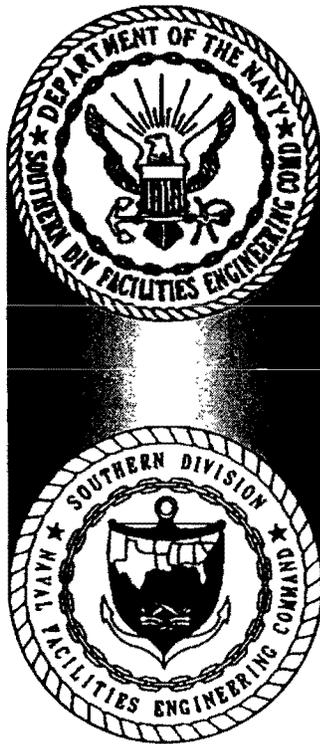


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PHASE I INTERIM MEASURE WORK PLAN SOLID WASTE MANAGEMENT UNIT 3 (SWMU
3) ZONE G WITH TRANSMITTAL CNC CHARLESTON SC
3/11/2002
CH2M HILL

PHASE II INTERIM MEASURE WORK PLAN

SWMU 3, Zone G



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

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

PREPARED BY
CH2M-Jones

March 2002

*Revision 0
Contract N62467-99-C-0960
158814.ZG.PR.11*

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CH2MHILL

March 11, 2002

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

Re: Phase II Interim Measure Work Plan (Revision 0) – SWMU 3, Zone G

Dear Mr. Scaturo:

Enclosed please find four copies of the Phase II Interim Measure Work Plan (Revision 0) for SWMU 3 in Zone G of the Charleston Naval Complex (CNC). This report has been prepared pursuant to agreements by the CNC BRAC Cleanup Team for completing the RCRA Corrective Action process.

The principal author of this document is David Lane. Please contact him at 352/335-5877, extension 2320, if you have any questions or comments.

Sincerely,

CH2M HILL

Dean Williamson, P.E.

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

PHASE II INTERIM MEASURE WORK PLAN

SWMU 3, Zone G



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

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

PREPARED BY
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March 2002

*Revision 0
Contract N62467-99-C-0960
158814.ZG.PR.11*

**Certification Page for Phase II Interim Measure Work Plan
(Revision 0) – SWMU 3, Zone G**

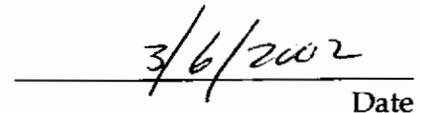
Soil Removal at Building 249

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

South Carolina

P.E. No. 21428


Dean Williamson, P.E.


Date

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1 Acronyms and Abbreviations

2	AST	aboveground storage tank
3	beta/delta-BHC	beta/delta-benzenehexachloride
4	BRAC	Base Realignment and Closure Act
5	CA	Corrective Action
6	CMS	corrective measures study
7	CNC	Charleston Naval Complex
8	COC	chemical of concern
9	COPC	chemical of potential concern
10	DAF	dilution attenuation factor
11	DDT	dichlorodiphenyltrichloroethane
12	DET	Environmental Detachment Charleston
13	EnSafe	EnSafe Inc.
14	EPA	U.S. Environmental Protection Agency
15	EPC	exposure point concentration
16	ft bls	feet below land surface
17	HSP	Health and Safety Plan
18	IM	interim measure
19	MCS	media cleanup standard
20	NAVBASE	Naval Base
21	mg/kg	milligrams per kilogram
22	OP	organo-phosphorus
23	PCB	polychlorinated biphenyl
24	PCE	tetrachloroethene
25	PPE	personal protective equipment
26	RBC	risk-based concentration
27	RCRA	Resource Conservation and Recovery Act
28	RFI	RCRA Facility Investigation

1 **Acronyms and Abbreviations, Continued**

2	SCDHEC	South Carolina Department of Health and Environmental Control
3	SSL	soil screening level
4	SWMU	solid waste management unit
5	UCL ⁹⁵	95-percent upper confidence limit
6	VOC	volatile organic compound
7	yd ³	cubic yards

Section 1.0

1.0 Introduction

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

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

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to document the basis for an Interim Measure (IM) for soil removal at Solid Waste Management Unit (SWMU) 3 in Zone G of the CNC. The land use zoning for this site is M-1, for marine industrial use. Figure 1-1 presents the location of SWMU 3 in Zone G.

