. No samples were selected as duplicates at this site. 13
The groundwater data are summarized in Section 10.8.4 and Appendix H of the *Draft Zone E* 14
RFI Report. 15
16

2.4.2 Data Gaps

Surface Soil

Benzo(a)pyrene equivalents (BEQs) in surface soil at borings 549SB002 and 549SB010 exceeded 17
the industrial RBC (780 micrograms per kilogram [$\mu\text{g}/\text{kg}$]). These constituents have been 18
delineated by soil borings 549SB001 to the east, 549SB004 to the west, and 549SB013 and 19
549SB014 to the south. Copper and lead were detected above their RBCs in soil borings 20
549SB009 and 549SB010, respectively. These constituents have been delineated by soil borings 21
549SB001 to the east, 549SB006 and 549SB007 to the west, and 549SB013 to the south. During 22
the initial phase of the investigation, several attempts were made to collect samples along the 23
24
25

northern edge of AOC 549, inside of Building 3. However, attempts to collect samples were 1
unsuccessful due to surface and subsurface obstructions (heavy equipment and machinery and 2
reinforced concrete supports). 3

Subsurface Soil 4

Previous investigation of SWMU 70 and AOCs 548 and 549 indicated VOCs, SVOCs, and metals 5
exceeding their SSLs. The sample locations where the most constituents exceeded SSLs in 6
previous sampling events (locations 548SB003 and 549SB009) were selected for soil sampling 7
from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the 8
USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional 9
monitoring wells. The soil samples will be analyzed for TOC, and for VOCs, SVOCs, and/or 10
metals according to the SPLP method. After calculating the site-specific SSLs, additional data 11
gaps may be identified and additional sampling may be required. Results of the site-specific 12
SSL calculation and the subsequent screening results for CMCOCs will be presented in the 13
Final Zone E RFI Report. 14

Shallow Groundwater 15

TCE in shallow wells NBCE070001, NBCE070002, and NBCE549003 exceeded its MCL each 16
quarter. Vinyl chloride exceeded its MCL (2 micrograms per liter [$\mu\text{g/L}$]) in well NBCE549003 17
during the second, third, and fourth quarter sampling, and in well NBCE549002 during the third 18
quarter. These constituents have been identified to the north by monitoring wells at 19
AOCs 538/539, and to the east by well NBCE549001. Areas to the west and south will be 20
delineated in this investigation during vertical profile groundwater sampling. Chromium exceeded 21
its MCL in wells NBCE070001/002 and NBCE549003 each quarter. Antimony and cadmium 22
exceeded their MCLs in well NBCE070001 during several quarterly sampling events. These 23
constituents have been defined to the east by well NBCE549001 and to the north by 24

wells NBCE538001 and NBCE539001. Areas to the west and south will be delineated in this investigation during vertical profile groundwater sampling.

Deep Groundwater

PCE, TCE, and chromium exceeded their MCLs in well NBCE07001D each quarter. These constituents have been delineated to the north by deep wells NBCE53801D and NBCE53901D. Areas to the west and south will be delineated in this investigation during vertical profile groundwater sampling. Deep well NBCE07001D also exhibited an extremely high pH, which was determined to be a laboratory error.

2.4.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.4 summarizes sample matrices and proposed analytical parameters.

Two additional soil borings are proposed to determine the leaching characteristics of contaminants which exceeded their SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 5' bgs) at borings 548SB03 and 549SB009 and analyzed for TOC, and for VOCs, SVOCs, pesticides, hexavalent chromium, cyanide, and metals according to the SPLP method.

Monitoring wells at this site will be re-sampled for VOCs and metals due to temporal variation between sampling events and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will be installed to further delineate VOCs (TCE, PCE, and vinyl chloride) and metals in groundwater at this site. Deep well NBCE07001D will also be analyzed for hexavalent chromium. All site monitoring wells will be monitored for pH to refute the previous laboratory results that were mistakenly analyzed for pH out of preserved sample containers rather than unpreserved containers. All analytical results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment

alternatives. Proposed sample locations are shown on Figure 2.4. Groundwater vertical profile
 sample locations are shown on Figure 1.2. All sampling procedures will adhere to the
 CNC Final Comprehensive Work Plan.

Table 2.4
 SWMU 70 and AOCs 548 and 549 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
548SB003	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, VOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
549SB009	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, SVOCs; TOC	Use to calculate site-specific SSL and determine the potential for leaching to groundwater.
NBCE070001, NBCE070002, NBCE549001 - NBCE549003, NBCE07001D	Groundwater	6	VOCs, Metals, pH	Re-sample to determine effect of temporal variation; degradation and attenuation of VOCs; and metal concentrations.
Vertical Profile Samples	Groundwater	Various	VOCs	Vertical profile points will be installed to the west and south to delineate solvent plume.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

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2.5 SWMU 83, Foundry, Building 9; SWMU 84, Lead Storage, Building 9; AOC 574, Building 9 Fuel Tank

SWMUs 83 and 84, and AOC 574 were combined into one investigation because of their proximity to one another and their potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.5 shows site features. SWMU 83 is a former foundry that operated in Building 9 until 1991. The building currently houses electrical power supply equipment, capacitors, transformers, rectifiers, furnaces, and ovens, and is also used to repair hydraulic equipment. The foundry, built in 1906, was used to cast metal parts during ship refitting. Most recently, the foundry was used to repair hydraulic equipment and as a power substation providing electricity for smoldering activities. SWMU 84 is an area outside Building 9 that was used to store lead blankets and shielding. The lead-containing materials were placed either on pallets or directly on the concrete pavement. No containment structures were associated with this unit and no information was found regarding its operational period. AOC 574 was the site of a 3,700-gallon aboveground storage tank (AST) east of Building 9. The inactive AST, which previously contained fuel oil for the furnaces and torches in Building 9, is in an unpaved area with no secondary containment. No information was found regarding AST operations. SWMU 84 and AOC 574 have not been previously investigated. Section 10.10 of the *Draft Zone E RFI Report* provides additional information regarding previous activities.

2.5.1 Previous Field Work

Soil

Soil was sampled in two rounds at SWMUs 83 and 84, and AOC 574; in all, 27 upper- and lower-interval samples were collected during the investigation. The soil data, summarized in Section 10.10.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if they satisfied the requirements for delineating the nature and extent of contamination. Soil data gaps identified during the review are discussed in Section 2.5.2 below.

Groundwater

One deep monitoring well and seven shallow monitoring wells were installed and sampled four times to assess groundwater quality at SWMUs 83 and 84, and AOC 574. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins. One sample was duplicated and submitted for analysis at DQO Level IV for the parameters listed above plus a more comprehensive list of VOCs and SVOCs, herbicides, organophosphorus pesticides, dioxin, and hexavalent chromium. The groundwater data are summarized in Section 10.10.4 and Appendix H of the *Draft Zone E RFI Report*.

2.5.2 Data Gaps

Surface Soil

BEQ concentrations exceeded the industrial RBC (780 $\mu\text{g}/\text{kg}$) in several soil borings including 083SB001, 083SB006, 083SB010, 084SB001, 084SB003, 084SB004, 084SB005, 084SB007, 084SB008, 574SB001, 574SB002, 574SB003, 574SB005, 574SB007, and 574SB008. BEQs have been delineated to the west by borings at AOC 573, to the south by borings 083SB009, 084SB009, and borings at AOC 580, and to the east by borings at AOC 576.

Lead exceeded its industrial RBC (1,300 mg/kg) in soil boring 083SB010. Lead contamination has been delineated to the east by boring 083SB001, to the west by 084SB001, and to the south by 083SB009. Arsenic exceeded its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg) at soil boring 084SB007. Arsenic contamination in soil has been defined to the east by boring 084SB004, to the south by 084SB005 and 084SB008, and to the west by 573SB001. Building 9 to the north is covered by surface features which also serve as a contaminant barrier.

Subsurface Soil

Previous investigation of SWMUs 83, 84 and AOC 574 indicated VOCs, SVOCs, and metals exceeding their SSLs. The sample locations where the most constituents exceeded SSLs in previous sampling events (084SB004 and 574SB008) were selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The samples will be analyzed for TOC, and for VOCs, SVOCs, and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Thallium was detected in shallow wells NBCE083001, NBCE084002, and NBCE574001 in one of four quarterly sampling events. These results are being evaluated and will be addressed in the *Final Zone E RFI Report*.

Deep Groundwater

Arsenic exceeded its MCL (50 µg/L) in deep well NBCE57401D in each quarterly sampling event. Arsenic has been detected in deep groundwater at several deep monitoring wells near AOC 574, including wells installed at SWMU 145 and AOCs 566, 576, and 580. These results indicate an arsenic plume in deep groundwater in the center of Zone E, which will be addressed in the Corrective Measures Study (CMS) for the Zone E RFI.

2.5.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.5 summarizes sample matrices and proposed analytical parameters.

One soil boring will be installed to delineate lead concentrations in surface soil (0-1' bgs) near the northern edge of boring 083SB010. The sample will be analyzed for lead at DQO Level III. Two soil borings will also be installed to address BEQ contamination exceeding its SSL. Soil samples will be collected at locations 084SB004 (15,629 $\mu\text{g}/\text{kg}$) and 574SB008 (12,438 $\mu\text{g}/\text{kg}$), which exhibited the highest BEQ concentrations. These samples will be analyzed for TOC, and for VOCs, SVOCs, and metals according to the SPLP method to determine leaching characteristics of contaminants that exceeded their SSLs. Proposed sampling locations are shown on Figure 2.5. All sampling procedures will adhere to the CNC *Final Comprehensive Work Plan*.

Table 2.5
SWMUs 83 and 84 and AOC 574 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
083SB011	Soil (0-1' bgs)	1	Lead	Further delineate lead concentrations near the northern edge of 083SB010.
084SB004, 574SB008	Soil (0-1' bgs) (3-5' bgs)	4	*SPLP Metals, SVOCs, and VOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.6 SWMU 87, Less-than-90-Day Accumulation Area, Building 80; SWMU 172, Steam Cleaning Operations, Building 80; and AOC 564, Oil/Water Separator, Building 80

SWMUs 87 and 172, and AOC 564 were combined into one investigation due to their proximity to one another and their potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.6 shows site features. SWMU 87 is a former less-than-90-day accumulation area that was once a part of the CNC hazardous waste management system. The metal building with an asphalt foundation was located north of Building 80. Wastes were accumulated in closed, palletized 55-gallon drums and palletized plastic bags. The accumulation area was taken out of service in March 1994. SWMU 172 was a concrete-paved area north of Building 80 where small engines, generators, and construction equipment were steam-cleaned. The concrete was curbed and sloped so liquids would run off into two storm drains. This area, which was not enclosed or roofed, has been out of service since 1994. AOC 564 is a 300-gallon oil-water separator (OWS) north of Building 80. Wastewater from machining and parts cleaning in Building 80 drains onto a sloped asphalt ramp and into an exterior drain connected to the OWS, which has been in operation for more than 25 years. Section 10.11 of the *Draft Zone E RFI Report* provides additional information.

2.6.1 Previous Field Work

Soil

Soil borings were advanced within the SWMU 87/SWMU 172/AOC 564 area to assess the presence of any contamination at these sites during the initial phase of the RFI. Samples were collected from eight soil borings from the upper interval (0 to 1 foot bgs) and the lower interval (3 to 5 feet bgs) at each location. Soil samples were also collected at both intervals for the two shallow monitoring wells.

All samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, and organotins. Two upper-interval samples selected as duplicates were analyzed

at DQO Level IV for Appendix IX parameters, including the parameters proposed for the site, and a more comprehensive list of VOCs and SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. The soil data are summarized in Section 10.11.2 and Appendix H of the *Draft Zone E RFI Report*.

Groundwater

One deep and two shallow monitoring wells were installed and sampled four times to assess groundwater quality at SWMUs 87 and 172 and AOC 564. Samples were analyzed at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins. No samples were selected as duplicates at this site. The groundwater data are summarized in Section 10.11.4 and Appendix H of the *Draft Zone E RFI Report*.

2.6.2 Data Gaps

Surface Soil

Arsenic exceeded its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg) in boring 087SB001. Arsenic has been delineated to the east by boring 172SB002, and to the south by 564SB002. Surface soil data gaps need to be addressed north and west of boring 087SB001.

Subsurface Soil

Previous investigation of SWMUs 87 and 172 and AOC 564 indicated VOCs, SVOCs, pesticides, and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells, the sample locations with the most constituents exceeding SSLs in previous sampling events (locations 087SB001 and 172SB006) were selected for soil sampling from the upper and lower intervals. The soil samples will be analyzed for TOC, and for VOCs, SVOCs, pesticides and/or metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results

of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for site shallow monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. Several VOCs, including 1,2-dichloroethene (DCE), TCE, and vinyl chloride, exceeded their MCLs in well NBCE172001. 1,2-DCE and TCE exceeded their MCLs in the last quarterly sampling event and vinyl chloride exceeded its MCL in the second, third, and fourth quarter sampling events. VOCs in shallow groundwater have been delineated to the east by well NBCE566001 and to the south by NBCE576001/002. Data gaps need to be addressed north and west of well NBCE172001.