1.1 Purpose of the Phase II Interim Measure Work Plan

This Phase II IM Work Plan presents the technical approach to excavate soils contaminated with pesticides at SWMU 3 in Zone G of the CNC. Specifically, the IM will address the removal of surface and subsurface (above the water table) soils that exceed the appropriate surface and subsurface soil Media Cleanup Standards (MCSs) for pesticides.

The Phase I sampling at SWMU 3 has been conducted in accordance with the *Phase I Interim Measure Work Plan, Surface and Subsurface Soil Delineation; SWMU 3, Zone G* (CH2M-Jones, 2001). A Sampling and Analysis Plan (CH2M-Jones, 2002) has been completed for additional delineation of pesticides in soil.

1.2 Site Background and Setting

SWMU 3 is located in an industrial area of Zone G that also includes a petroleum tank farm. The original SWMU location was an approximately 50 by 30-ft area where the former Building 42-A was reported to be located. The building was reported to be a shed where

1 pesticides were mixed prior to 1971. Equipment for spraying and mixing pesticides was
2 reportedly rinsed on the ground outside. The rinsate may have been released in the
3 surrounding area and allowed to absorb onto the soil. During the Confirmation Study
4 performed by Geraghty and Miller (1982), a portion of the area surrounding the slab
5 reported to be Building 42-A was noted to be devoid of vegetation. This once devoid area is
6 now covered with grass. The north section of existing Building 249 was constructed later
7 over a portion of the slab.

8 Soil and groundwater samples collected during the 1982 Confirmation Study revealed the
9 presence of various pesticides and associated degradation products in the soil, consistent
10 with the types of pesticides documented as having been used there. Pesticides detected in
11 previous investigations included dichlorodiphenyltrichloroethane (DDT) and its
12 degradation products, heptachlor, and beta/delta-benzenehexachloride (beta/delta-BHC).
13 Groundwater in the area is not contaminated with these pesticide releases since sample
14 results were below detection limits for pesticides, herbicides, polychlorinated biphenyls
15 (PCBs), and arsenic.

16 A subsequent review of historic maps indicates other nearby areas where pesticide mixing
17 operations may have occurred, expanding the potential scope of the IM. This Phase II IM
18 Work Plan addresses these additional areas (Section 2.0).

19 Additional details of the regulatory background and description of SWMU 3 are described
20 in the *Phase I Interim Measure Work Plan* (CH2M-Jones, 2001) and the *Zone G RFI Report,*
21 *Revision 0* (EnSafe Inc. [EnSafe], 1998).

22 **1.3 Organization of the Phase II IM Work Plan**

23 This Phase II IM Work Plan consists of the following sections, including this introductory
24 section.

25 **1.0 Introduction** — Presents the purpose of the Phase II IM Work Plan and background
26 information regarding the site.

27 **2.0 Previous Investigations at SWMU 3**— Provides a brief description of previous
28 investigations conducted at SWMU 3.

29 **3.0 Identification of Media Cleanup Standards at SWMU 3**— Identifies and presents the
30 derivation of the MCSs for pesticides and VOCs at SWMU 3.

- 1 **4.0 Technical Approach to the Interim Measure** — Provides a brief description of the
- 2 technical approach for the soil removal IM, including identification of the proposed
- 3 excavation area, confirmation sampling, and procedures for waste management.

- 4 **5.0 Interim Measure Completion Report** — Describes the proposed contents of the IM
- 5 Completion Report.

- 6 **6.0 References** — Lists the references used in this document.

- 7 All tables and figures are presented at the end of their respective sections.

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



-  SWMU Boundary
-  Railroads
-  Roads
-  Fence
-  Buildings
-  Pavement
-  Sidewalk
-  Zone Boundary

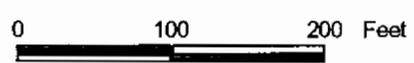


Figure 1-1
 Site Location Map
 SWMU 3, Zone G
 Charleston Naval Complex

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Section 2.0

2.0 Previous Investigations at SWMU 3

An initial Confirmation Study performed by Geraghty and Miller (1982) focused on the soil and groundwater around the reported Building 42-A concrete slab, which was historically used for pesticide mixing and rinsing. The former mixing/rinsing slab is depicted on Figure 2-1. Soil sampling results indicated the presence of low levels of pesticides and associated degradation products, including DDT and its degradation products, heptachlor, and beta/delta-BHC.