Deep Groundwater

No data gaps exist for deep groundwater at this site.

2.6.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.6 summarizes sample matrices and proposed analytical parameters.

Two soil borings will be advanced and surface soil (0-1' bgs) sampled to delineate arsenic north and west of boring 087SB001. Samples will be analyzed for metals at DQO Level III. Soil samples will also be collected from the upper (0-1' bgs) and lower interval (3-5' bgs) and submitted for SPLP and TOC analysis at two locations (087SB001 and 172SB006) to determine leaching characteristics of contaminants that exceeded their SSLs.

Shallow monitoring wells will be re-sampled for VOCs due to temporal variation between 1
 sampling events and to determine the potential for degradation and attenuation of these 2
 constituents. A series of vertical profile groundwater sample locations will also be installed west 3
 of SWMU 172 to help delineate the solvent plume in the center of Zone E. Analytical results will 4
 be presented in the *Final Zone E RFI Report* along with recommendations for treatment 5
 alternatives. Proposed sample locations are illustrated on Figure 2.6. Groundwater vertical 6
 profile sample locations are shown on Figure 1.2. All sampling procedures will adhere to the 7
 CNC *Final Comprehensive RFI Work Plan*. 8

Table 2.6
 SWMUs 87 and 172 and AOC 576 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
087SB002, 087SB003	Soil (0-1' bgs)	2	Metals	Delineate arsenic to the north and west of 087SB001.
087SB001	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, Pesticides, and SVOCs; TOC	Use to calculate site-specific SSLs and determine leaching potential to groundwater.
172SB006	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, SVOCs, and VOCs; TOC	Use to calculate site-specific SSLs and determine leaching potential to groundwater.
NBCE172001, NBCE172002	Groundwater	2	VOCs	Re-sample to determine effect of temporal variation; and degradation and attenuation of VOCs.
Vertical Profile Samples	Groundwater	Various	VOCs	Vertical Profile points will be installed to the west to delineate solvent plume.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.7 SWMU 102, Mercury Spill, Building 79

SWMU 102 is a mercury spill area under the center of Building 79, which housed an ordnance shop from 1943 to 1966. Figure 1.1 shows site locations and Figure 2.7 shows site features. Several hazardous material spills, as well as cleanup activities, have been documented at SWMU 102 since 1976; however, no environmental media data were identified from previous investigations. A mercury spill is reported to have seeped under the floor, forming a pool approximately 10 feet in diameter. The mercury release reportedly occurred in the central portion of the building in 1969. The level of cleanup is not known. Section 10.14 of the *Draft Zone E RFI Report* provides additional site information.

2.7.1 Previous Field Work

Soil

Soil was sampled in three rounds at SWMU 102 to assess the presence of any contamination. Forty-three soil samples were collected from the upper interval (0 to 1 foot bgs) and 39 were collected from the lower interval (3 to 5 feet bgs) of 46 borings advanced during the field investigation. Soil samples were also collected at both intervals from the site shallow monitoring well. Three upper-interval samples and seven lower-interval samples could not be collected due to obstructions.

All first-round samples were submitted for analysis at DQO Level III for organotins and the standard parameters (VOCs, SVOCs, pesticides/PCBs, metals, and cyanide). One upper-interval sample was selected as a duplicate and submitted for analysis at DQO Level IV for the Appendix IX analytical parameters including mercury, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Second and third rounds were completed to more accurately delineate the mercury contamination plume. The upper-interval samples at 102SB010, 102SB011, and 102SB012 were screened only for mercury using a mercury vapor analyzer. All second- and third-round samples were submitted for mercury analysis at DQO Level III. Six of

the additional samples (three upper interval and three lower interval) were duplicated and analyzed at DQO Level IV for mercury only. Two of the additional samples from the upper interval were duplicated and analyzed at DQO Level IV for Appendix IX analytical parameters including SVOCs, pesticides, metals, and cyanide. The soil data, which are summarized in Section 10.14.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified during the review are discussed in Section 2.7.2 below.

Groundwater

One shallow monitoring well was installed and subsequently sampled four times during the field investigation to assess groundwater quality at SWMU 102. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins. No samples were selected as duplicates at this site. The groundwater data are summarized in Section 10.14.4 and Appendix H of the *Draft Zone E RFI Report*.

2.7.2 Data Gaps

Surface Soil

BEQs and arsenic exceeded their industrial RBCs at several locations. Specifically, BEQs exceeded its industrial RBC (780 $\mu\text{g}/\text{kg}$) at soil borings 102SB002, 102SB003, 102SB004, 102SB005, 102SB008, 102SB034, 102SB036, 102SB037, 102SB038, 102SB040, 102SB042, and 102SB045. BEQs have been delineated to the west of soil borings 102SB040 and 102SB042 by 102SB041 and soil borings at AOC 590 to the west. Arsenic exceeded its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg) at soil borings 102SB034, 102SB036, and 102SB038 along the western portion of SWMU 102. Based on review of the data, BEQs and arsenic have not been delineated to the west of SWMU 102.

Subsurface Soil

Previous investigation of SWMU 102 indicated SVOCs, pesticides, and metals exceeding their SSLs. The sample locations where the most constituents exceeded SSLs in previous sampling events (locations 102SB036 and 102SB008) were selected for soil sampling from the upper and lower intervals to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The soil samples will be analyzed for TOC, and for SVOCs, pesticides, and metals according to the SPLP method. After calculation of the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Thallium was detected in well NBCE102001 during one quarterly sampling event at a concentration (3.1 µg/L) which exceeded its MCL (2 µg/L) and it is not considered a COC at this site.

2.7.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.7 summarizes sample matrices and proposed analytical parameters.

Six additional soil borings will be advanced and sampled from the upper interval (0 to 1' bgs) to delineate BEQ and arsenic contamination in surface soil along the northeast edge of SWMU 102. Soil samples will be analyzed for SVOCs and metals at DQO Level III. Soil samples will also be collected from the upper interval (0 to 1' bgs) and lower interval (3 to 5' bgs) at three locations where constituents exceeded RBCs and SSLs to determine leaching characteristics of contaminants which exceeded their respective SSLs.. Samples will be analyzed for TOC and for SVOC,

pesticides, and metals according to the SPLP method. Results will be reviewed to determine if 1
 additional monitoring wells are needed in this area. All sampling procedures will adhere to the 2
 CNC *Final Comprehensive Work Plan*. Proposed sample locations are illustrated on Figure 2.7. 3

Table 2.7
SWMU 102 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
102SB047 - 102SB052	Soil (0-1' bgs)	6	SVOCs, Metals	Delineate BEQs and arsenic along northeast edge of SWMU 102.
102SB004, 102SB008, 102SB036	Soil (0-1' bgs) (3-5' bgs)	6	*SPLP SVOCs, Pesticides, and Metals; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.8 SWMU 106, Blast Area, Dry Dock 3; AOC 603, Burning Dump, Dry Dock 3 Area 1

SWMU 106 and AOC 603 were combined into one investigation due to their proximity to one 2
another and their potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.8 3
shows site features. SWMU 106 was an abrasive blasting area near Drydocks 3 and 4. AOC 603 4
is on an outside area paved with asphalt/concrete; however, at one time this area was merely 5
graded and covered with rock. When blasting operations occurred, temporary structures were 6
erected using scaffolding and herculite to contain blast material. Steel grit and sodium bicarbonate 7
are the reported materials used for blasting, although blasting operations are rarely conducted 8
here. AOC 603 had not been previously investigated. However, SWMU 106 was investigated 9
in June of 1989 in the area between Drydocks 3 and 4. Section 10.15 of the *Draft Zone E RFI* 10
Report provides additional site information. 11

2.8.1 Previous Field Work 12

Soil 13

Seven soil borings were advanced within the SWMU 106/AOC 603 area during the initial phase 14
of the RFI to assess the presence of any contamination. Soil was sampled in one round at seven 15
upper-interval (0 to 1 foot bgs) and seven lower-interval (3 to 5 feet bgs) locations and submitted 16
for analysis. Soil samples were also collected at both intervals for the site shallow monitoring 17
well. All samples were submitted for analysis at DQO Level III for organotins and the standard 18
parameters — VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. The grid well location along 19
the northern edge of the site was sampled at the same level for the same parameters, except 20
organotins. No samples were selected as duplicates at this site. The soil data, which are 21
summarized in Section 10.15.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed 22
to determine if they satisfied the RFI requirement for delineating the nature and extent of 23
contamination. Soil data gaps identified during the review are discussed in Section 2.8.2 below. 24

Groundwater

One deep and one shallow monitoring well were installed and sampled four times to assess groundwater quality during the field investigation. One deep and one shallow well proposed for this site were not installed because a supplemental well pair (NBCEGDE003 and NBCEGDE03D) already existed nearby. The shallow and deep grid-based well pair, installed adjacent to AOC 603, was used to assess groundwater along the northern boundary of AOC 603. Groundwater samples from SWMU 106 and AOC 603 were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins. The grid-based shallow and deep well pair samples were not submitted for organotins. No duplicate samples were collected at this site. Groundwater data are summarized in Section 10.15.4 and Appendix H of the *Draft Zone E RFI Report*.

2.8.2 Data Gaps

Surface Soil

Arsenic exceeded its industrial RBC at soil boring 106SB001. Arsenic has been delineated to the north by soil samples from shallow well NBCEGDE003, to the west by soil boring 603SB002, and to the south by 603SB004.

Subsurface Soil

Previous investigation of SWMU 106 and AOC 603 indicated SVOCs, pesticides, and metals exceeding their SSLs. The sample locations where the most constituents exceeded SSLs in previous sampling events (locations 106SB003 and 603SB003) were selected for soil sampling from the upper and lower intervals to obtain the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The soil samples will be analyzed for TOC, and for SVOCs, pesticides, and/or metals according to the SPLP method. After calculating the site-specific SSLs, additional data

gaps may be identified and additional sampling may be required. Analytical results and site-specific SSL calculations will be documented in the *Final Zone E RFI Report*.

Shallow Groundwater

Thallium was detected in well NBCE106001 during one quarterly sampling event at a concentration (3.7 $\mu\text{g/L}$) that exceeded its MCL (2 $\mu\text{g/L}$), and is not considered a COC at this site.

Deep Groundwater

Thallium was detected in well NBCE10601D during one quarterly sampling event at a concentration (5.0 $\mu\text{g/L}$) that exceeded its MCL (2 $\mu\text{g/L}$), and is not considered a COC at this site.

2.8.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.8 summarizes sample matrices and proposed analytical parameters.

One additional soil boring will be advanced and sampled from the upper interval (0 to 1 foot bgs) on the northeast edge of SWMU 106 to delineate arsenic in surface soil at soil boring 106SB001. The sample will be analyzed for metals at DQO Level III. Soil samples will also be collected from the upper interval (0 to 1 foot bgs) and lower interval (3 to 5 feet bgs) at borings 603SB002 and 603SB003 southwest of Drydock 3. They will be submitted for analysis of TOC, and for SVOCs, pesticides, and metals according to the SPLP method to determine leaching characteristics of contaminants that exceeded their SSLs. An attempt will also be made to collect one sediment sample from the drain in Drydock 3 for SVOCs and metals analysis. All sampling procedures will adhere to the *CNC Final Comprehensive Work Plan*. Proposed sample locations are illustrated on Figure 2.8.

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**Table 2.8
 SWMU 106 and AOC 603 Sampling and Analysis Plan**

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
106SB004	Soil (0-1' bgs)	1	Metals	Delineate arsenic to the northeast of 106SB001.
603SB002 603SB003	Soil (0-1' bgs) (3-5' bgs)	4	*SPLP SVOCs, Pesticides, and Metals; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
Drain in Dry Dock 3	Sediment	1	SVOCs, Metals	Assess sediment in drain.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.9 SWMU 170, PCB Removal Operations, Dry Dock 1 Area; SWMU 171, PCB Removal Operations, Dry Dock 2 Area

SWMUs 170 and 171 were combined into one investigation due to their proximity to one another and their potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.9 shows site features. These two storage areas are immediately west of Dry Docks 1 and 2. Missile launching tubes removed from decommissioned ballistic missile submarines were stored in these areas for removal of PCB-containing components. No secondary containment was in place at the missile tube dismantling areas. It is estimated that missile tube dismantling began around the late 1980s. Section 10.17 of the *Draft Zone E RFI Report* provides additional information.

2.9.1 Previous Field Work

Soil

Soil borings were advanced within the SWMU 170/SWMU 171 area to assess the presence of any contamination during the initial phase of the RFI. Thirty-five of the proposed 40 upper-interval samples (0 to 1 foot bgs) and 27 of the proposed 40 lower-interval samples (3 to 5 feet bgs) were collected in one round. At SWMU 170, five lower-interval samples were not collected due to subsurface obstructions in the form of large rocks and metal pipes at a depth of 2 to 3 feet bgs. At SWMU 171, collection of five upper-interval samples was obstructed by gravel used as a base for railroad and crane tracks. Eight lower-interval samples were not collected at SWMU 171 due to gravel, concrete, or brick subsurface obstructions.

All samples were submitted for analysis at DQO Level III for PCBs. Nine of these samples were also analyzed for VOCs due to high OVA readings and/or petroleum odor in the sample and one sample was submitted for VOC and total petroleum hydrocarbon (TPH) analysis due to the possible presence of free product. Four upper-interval and three lower-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters including PCBs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. The soil data,

summarized in Section 10.17.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified during the review are discussed in Section 2.9.2 below.

Groundwater

Groundwater was not assessed at this site, but well pair NBCEGDE016/NBCEGDE16D was installed at the juncture of the two SWMUs.

2.9.2 Data Gaps

Surface Soil

The PCB Aroclor-1260 exceeded residential RBCs in surface soil at borings 171SB012 and 171SB013. PCBs have been delineated around boring 171SB013 vertically and horizontally, but the area west of 171SB012 has not been delineated for PCBs.

Subsurface Soil

No data gaps were identified in subsurface soil at SWMUs 170 and 171.

Groundwater

Monitoring wells were not installed as part of the investigation of SWMUs 170 and 171. Supplemental well pair NBCEGDE016/16D, installed near SWMUs 170 and 171, did not indicate any detections above MCLs except for arsenic, which was detected in shallow well NBCEGDE016 during the first three quarterly sampling events.

2.9.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.9 summarizes sample matrices and proposed analytical parameters.

To complete the delineation of Aroclor-1260, surface soil (0-1' bgs) will be sampled at one location along the western edge of boring 171SB012 and analyzed for PCBs at DQO Level III. The proposed sample location is illustrated on Figure 2.9. All sampling procedures will adhere to the CNC *Final Comprehensive Work Plan*.

Table 2.9
SWMU 170 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
171SB026	Soil (0-1' bgs)	1	PCBs	Delineate the extent of Aroclor-1260 in surface soil west of 171SB012

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

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2.10 AOC 538, Forge Shop, Building 6; AOC 539, Propeller Shop, Building 6 1

AOCs 538 and 539 were combined into one investigation due to their proximity to one another and 2
their potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.10 shows site 3
features. AOC 538 is a forge shop in the eastern portion of Building 6. Various metal-working 4
processes have been conducted in the shop since its construction in 1906. The most recently used 5
forge furnaces were oil-fired. Numerous quench oil tanks are also present. AOC 539, a 6
propeller shop, is in the western extension of Building 6, which was added in 1967. The 7
Zyglyo process was used here until it was replaced by the current red dye process in 1979. Zyglyo 8
was reportedly rinsed from the propellers onto the floor, and the rinse water was then washed 9
outside and drained into the storm sewer. Current operations use a red dye magnaflux process; 10
the excess waste is collected in a portable AST. Section 10.23 of the *Draft Zone E RFI Report* 11
provides additional information. 12

2.10.1 Previous Field Work 13

Soil 14

Soil borings were advanced within the AOC 538/AOC 539 area to assess the presence of any 15
contamination during the initial phase of the RFI. Thirteen upper-interval samples and 12 of the 16
13 proposed lower-interval samples were collected in one round. At AOC 538, one lower-interval 17
sample was not collected due to an obstruction. Soil samples were also collected at both intervals 18
for the three proposed shallow monitoring well locations. Based on its proximity to AOC 542, 19
two soil borings proposed for AOC 538 — 538SB002 and 538SB003 — were given AOC 542 20
identification numbers (542SB002 and 542SB006). Therefore, the sample identification sequence 21
for AOC 538 will not include soil samples from 538SB002 or 538SB003, which were used to help 22
characterize both sites. Soil boring 538SB010 was also added during the field investigation to 23
further delineate AOC 538. 24

All samples were submitted for analysis at DQO Level III for VOCs, SVOCs, and metals. 1
Two samples selected as duplicates were analyzed at DQO Level IV for 2
Appendix IX analytical parameters, which include the parameters proposed for the site plus a 3
more comprehensive list of VOCs and SVOCs, herbicides, hexavalent chromium, 4
organophosphorus pesticides, and dioxins. The soil data, which are summarized in 5
Section 10.23.2 and Appendix H of the *Draft Zone E RFI Report*, were reviewed to determine if 6
they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data 7
gaps identified during the review are discussed in Section 2.10.2 below. 8

Groundwater

 9

Two deep and two shallow monitoring wells were installed and sampled to assess groundwater 10
quality during the field investigation. One shallow monitoring well (NBCE542002) proposed for 11
AOC 538 was so close to AOC 542 that it was identified as a well for that AOC. Groundwater 12
samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, chlorides, 13
sulfates, and TDS. One duplicate sample was collected and submitted for analysis at 14
DQO Level IV for the parameters listed above, as well as herbicides, organophosphorus 15
pesticides, dioxin, and hexavalent chromium. Groundwater data are summarized in 16
Section 10.23.4 and Appendix H of the *Draft Zone E RFI Report*. 17

2.10.2 Data Gaps

 18

Surface Soil

 19

No data gaps were identified in surface soil at AOCs 538 and 539. 20

Subsurface Soil

 21

Previous investigation of AOCs 538 and 539 indicated SVOCs and metals exceeding their SSLs. 22
The sample location where the most constituents exceeded SSLs in previous sampling events 23
(location 538SB009) was selected for soil sampling from the upper and lower intervals to obtain 24

the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. The soil samples will be analyzed for TOC, and for SVOCs and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data were reviewed for analyte detections, comparison with screening levels, data trends, spatial distribution, and groundwater flow direction. Arsenic in shallow well NBCE538001 exceeded its MCL (50 µg/L) during each quarterly sampling event. Arsenic in shallow groundwater has been defined to the north by monitoring wells at AOC 530, to the west by well NBCE539001, to the south by monitoring wells at SWMU 70 and AOC 549, and to the east by monitoring wells at AOC 542.

Groundwater samples from monitoring well NBCE538001 were analyzed for SVOCs in the first and second quarter sampling events, but SVOC analytical results were omitted for the third and fourth quarter events.

Deep Groundwater

Groundwater samples from monitoring well NBCE53801D were analyzed for SVOCs in the first and second quarter sampling events, but SVOC analytical results were omitted for the third and fourth quarter events.

2.10.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.10 summarizes sample matrices and proposed analytical parameters.

Additional soil samples will be collected from the upper (0 to 1' bgs) and lower interval (3 to 5' bgs) at boring 538SB009 and analyzed for TOC, and for SVOC and metals analysis according to SPLP to determine the leaching potential of constituents that exceeded SSLs.

Wells NBCE538001/01D will be sampled for SVOCs at DQO Level III due to the omission of this particular analysis in the third and fourth quarter sampling events in the initial phase of the investigation. Proposed sampling locations are illustrated on Figure 2.10. All sampling procedures will adhere to the CNC *Final Comprehensive Work Plan*.

Table 2.10
 AOCs 538, 539 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
NBCE538001/01D	Groundwater	2	SVOCs	Re-sample since 3 rd and 4 th quarter sampling events were omitted.
538SB009	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP SVOCs and Metals; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.11 AOC 551, Boiler House, Building 1119; AOC 552, Former Galvanizing Shop, Building 1030

AOCs 551 and 552 were combined into one investigation due to their proximity and potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.11 shows site features. AOC 551 is Building 1119, a former boiler house that operated before 1942. The building appears to have undergone drastic renovations, or it may have been demolished and a new structure built on the same site. A boiler was used onsite, but no information was found to indicate the type of fuel used in it. AOC 552 is a former galvanizing shop in Building 1030, which operated from 1922 to 1926. From 1926 to 1929, the building housed a tooling shop. In 1929, the building was converted to a storage shop and was later demolished. The site is currently paved with asphalt and traversed by a pair of railroad tracks. Section 10.25 of the *Draft Zone E RFI Report* provides additional site information.

2.11.1 Previous Field Work

Soil

Soil borings were advanced within the AOC 551/AOC552 area to assess the presence of any soil contamination during the initial phase of the RFI. Soil was sampled in two rounds at AOCs 551 and 552. During the first round of sampling, nine of the 10 proposed upper-interval and lower-interval samples were collected. At AOC 552, one upper- and one lower-interval sample could not be collected at 552SB003 due to large rocks near the adjacent railroad tracks. Soil samples were also collected at both intervals for the two site shallow monitoring well locations.

All first-round samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, and pH. Two upper-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the requested suite of parameters for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins.

Second-round sampling was performed at AOC 551 after first-round analytical results were compared with USEPA Region III RBCs and SSLs. One upper-interval and one lower-interval sample were proposed this second round to determine the extent of constituents detected in the initial round. The upper-interval sample at 551SB007 was collected, but the lower-interval sample could not be collected due to subsurface obstructions in the form of large rocks. The second-round sample was submitted for analysis at DQO Level III for SVOCs, metals, and pH. This soil data set is summarized in Section 10.25.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

One deep and two shallow monitoring wells were installed and sampled four times to assess groundwater quality at AOCs 551 and 552. In addition, grid well pair NBCEGDE017/NBCEGDE17D was installed next to the western edge of the site and analytical results were reviewed along with site results. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, pH, chlorides, sulfates, and TDS. No duplicate samples were collected at this site. Groundwater data are summarized in Section 10.25.4 and Appendix H of the *Draft Zone E RFI Report*.

2.11.2 Data Gaps

Surface Soil

No COCs or data gaps were identified in surface soil at AOCs 551/552.

Subsurface Soil

Previous investigation of AOCs 551 and 552 indicated SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance) and to determine the need for additional monitoring wells, the

sample location with the most constituents exceeding SSLs in previous sampling events 1
(location 551SB006) was selected for soil sampling from the upper and lower intervals. The soil 2
samples collected will be analyzed for TOC, and for SVOCs and metals according to the 3
SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and 4
additional sampling may be required. Results of the site-specific SSL calculation and the 5
subsequent screening results for CMCOCs will be presented in the Final Zone E RFI Report. 6

Shallow Groundwater

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Thallium was detected exceeding its MCL ($2 \mu\text{g/L}$) in shallow monitoring wells NBCE551001 8
($3.1 \mu\text{g/L}$) and NBCE551002 ($4.4 \mu\text{g/L}$) during one quarterly sampling event. Thallium is not 9
considered a COC at this site. 10

Deep Groundwater

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Groundwater data for deep site monitoring wells were reviewed for analyte detections, comparison 12
with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. 13
PCE and TCE exceeded their MCLs in deep grid well NBCEGDE17D, located to the west of 14
AOCs 551 and 552. However, these constituents did not exceed their MCLs in groundwater 15
samples from AOCs 551 and 552. The nature of contamination has been defined in this area. 16

2.11.3 Sampling and Analysis Plan

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The following site-specific sampling and analysis requirements are proposed. Table 2.11 18
summarizes sample matrices and proposed analytical parameters. 19

One additional soil boring is proposed to determine the leaching characteristics of contaminants 20
that exceeded their SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 21
5' bgs) at boring 025SB015 and analyzed for TOC, and for VOCs, SVOCs, pesticides, hexavalent 22
chromium, cyanide, and metals according to the SPLP method. 23

A series of vertical profile groundwater sample locations will also be installed west of AOCs 551 and 552 to help delineate the solvent plume in the center of Zone E. Samples will be collected and analyzed for VOCs at DQO Level III and the results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment alternatives. Each proposed sampling location is illustrated on Figure 2.11. All sampling procedures will adhere to the *CNC Final Comprehensive Work Plan*.