In late 1996 and early 1997, a RCRA Facility Investigation (RFI) was conducted at SWMU 3 to further investigate the nature and extent of pesticides in soils, and to determine if any corrective action would be required to eliminate or minimize unacceptable risks to human health or the environment. The work included soil sample collection from ten soil borings with analyses for metals, PCBs, and pesticides (including organo-phosphorus [OP] pesticides). Three shallow monitoring wells were also installed and sampled four times, with analyses for metals, pesticides/PCBs, and OP-pesticides.

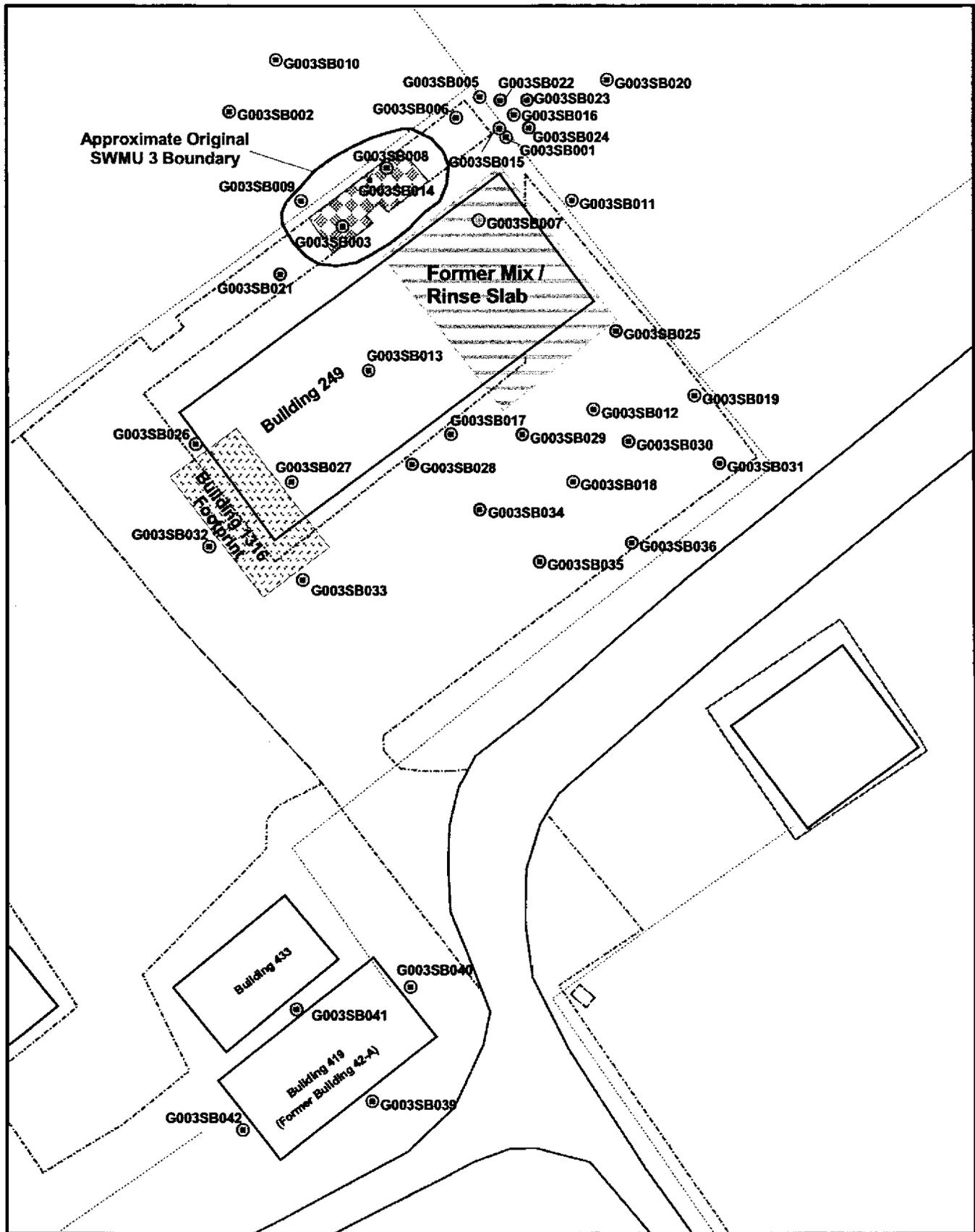
The *Zone G RFI Report, Revision 0* (EnSafe, 1998) identified alpha-chlordane and gamma-chlordane as chemicals of concern (COCs) in surface soils at depths of 0 to 1 foot below land surface (ft bls). No pesticides were detected in groundwater, but the naturally occurring metals aluminum, beryllium, chromium, antimony, and thallium were detected and identified as chemicals of potential concern (COPCs) in the site groundwater. A Corrective Measures Study (CMS) for surface soils and groundwater was proposed in the *Zone G RFI Report, Revision 0*.