Table 2.11
AOCs 551 and 552 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
551SB006	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP SVOCs and Metals	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
Vertical Profile Samples	Groundwater	Various	VOCs, SVOCs	Define extent of benzene and 1,4-dichlorobenzene contamination.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

**2.12 AOC 559, Central Power Station, Building 32; AOC 560, Disinfector, Building 34;
AOC 561, Substation, Building 451B**

AOCs 559, 560, and 561 were combined into one investigation due to their proximity and potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.12 shows site features. AOC 559 (Building 32) is a three-story brick and concrete structure with concrete floors built in 1909 for steam and electrical generation. The power plant, which continues in this capacity, has historically burned coal, fuel oil, and diesel fuel. AOC 560 is former Building 34, labeled as a "disinfector" on base maps from the 1920s and 1930s. It is believed that the disinfector treated water prior to use in the power plant, or treated steam with a rust inhibitor. No visible evidence of the disinfector remains. AOC 561, designated as Building 451B, is a substation built in 1944. The substation consists of three parts: a weatherproof metal enclosure containing electrical switch gear; a pad-mounted, high-voltage transformer with feed towers; and a battery bank housed in a two-room area. The substation is one of the principal electrical power feeds to the shipyard and the former controlled industrial area. Section 10.29 of the *Draft Zone E RFI Report* provides additional site information.

2.12.1 Previous Field Work

Soil

Soil borings were advanced within the AOC 559/AOC 560/AOC 561 area to assess the presence of any contamination during the initial phase of the RFI. Soil was sampled in two rounds at AOCs 559, 560 and 561. During the first round of sampling, 28 of the proposed 29 upper-interval samples were collected and 26 of the proposed 29 lower-interval samples were collected. At AOC 561, both intervals at sample location 561SB003 were abandoned due to its proximity to an electrical substation. Two lower-interval samples (one at AOC 561 and one at AOC 559) were also abandoned due a subsurface obstruction. Soil samples were also collected at both intervals from the five proposed shallow monitoring well locations.

All first-round samples were submitted for analysis at DQO Level III for the standard suite of parameters which includes VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. Four upper-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins.

Second-round soil sampling was performed at AOCs 559 and 561 after first-round analytical results were compared with USEPA Region III RBCs. Seven upper- and seven lower-interval samples were proposed for the second round to determine the extent of constituents detected in the initial round. All of the proposed upper-interval and lower-interval samples were collected.

All second-round samples were submitted for analysis at DQO Level III for the standard suite of parameters (VOCs, SVOCs, pesticides/PCBs, metals, and cyanide). Three upper-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Soil data are summarized in Section 10.29.2 and Appendix H of the *Draft Zone E RFI Report*. Soil data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

Three deep and five shallow monitoring wells were installed and sampled four times to assess groundwater quality at AOCs 559, 560, and 561. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, and TDS. One deep groundwater sample was selected as a duplicate and analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters

proposed for this site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Groundwater data are summarized in Section 10.29.4 and Appendix H of the *Draft Zone E RFI Report*.

2.12.2 Data Gaps

Surface Soil

Metals and SVOCs were detected at concentrations exceeding their industrial RBCs in both upper- and lower-interval soil samples at several locations in the northern and western sections of the site. Specifically, industrial RBCs for arsenic (3.8 mg/kg) and BEQs (780 µg/kg) were exceeded at soil borings 559SB002, 559SB006, 559SB010, 559SB012, 559SB023, and 559SB025. BEQs also exceeded the industrial RBC at locations 559SB015, 559SB019, and 559SB020. Arsenic exceeded its industrial RBC at soil borings 559SB016, 559SB021, and 561SB001. Aroclor-1254 exceeded its industrial RBC (740 µg/kg) at 559SB020 and Aroclor-1260 exceeded its RBC (740 µg/kg) at 561SB001. Beryllium exceeded its RBC (1.3 mg/kg) at boring 559SB020. Surface soil data gaps exist for several locations along the northern and western edges of AOC 559.

Subsurface Soil

Previous investigation of AOCs 559, 560, and 561 indicated VOCs, SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance) and to determine the need for additional monitoring wells, the sample location with the most constituents exceeding SSLs in previous sampling events (location 559SB015) was selected for soil sampling from the upper and lower intervals. The soil samples collected will be analyzed for TOC, and for VOCs, SVOCs and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for shallow site monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. Benzene and 1,4-dichlorobenzene were detected exceeding their MCLs in shallow monitoring well NBCE559005 during three quarterly sampling events. Shallow monitoring wells to the north and east did not indicate significant concentrations of either of these constituents in groundwater samples. Shallow groundwater data gaps are indicated south and west of NBCE559005.

Deep Groundwater

TCE was detected in NBCE55903D at a concentration of 6 $\mu\text{g/L}$, exceeding its MCL (5 $\mu\text{g/L}$) in the third quarter sampling event only. No other significant VOC detections occurred in deep wells NBCE55902D, NBCE55904D and NBCEGDE16D to the north, but TCE has been detected exceeding its MCL in shallow wells to the south at AOCs 569 and 570, and to the east at AOC 563.

2.12.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.12 summarizes sample matrices and proposed analytical parameters.

Additional soil samples will be collected from the upper interval (0 - 1' bgs) at 10 locations in the northeast and western portions of AOC 559, and submitted for metals and SVOC analysis to delineate the extent of arsenic and BEQ contamination. The proposed soil boring locations can be seen in Figure 2.12 along with existing soil borings.

Additional soil samples will also be collected at borings 559SB015 and 560SB001 to determine leaching characteristics of contaminants that exceeded their SSLs. Samples will be collected at

two depth intervals (0 to 1' bgs and 3 to 5' bgs) and submitted for analysis of TOC, and for VOC, SVOC, and metals according to the SPLP method.

Monitoring wells NBCE559005 and NBCE55903D will be re-sampled for VOCs and SVOCs due to temporal variation between sampling events, and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will be installed to further delineate VOCs (TCE) and SVOCs (benzene, 1,4-dichlorobenzene) in site groundwater. Analytical results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment alternatives. Existing and proposed sample locations are shown on Figure 2.12. Groundwater vertical profile sample locations are shown on Figure 1.2. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

Table 2.12
AOC 559, 560, and 561 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
559SB030 - 559SB039	Soil (0-1' bgs)	10	SVOCs, Metals	Further delineate BEQ and arsenic soil concentrations to the northeast and western portion of the site.
559SB015	Soil	2	*SPLP Metals, SVOCs, and VOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
560SB001	Soil	2	*SPLP Metals	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
NBCE559005 NBCE55903D	Groundwater	2	VOCs, SVOCs	Re-sample to determine effect of temporal variation; and degradation and attenuation of VOCs and SVOCs.
Vertical Profile Points	Groundwater	Various	VOCs, SVOCs	Vertical profile pints will be installed to delineate VOCs and SVOCs.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

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2.13 AOC 563, Locomotive House, Former Building 37

AOC 563 is former Building 37, a locomotive maintenance house built in 1913 and used until 1939. Figure 1.1 shows site locations and Figure 2.13 shows site features. Little is known about Building 37 operations other than probable maintenance of locomotive engines, implied by the name. Maintenance activities probably involved petroleum-based lubricants, chlorinated solvents and degreasers, and coal or petroleum fuels. Building 177 now stands on the site of former Building 37. Section 10.31 of the *Draft Zone E RFI Report* provides additional site information.

2.13.1 Previous Field Work

Soil

Soil was sampled in one round with six samples collected from each of the upper and lower intervals. Soil samples were also collected at both intervals from the three proposed site shallow monitoring well locations. All nine of the proposed upper- and lower-interval samples were submitted for analysis at DQO Level III for the standard suite of parameters (VOCs, SVOCs, pesticides/PCBs, metals and cyanide). Two samples (one upper and one lower interval) selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Soil data are summarized in Section 10.31.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

One deep and three shallow monitoring wells were installed and sampled four times to assess groundwater quarterly at AOC 563. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, and

TDS. No duplicate samples were collected at this site. Groundwater data are summarized in Section 10.31.4 and Appendix H of the *Draft Zone E RFI Report*.

2.13.2 Data Gaps

Surface Soil

No data gaps were identified in surface soil at this site.

Subsurface Soil

Previous investigation of AOC 563 indicated VOCs, SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance) and to determine the need for additional monitoring wells, the sample location with the most constituents exceeding SSLs in previous sampling events (location 563SB007) was selected for soil sampling from the upper and lower intervals. The soil samples collected will be analyzed for TOC, and for VOCs, SVOCs and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for site shallow monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater flow direction. TCE was detected exceeding its MCL in all three shallow wells. Shallow monitoring wells to the west, at AOCs 569 and 570, did not indicate concentrations of TCE exceeding its MCL in groundwater samples, but these wells did indicate concentrations of PCE exceeding its MCL. Results from shallow wells to the south at AOCs 572 and 573, and to the southeast at SWMUs 83, 84, and AOC 574, did not indicate elevated concentrations of TCE.

Shallow well NBCE172001 to the east indicated elevated concentrations of 1,2-dichloroethene (DCE), TCE, and vinyl chloride exceeding their MCLs. 1
2

Deep Groundwater 3

No data gaps were identified in deep groundwater at AOC 563. 4

2.13.3 Sampling and Analysis Plan 5

The following site-specific sampling and analysis requirements are proposed. Table 2.13 summarizes sample matrices and proposed analytical parameters. 6
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Additional soil samples will be collected at location 563SB007 to determine leaching characteristics of contaminants that exceeded their SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 5' bgs) and analyzed for TOC, and for VOC, SVOC, and metals according to the SPLP method. 8
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In addition, monitoring wells at this site will be re-sampled for VOCs due to temporal variation between sampling events, and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will be installed to delineate TCE in shallow groundwater and to further delineate the solvent plume in the center of Zone E. Samples will be collected and analyzed for VOCs at DQO Level III. Each proposed sampling location is illustrated on Figure 2.13. Groundwater vertical profile sample locations are shown on Figure 1.2. All sampling procedures will adhere to the CNC *Final Comprehensive Work Plan*. 12
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Table 2.13
 AOC 563 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
563SB007	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals, SVOCs, and VOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
NBCE563001 - NBCE563003	Groundwater	3	VOCs	Re-sample to determine effect of temporal variation; and degradation and attenuation of VOCs.
Vertical Profile Points	Groundwater	Various	VOCs	Vertical profile points will be installed to delineate VOCs.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.14 AOC 569, Gas Station and Oil Storage, Former Building 1279; AOC 570, Former Coal Storage Area; AOC 578, Transportation Shop and Garage, Building 25 1
AOC 569, AOC 570, and AOC 578 were combined into one investigation due to their proximity 2
and potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.14 shows site 3
features. AOC 569 is a former gas station and oil storehouse once housed in Building 1279. The 4
gas station, built in 1944, had two pumps and two 2,500-gallon USTs. An additional 3,000-gallon 5
UST was installed in 1986. This site was demolished in 1992, which involved pump and 6
UST removal, filling vent lines, soil excavation, soil sampling, and resurfacing the area with 7
asphalt. AOC 570 was a coal storage area that extended from Building 30 to Sixth Avenue and 8
from Carolina Avenue to Hobson Avenue. This area was operated from 1919 to 1941, at which 9
time coal was replaced by steam power. AOC 578 consists of a transportation shop and garage 10
in Building 25. Built in 1940, this structure was originally used as an automobile garage and more 11
recently as a transportation and appliance maintenance shop. Building 25 includes an 12
air conditioning repair shop, a sheet metal shop, two electric shops, a paint shop, a sign shop, a 13
carpenter's shop, a paper-shredding area, a restroom, an electrical maintenance area, a tool room, 14
a maintenance shop with personnel lockers, and an emergency supply storage area. Section 10.34 15
of the *Draft Zone E RFI Report* provides additional site information. 16
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2.14.1 Previous Field Work 18

Soil 19

Soil borings were advanced within the AOC 569/AOC 570/AOC 578 area to assess the presence 20
of any contamination during the initial phase of the RFI. Soil was sampled in two rounds at 21
AOCs 569, 570, and 578. During the first round of sampling, 25 of 26 proposed upper- and 22
lower-interval samples were collected. Soil samples were not collected from NBCE570001 due 23
to its proximity to an existing soil boring location (570SB007). Soil samples were also collected 24
from the five proposed shallow monitoring well locations. 25

First-round samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, and pH. Three samples (two upper and one lower interval) selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters including the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins.

Second-round sampling was performed at AOCs 569, 570, and 578 after first-round analytical results were compared with USEPA Region III RBCs. The second round included two upper- and two lower -interval samples to determine the extent of constituents detected in the first round. One soil boring proposed for second-round sampling was abandoned due to inaccessibility. All second-round samples were submitted for analysis of SVOCs and metals. One duplicate sample was collected and analyzed for Appendix IX SVOCs and metals. A summary of this soil data are summarized in Section 10.31.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

Three deep and six shallow monitoring wells were installed and sampled four times to assess groundwater quality at AOCs 569, 570, and 578. One additional shallow monitoring well, NBCE570004, was added to determine the extent of constituents detected during first-round groundwater sampling.

Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, pH, chlorides, sulfates, and TDS. Two duplicate samples (one each from a shallow and a deep monitoring well) were collected and submitted for Appendix IX analysis at DQO Level IV, which includes the parameters listed above plus a more comprehensive list of VOCs, SVOCs, herbicides,

hexavalent chromium, organophosphorous pesticides, and dioxins. Groundwater data are summarized in Section 10.34.4 and Appendix H of the *Draft Zone E RFI Report*.

2.14.2 Data Gaps

Surface Soil

BEQs exceeded the industrial RBC (780 $\mu\text{g}/\text{kg}$) in surface soil at several borings including 569SB005, 570SB002, 570SB004, 570SB005, 570SB012, 578SB005, and 578SB006. Arsenic exceeded its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg) in surface soil at 570SB012. A review of the data shows data gaps for BEQs west of 570SB004, 578SB005, and 578SB006, and east of 570SB012. Arsenic also has not been delineated east of boring 570SB012.

Subsurface Soil

Previous investigation of AOCs 569, 570, and 578 indicated VOCs, SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance) and to determine the need for additional monitoring wells, the sample locations with the most constituents exceeding SSLs in previous sampling events (location 569SB005 and 578SB005) were selected for soil sampling from the upper and lower intervals. The soil samples collected will be analyzed for TOC, and for VOCs, SVOCs and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

Groundwater data for site shallow monitoring wells were reviewed for analyte detections, comparison with applicable screening levels, data trends, spatial distribution, and groundwater

flow direction. PCE was detected in shallow groundwater consistently exceeding its MCL during each quarterly sampling event in shallow wells NBCE569001, NBCE569002, and NBCE570001. The extent of this contaminant has been defined to the south by NBCE570002 and NBCE570003, and to the east by shallow wells at AOC 572. The extent of PCE has not been defined to the west and northeast.

Shallow well NBCE570002 indicated concentrations of lead exceeding its MCL in three quarterly sampling events. The extent of lead in shallow groundwater has been defined by wells NBCE570001 to the north, NBCEGDE030 to the west, NBCE570004 to the south, and NBCE572001 and NBCE580002 to the east.



Deep Groundwater

TCE was detected in deep groundwater exceeding its MCL at well NBCE57003D in each quarterly sampling event. Results from deep monitoring well NBCEGDE30D to the west and NBCE57002D to the east did not indicate concentrations of TCE exceeding its MCL in any quarterly sampling event.

2.14.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.14 summarizes sample matrices and proposed analytical parameters.

Additional samples will be collected from surface soil (0 - 1' bgs) at three locations in the western portion of AOC 578 and submitted for SVOC analysis to delineate the extent of BEQ contamination. One surface-soil sample will also be collected from the eastern edge of 570SB012 and submitted for metals and SVOC analysis to delineate arsenic and BEQ contamination. The proposed soil boring locations can be seen in Figure 2.14 along with existing soil borings.

Soil samples will also be collected at locations 569SB005 and 578SB005 to determine leaching characteristics of contaminants that exceeded their SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 5' bgs) and analyzed for TOC, and for VOC, SVOC, and metals analysis according to the SPLP method.

In addition, monitoring wells will be re-sampled for VOCs due to temporal variation between sampling events, and to determine the potential for degradation and attenuation of these constituents. A series of vertical profile groundwater sample locations will be installed to further delineate VOCs (TCE, PCE) in groundwater at this site and to further delineate the solvent plume in the center of Zone E. Samples will be submitted for VOC analysis at DQO Level III. All analytical results will be presented in the *Final Zone E RFI Report* along with recommendations for treatment alternatives. Existing and proposed sample locations are shown on Figure 2.14. Groundwater vertical profile sample locations are shown on Figure 1.2. All sampling procedures will adhere to the *CNC Final Comprehensive RFI Work Plan*.

**Table 2.14
 AOCs 569, 570, 578 Sampling and Analysis Plan**

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
578SB007 - 578SB009	Soil (0-1' bgs)	4	SVOCs	Delineate BEQs west of AOC 578.
570SB017	Soil (0-1' bgs)	1	Arsenic	Delineate arsenic east of 570SB012.
569SB005 578SB005	Soil (0-1' bgs) (3-5' bgs)	4	*SPLP - Metals, SVOCs, VOCs	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
NBCE569001, NBCE569002, NBCE570001, NBCE57003D	Groundwater	4	VOCs	Re-sample to determine effect of temporal variation; and degradation and attenuation of VOCs.

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Table 2.14
AOCs 569, 570, 578 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
Vertical Profile Points	Groundwater	Various	VOCs	Vertical profile points will be installed to further delineate solvent plume.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.15 AOC 580, Former Pattern and Electric Shop, Building 10

AOC 580 is a former pattern and electric shop in Building 10. Built in 1918, it was used until 1935 as a pattern and storage shop. Figure 1.1 shows site locations and Figure 2.15 shows site features. From 1935 until 1955, this unit was again used as a pattern and electric shop. In the early 1980's Building 10 became the office for the Nuclear Engineering Department. No information could be found regarding operating practices at this facility. Section 10.40 of the *Draft Zone E RFI Report* provides additional site information.

2.15.1 Previous Field Work

Soil

Soil was sampled in two rounds at AOC 580. During the first round, four samples from both the upper and lower interval were collected. Soil samples were also collected from both intervals from the two proposed shallow monitoring well locations. First-round samples were submitted for analysis of VOCs, SVOCs, and metals at DQO Level III. One upper-interval sample was selected for duplication and analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, organophosphorus pesticides, hexavalent chromium, and dioxins.

Second-round sampling was performed at AOC 580 after first-round analytical results were compared with USEPA Region III RBCs. The second round included three upper-interval and three lower-interval samples to determine the extent of constituents detected in the first round. All proposed upper-interval samples and two of three lower-interval samples were collected. One lower-interval sample could not be collected due to subsurface obstructions such as wood or rocks. All second-round samples at AOC 580 were submitted for analysis of SVOCs and metals. No duplicate samples were collected in the second round. Soil data are summarized in Section 10.40.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to

determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

One deep and two shallow monitoring wells were installed and sampled to assess groundwater quality at AOC 580. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, sulfates, chlorides, and TDS. One duplicate sample was collected from a shallow monitoring well and submitted for Appendix IX analysis at DQO Level IV, which includes the parameters listed above plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins. Groundwater data are summarized in Section 10.40.4 and Appendix H of the *Draft Zone E RFI Report*.

2.15.2 Data Gaps

Surface Soil

BEQs were detected at two soil borings (580SB002 and 580SB006) at concentrations exceeding the industrial RBC (780 $\mu\text{g}/\text{kg}$). A review of the data shows BEQs have been delineated south of 580SB002 by 580SB008, to the north by 580SB003, to the east by 580SB004, and to the west by soil borings at AOC 579. BEQs have been delineated north of 580SB006 by 580SB007, to the south by 580SB004, and to the east by 580SB001. BEQs have not been delineated west of the two boring locations. Lead was detected up to 1,180 mg/kg in surface soil, exceeding the residential RBC of 400 mg/kg at borings 580SB006 and 580SB005 along the northern and eastern edges of Building 10. (The project team expressed concern that this detection might represent the leading edge of higher lead concentrations). Lead contamination around boring 580SB006 has not been fully delineated to the west, while at boring 580SB005 lead has not been fully delineated to the east. Arsenic also exceeded its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg) in surface soil at boring 580SB006; arsenic has not been fully delineated to the west of this boring.

Subsurface Soil

1
2 Previous investigation of AOC 580 indicated SVOCs and metals exceeding their SSLs. In order
3 to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening
4 Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells, the sample
5 location with the most constituents exceeding SSLs in previous sampling events
6 (location 580SB006) was selected for soil sampling from the upper and lower intervals. The soil
7 samples collected will be analyzed for TOC, and for SVOCs and metals according to the
8 SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and
9 additional sampling may be required. Results of the site-specific SSL calculation and the
10 subsequent screening results for CMCOs will be presented in the *Final Zone E RFI Report*.

Shallow Groundwater

11
12 Groundwater data for site shallow monitoring wells were reviewed for analyte detections,
13 comparison with applicable screening levels, data trends, spatial distribution, and groundwater
14 flow direction. No COCs were identified in shallow groundwater at AOC 580.

Deep Groundwater

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16 Arsenic was detected in deep well NBCE58001D exceeding its MCL (50 $\mu\text{g/L}$) in each quarterly
17 sampling event. Arsenic has been detected in deep groundwater in several wells around AOC 580,
18 including those at SWMU 145 and AOCs 566, 574, and 576. These results indicate a deep
19 groundwater arsenic plume in the center of Zone E, which will be addressed in the CMS in the
20 Zone E RFI.

2.15.3 Sampling and Analysis Plan

The following site-specific sampling and analysis requirements are proposed. Table 2.15 summarizes sample matrices and proposed analytical parameters.

Two upper-interval (0 - 1' bgs) soil samples will be collected to delineate arsenic, lead, and BEQ detected at 580SB006. Samples will be collected and analyzed for SVOCs and metals at DQO Level III. Also, one surface-soil sample will be collected to delineate lead at 580SB005; this sample will be analyzed for lead only.

Soil samples will also be collected at boring 580SB006 to determine leaching characteristics of contaminants that exceeded their SSLs. Samples will be collected at two depth intervals (0 to 1' bgs and 3 to 5' bgs) and analyzed for TOC, and for SVOC and metals analysis according to the SPLP method. Each proposed sampling location is illustrated on Figure 2.15. All sampling procedures will adhere to the *CNC Final Comprehensive RFI Work Plan*.

Table 2.15
 AOC 580 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
580SB011 580SB012	Soil (0-1' bgs)	2	SVOCs, Metals	Delineate lead, arsenic, and BEQs along the north edge of Building 10.
580SB010	Soil (0-1' bgs)	1	Lead	Delineate lead east of 580SB005.
580SB006	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP - Metals, SVOCs	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.16 AOC 590, Alley, Buildings 79 and 1760

AOC 590 is the alley between Buildings 1760 and 79. Figure 1.1 shows site locations and Figure 2.16 shows site features. This alley is the reported site of past releases of acetone and cutting oil. No information was found regarding the exact locations, volumes, or duration of the discharged wastes. The alley is currently paved with asphalt. Section 10.43 of the *Draft Zone E RFI Report* provides additional site information.

2.16.1 Previous Field Work

Soil

Soil was sampled in two rounds at AOC 590. All five proposed upper- and lower-interval samples were collected in the first round of sampling. Soil samples were also collected at both intervals from the proposed shallow monitoring well location. First-round samples were submitted for analysis at DQO Level III for VOCs, SVOCs, and metals. In addition, five samples (one upper interval and four lower interval) were submitted for TPH analysis due to elevated OVA readings and petroleum odor. No duplicate samples were collected at AOC 590.

Second-round sampling was performed at AOC 590 after first-round analytical results were compared with USEPA Region III RBCs. Proposed second-round samples included one upper- and one lower-interval sample to determine the extent of constituents detected in the first round. The lower-interval sample could not be collected due to subsurface obstructions such as wood or rocks. The second-round sample was submitted for analysis of SVOCs and metals. Soil data are summarized in Section 10.43.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

One shallow and one deep monitoring well were installed and sampled four times to assess groundwater quality at AOC 590. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, chlorides, sulfates, and TDS. No duplicate samples were collected at AOC 590. Groundwater data are summarized in Section 10.43.4 and Appendix H of the *Draft Zone E RFI Report*.

2.16.2 Data Gaps

Surface Soil

BEQs were detected at two soil borings (590SB001 and 590SB002) at concentrations exceeding the industrial RBC (780 $\mu\text{g}/\text{kg}$). A review of the data shows BEQs have been delineated south of 590SB001 by 590SB004 and 590SB005, to the north by 590SB003, and to the east by soil borings at SWMU 102. BEQs have been delineated south of 590SB002 by 590SB003, to the west by 590SB006, and to the east by soil borings at SWMU 102. BEQs have not been delineated west of 590SB001 or north of 590SB002. Lead was detected in surface soil exceeding the residential RBC of 400 mg/kg at concentrations up to 871 mg/kg at soil boring 590SB006 on the northern end of the alley. (The project team expressed concern that this detection might represent the leading edge of higher lead concentrations). Lead contamination has been delineated to the east by boring 590SB002 and to the south by 590SB003. Areas north and west of 590SB006 have been fully delineated for lead.

Subsurface Soil

Previous investigation of AOC 590 indicated SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells, the sample location with the most constituents exceeding SSLs in previous sampling events (location 590SB002) was selected for soil sampling from the upper and lower intervals. The soil

samples collected will be analyzed for TOC, and for SVOCs and metals according to the 1
SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and 2
additional sampling may be required. Results of the site-specific SSL calculation and the 3
subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*. 4

Shallow Groundwater

 5

Thallium was detected in well NBCE590001 in one quarterly sampling event at a concentration 6
(4.5 $\mu\text{g/L}$) exceeding its MCL (2 $\mu\text{g/L}$), but is not considered a COC at this site. 7

Deep Groundwater

 8

Thallium was detected in well NBCE59001D in two quarterly sampling events at concentrations 9
of 3.1 $\mu\text{g/L}$ in the third quarter and 5.2 $\mu\text{g/L}$ in the fourth quarter. Both detections exceeded its 10
MCL (2 $\mu\text{g/L}$), but thallium is not considered a COC at this site. 11

2.16.3 Sampling and Analysis Plan

 12

The following site-specific sampling and analysis requirements are proposed. Table 2.16 13
summarizes sample matrices and proposed analytical parameters. 14

Additional soil samples will be collected from the upper interval (0 - 1' bgs) at two locations north 15
and west of 590SB006 and submitted for lead analysis to complete the delineation of lead in 16
surface soil. Samples will also be collected from the upper interval west of 590SB001 and north 17
of 590SB002 and submitted for SVOC analysis to complete the delineation of BEQs. 18

Soil samples will also be collected at boring 590SB002 to determine leaching characteristics of 19
contaminants that exceeded their SSLs. Samples will be collected at two depth intervals 20
(0 to 1' bgs and 3 to 5' bgs) and analyzed for TOC, and for SVOC and metals according to the 21

SPLP method. Each proposed sampling location is illustrated on Figure 2.16. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

Table 2.16
 AOC 590 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
590SB007, 590SB008, 590SB009	Soil (0-1' bgs)	3	SVOCs, Lead	Delineate lead north and west of 590SB006, and BEQs north of 590SB002 and west of 590SB001.
590SB002	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP - Metals, SVOCs	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.17 AOC 596, Former Torpedo Storage, Building 101

AOC 596 is the site of a former torpedo storage area in Building 101, which was built in 1919 and stored torpedoes until 1943. Figure 1.1 shows site locations and Figure 2.17 shows site features. From 1943 to 1946, Building 101 housed a machine shop. In 1946, the building was converted into a storehouse for diesel parts and in 1947 it was used as a storage house for a galvanizing plant. From 1981 to 1995, it was used to store radioactive-contaminated material. SWMU 155 addresses mixed-waste storage inside Building 101. Section 10.45 of the *Draft Zone E RFI Report* provides additional site information.

2.17.1 Previous Field Work

Soil

Soil was sampled in two rounds at AOC 596. During the first round, 11 of the proposed 12 upper and lower interval samples were collected. One sample location, 596SB008, was abandoned due to the extreme thickness of the cement floor (greater than 3 feet) in Building 101. Soil samples were also collected at both intervals from the four shallow monitoring well locations. All first-round samples were submitted for analysis at DQO Level III for VOCs, SVOCs, and metals. No duplicate samples were collected at AOC 596.

Second-round sampling was performed at AOC 596 after first-round analytical results were compared with USEPA Region III RBCs. The second round included one upper- and one lower-interval sample to determine the extent of constituents detected in the initial round. Samples were collected from both intervals during second-round sampling. Second-round samples at AOC 596 were submitted for analysis of VOCs, SVOCs, and metals. Soil data are summarized in Section 10.45.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

Two deep and four shallow monitoring wells were installed and sampled four times to assess groundwater quality at AOC 596. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, metals, chlorides, sulfates, and TDS. One duplicate sample was collected from a shallow monitoring well and submitted for Appendix IX analysis at DQO Level IV, which includes the parameters listed above plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins. Groundwater data are summarized in Section 10.45.4 and Appendix H of the *Draft Zone E RFI Report*.

2.17.2 Data Gaps

Surface Soil

BEQs were detected in surface soil at two borings (596SB006 and 596SB013) exceeding the industrial RBC (780 $\mu\text{g}/\text{kg}$). A review of the data shows BEQs been delineated east of 596SB006 and 596SB013 by boring 596SB007, to the west by 596SB005, and to the south by 596SB010. BEQs have not been delineated north of these locations. Arsenic was detected in surface soil at boring 596SB006 exceeding its industrial RBC (3.8 mg/kg) and background concentration (23.9 mg/kg). Arsenic contamination has been delineated to the east by boring 596SB007, to the west by 596SB005, to the north by 596SB013, and to the south by 596SB010.

Subsurface Soil

Previous investigation of AOC 596 indicated SVOCs and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance) and to determine the need for additional monitoring wells, the sample location with the most constituents exceeding SSLs in previous sampling events (location 596SB006) was selected for soil sampling from the upper and lower intervals. The soil samples collected will be analyzed for TOC, and for SVOCs and metals according to the SPLP method. After calculating the

site-specific SSLs, additional data gaps may be identified and additional sampling may be required. 1
Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will 2
be presented in the *Final Zone E RFI Report*. 3

Shallow Groundwater 4

Groundwater data was reviewed for analyte detections, comparison with applicable screening 5
levels, data trends, spatial distribution, and groundwater flow direction. Thallium was detected 6
in shallow well NBCE596003 (6.7 $\mu\text{g/L}$) above its MCL (2.0 $\mu\text{g/L}$) in one quarterly sampling 7
event. Lead was detected in shallow well NBCE596002 (28.1 $\mu\text{g/L}$) above its MCL (15 $\mu\text{g/L}$) 8
also in one quarterly sampling event. These constituents were limited to only one detection each 9
throughout four quarterly sampling events and are not considered COCs at this site. 10

Deep Groundwater 11

Thallium was detected in deep well NBCE59604D (7.0 $\mu\text{g/L}$) above its MCL (2.0 $\mu\text{g/L}$) in only 12
one of four quarterly sampling events, and is not considered a COC at this site. 13

2.17.3 Sampling and Analysis Plan 14

The following site-specific sampling and analysis requirements are proposed. Table 2.17 15
summarizes sample matrices and proposed analytical parameters. 16

Additional soil samples will be collected from the upper interval (0 - 1' bgs) at one location north 17
of 596SB013 and submitted for SVOC analysis to complete the delineation of BEQs in surface 18
soil. One soil boring will also be installed at 596SB006 to determine leaching characteristics of 19
contaminants that exceeded their SSLs. Samples will be collected in the upper (0 - 1' bgs) and 20
lower interval (3 - 5' bgs) in this area and submitted for analysis of TOC, and for SVOC and 21
metals according to the SPLP method. Each proposed sampling location is illustrated on 22

Figure 2.17. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*. 1
2

Table 2.17
 AOC 596 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
596SB014	Soil (0-1' bgs)	1	SVOCs	Delineate BEQs north of 596SB013
596SB006	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP Metals and SVOCs; TOC	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

2.18 AOC 598, Sonar Dome Area, End of Pier J; AOC 599, Pump House, Pier J 1

AOCs 598 and 599 were combined into one investigation due to their proximity and potential for similar COPCs. Figure 1.1 shows site locations and Figure 2.18 shows site features. AOC 598 was a temporary metal building on the asphalt at the beginning of Pier J. The site was used for sonar dome repair work, cleaning, repainting, adhesive removal, and some sanding and media blasting. Several storm drains are located near Pier J. AOC 599 is a pump house on the pier that was used as a transfer station for diesel fuel. Rainwater has collected in the below-grade structure since the pump house was damaged by Hurricane Hugo in 1989. Section 10.47 of the *Draft Zone E RFI Report* provides additional site information. 2
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2.18.1 Previous Field Work 10

Soil 11

Soil was sampled in two rounds at AOCs 598 and 599. During the first round, all nine proposed upper-interval samples and seven of the nine proposed lower-interval samples were collected. Two lower-interval samples at AOC 599 were not collected due to subsurface obstructions such as wood and rocks. Soil samples were also collected at both intervals from the two proposed shallow monitoring well locations. First-round samples were submitted for analysis at DQO Level III for the standard suite of parameters. Two lower-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the suite of parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. 12
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Second-round sampling was performed at AOCs 598 and 599 after first-round analytical results were compared with USEPA Region III RBCs. The second round included four upper- and four lower-interval samples to determine the extent of constituents detected in the first round. All four proposed upper-interval samples and three of the four proposed lower-interval samples were collected. One lower-interval sample could not be collected due to subsurface obstructions such 21
22
23
24
25

as wood and rocks. All second-round samples at AOCs 598 and 599 were submitted for analysis of SVOCs and metals. No duplicate samples were collected in the second round. Soil data are summarized in Section 10.47.2 and Appendix H of the *Draft Zone E RFI Report*. The data were reviewed to determine if they satisfied the RFI requirement for delineating the nature and extent of contamination. Soil data gaps identified are discussed below.

Groundwater

Two shallow monitoring wells were installed and sampled four times to assess groundwater quality at AOCs 598 and 599. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, and TDS. No duplicate samples were collected at this site. Groundwater data are summarized in Section 10.47.4 and Appendix H of the *Draft Zone E RFI Report*.

2.18.2 Data Gaps

Surface Soil

BEQs were detected in surface soil at four borings (598SB002, 598SB006, 599SB003, and 599SB007) at concentrations exceeding the industrial RBC (780 $\mu\text{g}/\text{kg}$). A review of the data shows BEQs have not been delineated west of these locations. Lead was detected exceeding its industrial RBC (1,300 mg/kg) in surface soil at boring 598SB005 on the northern end of AOC 598. The area has to the southeast been delineated by soil boring 598SB003, to the northeast by soil borings at AOC 597, and to the south by soil boring 598SB006. Lead has not been delineated north and west of 598SB005.

Subsurface Soil

Previous investigation of AOCs 598 and 599 indicated SVOCs, pesticides, and metals exceeding their SSLs. In order to obtain the data necessary for calculating site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional

monitoring wells, the sample location with the most constituents exceeding SSLs in previous 1
sampling events (location 598SB002 and 599SB007) was selected for soil sampling from the upper 2
and lower intervals. The soil samples collected will be analyzed for TOC, and for SVOCs, 3
pesticides, and/or metals according to the SPLP method. After calculating the site-specific SSLs, 4
additional data gaps may be identified and additional sampling may be required. Results of the 5
site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented 6
in the *Final Zone E RFI Report*. 7

Shallow Groundwater 8

Groundwater data was reviewed for analyte detections, comparison with applicable screening 9
levels, data trends, spatial distribution, and groundwater flow direction. Thallium was detected 10
in shallow well NBCE598001 (8.2 $\mu\text{g/L}$) above its MCL (2.0 $\mu\text{g/L}$) in one quarterly sampling 11
event, and is not considered a COC at this site. 12

2.18.3 Sampling and Analysis Plan 13

The following site-specific sampling and analysis requirements are proposed. Table 2.18 14
summarizes sample matrices and proposed analytical parameters. 15

Additional soil samples will be collected from the upper interval (0 - 1' bgs) at four locations west 16
of AOCs 598 and 599 and submitted for SVOC analysis to complete the delineation of BEQs in 17
surface soil. Two additional soil samples will be collected from the upper interval north and west 18
of 596SB005 and submitted for lead analysis to delineate lead in surface soil. Soil borings will 19
also be installed at 598SB002 and 599SB007 to determine leaching characteristics of contaminants 20
that exceeded their SSLs. Samples will be collected in the upper (0 - 1' bgs) and lower interval 21
(3 - 5' bgs) and analyzed for TOC, and for SVOCs, metals, and pesticides according to the 22
SPLP method. Each proposed sampling location is illustrated on Figure 2.18. All sampling 23
procedures will adhere to the *CNC Final Comprehensive RFI Work Plan*. 24

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 Charleston Naval Complex
 Section 2 – AOCs/SWMUs Requiring Additional Investigative Activities
 Revision No. 0

Table 2.18
 AOCs 598, 599 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
598SB007 598SB008	Soil (0-1' bgs)	2	Lead	Delineate lead north and west of 598SB005.
598SB009 598SB010 599SB008 599SB009	Soil (0-1' bgs)	4	SVOCs	Delineate BEQs west of AOCs 598 and 599.
598SB002	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP - Metals, SVOCs, Pesticides	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.
599SB007	Soil (0-1' bgs) (3-5' bgs)	2	*SPLP - Metals, SVOCs	Use to calculate site-specific SSLs and determine the potential for leaching to groundwater.

Notes:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

*Each soil sample will be split and analyzed for the parameters listed according to Synthetic Precipitation Leaching Procedure (SPLP), and according to method SW-846.

3.0 INVESTIGATION OF ADDITIONAL AOCs/SWMUs IDENTIFIED IN RFA

3.1 SWMU 80, Paint Shop Storage, Building 194

SWMU 80 (Figure 3.1) is Building 194, a single-story concrete block structure with a steel roof and concrete floor. The 850-square-foot building was built in 1964 and used to store supplies such as tools, hoses, and equipment. This building had previously been used to store and prepare unused abrasive blasting grit. A flammable materials locker outside the building was used as a waste paint satellite accumulation area, and a paint mixing area was located south of the flammable locker. Exterior paint for ships and submarines was mixed outside on a wooden pallet with a tarp roof covering. Approximately 36,000 gallons of paint per year were used in the ship and submarine painting operations. Asphalt and concrete parking areas are located around the site. SWMU 80 was recommended for a confirmatory sampling investigation (CSI) in the RFA. Constituents of concern for this unit include heavy metals (lead and copper) and VOCs from paint wastes, abrasive blasting grit, and solvents. This SWMU is collocated with AOC 566, which was investigated during the initial phase of the RFI. Results of the AOC 566 RFI were presented in Volume V, Section 10.32 of the *Draft Zone E RFI Report*. It is the Navy's opinion that the sample locations for AOC 566 will adequately serve to characterize SWMU 80, and information for SWMU 80 will be included in the site-specific section for AOC 566 in the *Final Zone E RFI Report*.

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3.2 SWMU 181, Former Satellite Accumulation Area, Metal Trades, CNSY Permit #99 1

SWMU 181 is the former location of a satellite accumulation area on Pier C and was an element 2
of the Charleston Naval Ship Yard (CNSY) hazardous waste management system. Hazardous 3
wastes were accumulated in this unit in accordance with 40 CFR 262.34(c) and SCHWMR R.61- 4
79.262.34(c). Hazardous waste was then transferred to Building 1640, a permitted facility where 5
hazardous wastes generated base-wide were stored prior to shipment offsite for treatment and/or 6
disposal. The satellite accumulation area was an approximately 8 cubic foot metal structure which 7
was permitted on June 29, 1994, and removed prior to 1996. Constituents of concern at this unit 8
are VOCs, metals, and petroleum hydrocarbons from waste paint cans and rags. 9

Even though a review of the Navy's spill reports and inspection records did not indicate any 10
history of releases from this site, there was some evidence of paint spills and petroleum-like stains 11
that appeared to be contained within the satellite accumulation area. Several large stains were 12
noted on the asphalt surface approximately 20 feet southeast of the unit. No drains or 13
storm sewers were located within 50 feet of the unit. Soil beneath the asphalt is the medium most 14
likely to have been impacted by a release from this unit. Confirmatory soil borings are proposed 15
for three locations at SWMU 181 and samples collected from the upper and lower interval at each 16
location to determine whether this site is contaminated. Samples will be submitted for the standard 17
analysis including VOCs, SVOCs, metals, PCB/pesticides, and cyanide. If contamination is 18
detected, additional sampling may be required to fulfill the RFI requirements. Otherwise, 19
confirmatory sampling results will be presented in the *Final Zone E RFI Report* and no further 20
action proposed. 21

Table 3.1 summarizes the sample matrices and proposed analytical parameters. Three soil borings 22
will be advanced and samples collected from the upper (0 to 1' bgs) and lower interval 23
(3 to 5' bgs), and submitted for analysis of VOCs, SVOCs, metals, PCB/pesticides, and cyanide. 24

Soil borings proposed for SWMU 181 are shown on Figure 3.2. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

Table 3.1
SWMU 181 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
181SB001 - 181SB003	Soil (0-1' bgs) (3-5' bgs)	6	VOCs, SVOCs, Metals, PCB/Pesticides, and Cyanide	New Investigation

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

3.3 SWMU 188, Satellite Accumulation Area, Paint Waste, CNSY Permit #103

SWMU 188 is the former location of a satellite accumulation area on the south side of Dry dock 5. It was an element of the CNSY hazardous waste management system, where hazardous wastes were accumulated in accordance with 40 CFR 262.34(c) and SCHWMR R.61-79.262.34(c). Hazardous waste was then transferred to Building 1640, a permitted facility where hazardous wastes generated base-wide were stored prior to shipment offsite for treatment and/or disposal. This SAA was an approximately 8' x 6' x 6' metal storage structure which was permitted on September 6, 1994, and removed prior to 1996. Constituents of concern at this unit include metals and VOCs from waste paint and solvents.

A review of the Navy's spill and inspection reports did not indicate any releases from this site; however, there was some evidence of paint spills and petroleum-like stains that appeared to be contained inside the satellite accumulation area. Several large stains were noted on the asphalt surface approximately 20 feet southeast of the unit. No drains or storm sewers were located within 50 feet of the unit. Soil beneath the asphalt is the medium most likely to have been impacted by a release from this unit. Confirmatory soil borings are proposed for two locations at SWMU 188 with samples to be collected from the upper (0 - 1' bgs) and lower-interval (3 to 5' bgs) at each location. Samples will be analyzed for VOCs, SVOCs, metals, PCB/pesticides, and cyanide. If contamination is detected, additional sampling may be required to fulfill the RFI requirements. Otherwise, confirmatory sampling results will be presented in the *Final Zone E RFI Report* and no further action proposed.

Table 3.2 summarizes sample matrices and proposed analytical parameters. Two soil borings will be advanced and samples collected from the upper (0 to 1 foot bgs) and lower interval (3 to 5 feet bgs), and submitted for analysis of VOCs, SVOCs, metals, PCB/pesticides, and cyanide. Soil borings proposed for SWMU 188 are shown on Figure 3.3. All sampling procedures will adhere to the *CNC Final Comprehensive RFI Work Plan*.

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Table 3.2
 SWMU 188 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
188SB001, 188SB002	Soil (0-1' bgs) (3-5' bgs)	4	VOCs, SVOCs, Metals, PCB/Pesticides, and Cyanide	New Investigation

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

3.4 AOC 537, Substation, Building 342

AOC 537 is the electrical substation at Building 342, a 2,728-square-foot single-story concrete block structure with a concrete slab floor and roof, which was built in the early 1970s. The building housed an electrical transformer substation, electrical parts storage area, and an insulation shop. In 1987, eight transformers in Building 342 were tested and found to contain less than 50 $\mu\text{g}/\text{kg}$ PCBs. The equipment previously used at this facility is unknown, although circuit breakers, dry transformers, and high-voltage switches were recently observed at the substation. Several pipes, which may indicate the presence of USTs, were seen next to Building 342 but research determined that no USTs had been located in this area. Waste materials associated with this unit include dielectric fluid, insulation, and an oily substance on the insulation shop floor. Constituents of concern include PCBs, calcium silicate particulates, VOCs, BTEX, PAHs, heavy metals, and petroleum hydrocarbons. Test results for the transformers indicated that the dielectric fluid contains less than 50 $\mu\text{g}/\text{kg}$ PCBs.

A visual inspection of the site identified stains outside the building on the rear sidewalk. The EBS report indicated stains on a concrete sidewalk outside the building, but no source was indicated. In 1996, wipe samples were collected at AOC 537 from the substation surface areas, including the floor and the equipment. Two of the wipe samples tested positive for Aroclor-1260. Soil borings are proposed for three locations at AOC 537 to determine if soil beneath the site has been impacted. Soil samples are proposed from the upper (0 to 1' bgs) and lower interval (3 to 5' bgs) at each location for analysis of VOCs, SVOCs, metals, PCB/pesticides, and cyanide. These results will be presented in the *Final Zone E RFI Report*.

Table 3.3 summarizes sample matrices and proposed analytical parameters. Three soil borings will be advanced and samples collected from the upper and lower interval, and submitted for analysis of VOCs, SVOCs, metal, PCB/pesticides, and cyanide. Soil borings proposed for

AOC 537 are shown on Figure 3.4. All sampling procedures will adhere to the 1
 CNC Final Comprehensive RFI Work Plan. 2

Table 3.3
AOC 537 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
537SB001 - 537SB003	Soil (0-1' bgs) (3-5' bgs)	6	VOCs, SVOCs, Metals, PCB/Pesticides, and Cyanides	New Investigation

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

3.5 AOC 557, Latrine, Former Building 1020

AOC 557 consisted of former Building 1020, a latrine built in 1909 and used until 1939. The latrine did not exist after 1939. Wastes from the latrine may have been discharged into the Cooper River, but no other information was found during this assessment to indicate the size, design features, or operating practices of this site. Constituents of concern were organic wastes and heavy metals. Surface water and sediment are the media most likely to have been impacted by a release from this site. It is believed that wastes from the latrine were discharged to the Cooper River since that was common practice before the early 1970s. This site is currently covered with asphalt and no physical indication remains of the site location. Because this site no longer exists and any releases would have been discharged directly into the river (covered under Zone J), no further action is proposed for this site. AOC 557 is shown on Figure 3.5.

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3.6 AOC 575, Substation, Building 454

AOC 575 is Building 454, an electrical substation. Built in 1964, this single-story block structure has a concrete slab floor and roof. The substation was renovated in 1989, but the extent of this work was not determined. Immediately adjacent to Building 454 is a concrete slab mounted with a weatherproof metal enclosure surrounded by a fence. High-voltage switches and transformers are housed in the metal enclosure. The east side of Building 454 houses a battery bank that provides emergency power for the building, and the west side houses a battery charger. The transformer currently in operation does not contain PCBs. Information regarding PCB use before 1989 was not available. Materials handled at this unit include dielectric fluid and lead-acid batteries. Constituents of concern are PCBs, lead, and acid, and potential migration pathways include soil, groundwater, and surface water.

A visual inspection of the site identified stains beneath the battery bank. In 1996, wipe samples were collected at AOC 575 from the substation surface areas, including the floor and the equipment. Two of the wipe samples tested positive for Aroclor 1260. Soil borings are proposed for two locations at AOC 575 where soil samples will be collected from the upper (0 to 1' bgs) and lower interval (3 to 5' bgs). Samples will be submitted for analysis of VOCs, SVOCs, metals, PCB/pesticides, and cyanide. Results from AOC 576 soil samples (576SB002) will also be used in the investigation of AOC 575. These results will be presented in the *Final Zone E RFI Report*.

Table 3.4 summarizes sample matrices and proposed analytical parameters. Two soil borings will be advanced and samples collected from the upper and lower interval, and submitted for analysis of VOCs, SVOCs, metals, PCB/pesticides, and cyanide. Soil borings proposed for AOC 575 are shown on Figure 3.6. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

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Table 3.4
AOC 575 Sampling and Analysis Plan

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
575SB001, 575SB002	Soil	4	VOCs, SVOCs, Metals, PCB/Pesticides, and Cyanide	New Investigation

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

3.7 AOC 621, Battery Cracking Area, Building 68

AOC 621 comprises the battery cracking area associated with SWMUs 5 and 18 and AOC 605, which were investigated during the RFI. The unit is a concrete pad surrounded by a 1-foot-high concrete containment wall. AOC 621 was used as a welding slab from the early 1940s until around 1950. From the early 1950s to the mid 1970s this work area was used for wrecking submarine batteries, with operations including cracking batteries and draining their acids to recover lead and container cells, which were sold for scrap. A collection sump drained acid from the pad to the neutralization facility. An adjacent crane was used to move batteries around the work area. Concrete and asphalt pavement surrounded AOC 621, except for an area of soil and gravel to the southwest. Battery waste such as acids and heavy metals are the constituents of concern at this unit.

Soil, groundwater, and surface water runoff are likely migration pathways for the constituents of concern. Due to the nonvolatile nature of the waste, air and subsurface gases are unlikely migration pathways. The unpaved areas next to this unit are the primary areas of concern for migration. The preliminary review found no spill reports, inspection reports, or employee interviews that would indicate any release at AOC 621, but the poor condition of the containment during the site inspection indicated that releases may have occurred at this unit. Acid spills have deteriorated the pavement which threatens the underlying soil. The Cooper River lies approximately 50 feet from the unit, creating a potential for ecological receptors in the river to be exposed to site releases. The evidence of releases presents an exposure potential for CNC employees and future site users. There are no residential areas in the site vicinity.

An IM removal action conducted by the Navy Detachment at SWMU 5 resulted in partial removal of the battery cracking pad. At the request of SCDHEC, EnSafe collected confirmation samples around the remaining portion of the pad. Another IM removal action at AOC 621 resulted in the removal of approximately half of the site and a large area southeast of AOC 621, including a large

portion of SWMU 18. Section 10.1 of the *Draft-Final Zone E RFI Report*, and the *Interim/Stabilization Measure Completion Report for SWMU 5, AOC 605 & AOC 621, Battery Wrecking/Salvage Area* (Navy Detachment, April 10, 1998) provide additional site information.

3.7.1 Previous Field Work

Soil

Soil borings were advanced in the SWMU 5/SWMU 18/AOC 605/AOC 621 area to assess the presence of any contamination during the initial phase of the RFI and prior to inclusion of AOC 621. Soil samples were collected in two rounds at SWMUs 5, 18, and AOC 605. During the first round, all 19 proposed upper-interval samples were collected and 13 of the proposed 19 lower-interval samples were collected from the soil borings and shallow well locations. At SWMU 18, two lower-interval samples were not collected due to subsurface obstructions (large rocks) below 2 feet bgs. At AOC 605, four lower-interval samples were not collected due to sample saturation or subsurface obstructions such as wood and rocks. All first-round samples were submitted for DQO Level III analysis for organotins and the standard parameters which included VOCs, SVOCs with tentatively identified compounds (TICs), pesticides/PCBs, metals, and cyanide. Two upper- and two lower-interval samples were selected as duplicates and analyzed at DQO Level IV for Appendix IX analytical parameters, which include the parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins.

Second-round sampling was performed at AOC 605 after first-round analytical results were compared with USEPA Region III RBCs and SSLs. Six upper-interval and six lower-interval soil samples were proposed for the second round to determine the extent of constituents detected in the initial round. Five of the six proposed upper-interval samples and four of the six proposed lower-interval soil samples were collected. The upper- and lower-interval samples proposed at

605SB016 could not be collected due to surface and subsurface obstructions (large rocks). The lower interval sample at 605SB013 could not be collected due to large rocks below 2 feet bgs. All second-round samples were submitted for analysis at DQO Level III for organotins and the standard parameters which included VOCs, SVOCs with TICs, pesticides/PCBs, metals, and cyanide. Samples from 605SB017 were analyzed for SVOCs and metals only. Two upper-interval duplicate samples were analyzed at DQO Level IV for Appendix IX analytical parameters, which include the parameters proposed for the site plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins.

Soil sampling conducted at AOC 621, after completion of the IM removal action, included the collection of 24 additional soil samples to further delineate the area to the north, east, and west. These samples were analyzed for Appendix IX analytical parameters. Figure 3.7 shows the AOC 621 sample locations and analytical results. Soil data are summarized in Section 10.1.2 of the *Draft-Final Zone E RFI Report* and the *Interim/Stabilization Measure Completion Report for SWMU 5, AOC 605 & AOC 621, Battery Wrecking/Salvage Area*.

Groundwater

Five shallow monitoring wells were installed and sampled four times during the field investigation to assess groundwater quality at SWMUs 5 and 18 and AOC 605. Monitoring wells were not installed during the AOC 621 IM. Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, TDS, and organotins. One duplicate sample was submitted for Appendix IX analyses at DQO Level IV, which includes the parameters listed above plus a more comprehensive list of VOCs, SVOCs, herbicides, hexavalent chromium, organophosphorous pesticides, and dioxins. Groundwater data are summarized in Section 10.1.4 and Appendix H of the *Draft-Final Zone E RFI Report*.

3.7.2 Data Gaps

Surface Soil

During the initial phase of the investigation, several locations along the western edge of AOC 605 indicated concentrations of BEQs exceeding the industrial RBC (780 $\mu\text{g}/\text{kg}$). Soil borings 605SB003, 605SB004, 605SB008, 605SB013, 605SB014, 018SB001, and 018SB004 exceeded the BEQ industrial RBC. Soil boring 605SB014 also exceeded the industrial RBC for arsenic. Several locations along the southwestern edge of AOC 605 exceeded the industrial RBC for beryllium. Soil borings 605SB005, 605SB007, 605SB0012, and 605SB015 each indicated concentrations exceeding beryllium's industrial RBC (1.3 mg/kg) and background concentration (1.7 mg/kg). Several soil borings indicated lead concentrations exceeding the 1,300 mg/kg industrial action level established for CNC. Soil borings 005SB002, 018SB004, and 605SB002 each exceeded the allowable limits for lead, but borings 005SB002 and 605SB002 were excavated during the AOC 621 IM removal action.

Lead was detected at concentrations up to 129,000 mg/kg during post-IM soil sampling at AOC 621. Many of these samples indicated lead concentrations exceeding the 1,300 mg/kg industrial action level established for CNC. The highest concentrations appeared to be contained in a slightly lower topographic area due to lead-contaminated surface runoff into this depression. Lead concentrations in soil borings 621SB008, 621SB010, 621SB017, and 621SB024 exceeded 1,300 mg/kg. Several soil samples from the southern portion of the sample grid, 621SB040 through 621SB043, also indicated low-level concentrations of the pesticide DDT.

Subsurface Soil

Previous investigation of SWMUs 5 and 18, and AOCs 605 and 621 indicated SVOCs, pesticides, and metals exceeding their SSLs. Sample locations where the most constituents exceeded SSLs in previous sampling events (locations 018SB005 and 605SB014) were selected for soil sampling

from the upper and lower intervals to determine the data needed to calculate site-specific SSLs (per the USEPA Soil Screening Guidance [USEPA, 1996]) and to determine the need for additional monitoring wells. Soil samples will be analyzed for TOC, and for SVOCs, pesticides, and metals according to the SPLP method. After calculating the site-specific SSLs, additional data gaps may be identified and additional sampling may be required. Results of the site-specific SSL calculation and the subsequent screening results for CMCOCs will be presented in the *Final Zone E RFI Report*.

3.7.3 Sampling and Analysis Plan

Additional soil samples are proposed for 11 locations east, south, and west of SWMUs 5 and 18, and AOC 605. Soil samples are proposed for eight locations northeast of AOC 621 and one location to the southwest. Samples will be collected from the upper (0 to 1' bgs) and lower interval (3 to 5' bgs) at each location and analyzed for lead. Additional samples will also be collected from the upper and lower interval at four locations in the southern portion of AOC 621 and analyzed for pesticides, to further characterize the extent of pesticide detections. Soil samples will be collected from the upper (0 to 1 foot bgs) and lower interval (3 to 5 feet bgs) at locations 018SB005 and 605SB014 and analyzed for TOC, and for SVOCs, pesticide, and metals according to the SPLP method. All results will be presented in the *Final Zone E RFI Report*.

Table 3.5 summarizes sample matrices and proposed analytical parameters. Twenty-four soil borings will be advanced and samples collected from the upper and lower interval, and submitted for analysis of metals and pesticides. Proposed sample locations are shown on Figure 3.7. All sampling procedures will adhere to the CNC *Final Comprehensive RFI Work Plan*.

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**Table 3.5
 SWMUs 5, 18, AOCs 605, 621 Sampling and Analysis Plan**

Proposed Sample Locations	Matrix	Number of Samples	Analysis	Rationale
621SB029 - 621SB039	Soil (0-1' bgs) (3-5' bgs)	18	Lead	Delineate lead northeast and southwest of sample grid.
621SB040 - 621SB043	Soil (0-1' bgs) (3-5' bgs)	8	Pesticides	Delineate DDT in the southern portion of the sample grid.
605SB018 - 605SB028	Soil (0-1' bgs) (3-5' bgs)	22	SVOCs, Metals	Delineate BEQs and metals in eastern, southern, and western portions of SWMUs 5, 18, AOC 605.
018SB005 605SB014	Soil (0-1' bgs) (3-5' bgs)	4	SVOC, Pesticides, Metals according to SPLP; TOC	Compare SSL exceedances, calculate site-specific SSLs.

Note:

All analyses will be performed per SW-846, except where other methods are specified. DQO Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10% duplicates. Sample quantities do not include QA/QC samples.

3.8 AOC 701, McMillan Avenue Gas Station

AOC 701 is the former McMillan Avenue gasoline station, Building 1141. The station was built in 1941 and used as a service station until 1979. Building 1141 was renovated and converted into the security building in 1979 and an addition was completed in 1987. According to CNC personnel, two USTs on the northwest side of the building were filled with sand and closed in place in 1973. A tank closure memorandum from the CNSY Occupational Safety, Health, and Environmental Office contained closure pictures and laboratory analytical results. According to the memorandum, a SCDHEC representative stated that no regulatory notification of the tanks' existence would be required because they were closed in 1973. Analytical data indicated surrounding soil was clean at the time of tank closure. Constituents of concern for this unit include metals, VOCs, acids, and petroleum hydrocarbons from gasoline, oil, batteries, antifreeze, and grease wastes.

Soil, groundwater, surface water, sediment, air and subsurface gas are all potential migration pathways due to potential leaks from the former USTs. The preliminary review found no spill reports, inspection reports, employee interviews, or visual observations to indicate any release at this unit. No residential areas or sensitive environments are near this AOC. A CSI was recommended to determine whether the USTs had caused any environmental impact. Additional research was conducted to determine whether any action had been conducted by the UST program and whether additional sampling would be required.

Based on research, no further action is proposed for this site. Analytical results and information for UST closure will be included in the *Final Zone E RFI Report*. AOC 701 is shown on Figure 3.8.

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3.9 AOC 702, Paint Accumulation, Pier D

AOC 702 consists of paint stains from former painting operations on Pier D, a concrete structure with several drainage holes that discharge directly into the Cooper River. Painting is no longer performed on the pier, but evidence of previous spills was discovered during the RFA along the entire length of the pier. The exact dates are unknown, but CNC personnel stated that painting operations began prior to 1973. Constituents of concern for this unit include metals and VOCs from spilled paint waste.

Surface water runoff and sediment are potential migration pathways for this unit, and due to the presence of VOCs, air is also considered a migration pathway. Soil, groundwater, and subsurface gas are not considered pathways because the pier projects solely into the river and contact with these media is not possible. The preliminary review found no spill reports, inspection reports, or employee interviews that indicated any release at this unit. However, paint stains were observed along the entire length of the pier during the visual site inspection. Some of the stains are adjacent to the pier drains and suggest that spilled paint has been released to the Cooper River. Due to this unit's proximity to the river and drainage holes along the pier, exposure would be possible for ecological receptors in the Cooper River through uncontrolled surface water runoff. Because access to this AOC is limited, exposure potential is limited to future site users and CNC personnel who may frequent the area. There are no residential areas near this AOC.

Based on this information, no further action is recommended for this site. Further action would be inconsistent with the approach employed throughout Zone E, and any releases to the Cooper River will be addressed in the Zone J investigation of ecological receptors and water bodies at CNC. AOC 702 is shown on Figure 3.9.

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3.10 AOC 703, Paint Accumulation, Pier F

AOC 703 consists of paint stains from former painting operations on the concrete Pier F, which juts out over the Cooper River. Painting is no longer performed on the pier, but evidence of previous spills was discovered during the RFA along the northern quay wall. The exact dates are unknown, but CNC personnel stated that painting operations began prior to 1973. Constituents of concern for this unit include metals and VOCs from spilled paint waste.

Surface water runoff and sediment are potential migration pathways for this unit and due to the presence of VOCs, air is also considered a migration pathway. Soil, groundwater, and subsurface gas are not considered pathways because the pier juts out solely into the river and contact with these media is not possible. The preliminary review found no spill reports, inspection reports, or employee interviews that would indicate any release at this unit. However, paint stains were observed during the visual site inspection along a section of the pier where painting operations were conducted. Due to this unit's proximity to the river, exposure would be possible for ecological receptors in the Cooper River through uncontrolled surface water runoff. Because access to this AOC is limited, exposure potential is limited to future site users and CNC personnel who may frequent the area. There are no residential areas near this AOC.

Analytical results from AOC 567, which is next to the southern edge of AOC 703, will be reviewed to help determine metals concentrations beneath AOC 703 and other paint accumulation areas. Based on this information, no further action is recommended for this site. Further action would be inconsistent with the approach employed throughout Zone E and any releases that may have occurred to the Cooper River will be addressed in the Zone J investigation of ecological receptors and water bodies at CNC. AOC 703 is shown on Figure 3.10.

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3.11 AOC 704, Paint Accumulation, Building 301B

AOC 704 consists of paint spills on the concrete surface west of Building 301B from past painting operations on nearby piers. The concrete surface is in poor condition with several cracks exposing the underlying soil. The exact dates are unknown, but CNC personnel stated that painting operations began prior to 1973. Constituents of concern for this unit include metals and VOCs from spilled paint waste.

Due to the proximity of the Cooper River and mobility of the volatile constituents, surface water and air are both potential pathways for this AOC. Soil, groundwater, and subsurface gas are also potential migration pathways because of cracks in the surrounding asphalt/concrete surface. The preliminary review found no spill reports, inspection reports, or employee interviews that would indicate any release at this unit. However, paint stains were observed on the west side of Building 301B during the RFA visual site inspection. Some of the stains suggest that paint was spilled near the drains and discharged to the Cooper River.

Due to this unit's proximity to the river, exposure would be possible for ecological receptors in the Cooper River through uncontrolled surface water runoff. Because access to this AOC is limited, exposure potential is limited to future site users and CNC personnel who may frequent the area. There are no residential areas near this AOC.

Based on this information, no further action is recommended for this site. Further action would be inconsistent with the approach employed throughout Zone E and any releases that may have occurred to the Cooper River will be addressed in the Zone J investigation of ecological receptors and water bodies at CNC. AOC 704 is shown on Figure 3.11.

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