The Environmental Detachment Charleston (DET) conducted an IM in July 1998 to remove pesticide and PCB-contaminated soils to a depth of 2 ft from the area around a transformer pad on the northern side of Building 249. A total of approximately 22 cubic yards (yd³) of contaminated soils were removed, and the excavation area was backfilled. The IM activities required the in-place abandonment of monitoring well G003GW003.

After completion of the IM, a second phase of soil boring investigations was performed, in which borings G003SB011 through G003SB020 were installed outside of the SWMU boundary to address SCDHEC concerns about areas adjacent to the former concrete mix/rinse slab.

1 Further investigations were conducted in January 2002 as part of a Phase I IM Work Plan to
2 delineate the extent of pesticide residues in soils around SWMU 3, and to expand the
3 investigation to areas surrounding two buildings shown on historical facility engineering
4 drawings. The new areas include the former Building 1316 and former Building 42-A.
5 Former Building 42-A is currently known as Building 419. Preliminary results from these
6 Phase I IM borings and analyses indicate a few pesticide concentrations exceeding U.S.
7 Environmental Protection Agency (EPA) Region III residential risk-based concentrations
8 (RBCs) and/or soil screening levels (SSLs). A full description of sampling results will be
9 presented in the IM Completion Report. Figures presenting these results were previously
10 provided in the *Sampling and Analysis Plan* (CH2M-Jones, 2002). These data have been used
11 to establish an initial target excavation area (see Section 4.0). Additional sampling results
12 will be used to finalize excavation areas and depths, as necessary.

13 In addition, once the soil excavation has been completed, additional groundwater
14 investigation activities will be completed to assess whether impacts to groundwater have
15 occurred. The groundwater investigation activities will be planned and coordinated with
16 SCDHEC staff.



- Subsurface Soil Samples
- ⊙ Surface Soil Samples
- ▨ Building 1316 Footprint
- ⌒ Railroads
- ⌒ Roads
- ⌒ Fence
- ▨ Pavement
- ▨ Former IM Excavation Area
- ▭ Buildings
- ▭ SWMU 3 Boundary
- ▨ Former Mix / Rinse Slab



0 20 40 Feet

Figure 2-1
RFI and Phase I Soil Sample Locations
SWMU 3, Zone G
Charleston Naval Complex

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Section 3.1

1 3.0 Identification of Media Cleanup Standards 2 at SWMU 3

3 This section identifies the MCSs for soil at SWMU 3 and describes the approach for selection
4 of areas needing remediation. The MCSs are generally based on protection of human health
5 and prevention of future migration/releases. The MCSs for pesticides in different media are
6 1) human health-based concentrations in surface soil, 2) protection against leachability to
7 groundwater for surface and subsurface soil, and 3) background soil concentrations, where
8 applicable.

9 The objectives of the soil removal IM are to remove contaminated soils such that once the
10 IM has been completed, the remaining surface soils meet the risk-based criteria for
11 industrial land use (based on EPA Region III industrial RBCs), and to ensure that the
12 remaining surface and subsurface soil concentrations do not pose a leaching hazard to the
13 groundwater. The SSL criteria are based on the EPA *Soil Screening Guidance: Technical*
14 *Background Document (Table A-1)* (1996), using a dilution attenuation factor (DAF) of 1 for
15 VOCs and a DAF of 10 for other parameters.

16 In addition, based on the current data, CH2M-Jones believes that by removing a relatively
17 small amount of additional surface soil, and upon completion of the IM, the surface soil will
18 meet the EPA Region III unrestricted (residential) land use RBCs, based on an evaluation of
19 Exposure Point Concentrations (EPCs), using standard risk assessment criteria. CH2M-Jones
20 is committed to trying to meet this more protective cleanup level even though the site is
21 zone for future industrial land use, if this can be achieved without significantly greater soil
22 excavation. The additional soil samples that will be collected in the near future (as proposed
23 in the recent *Soil Sampling Plan* [CH2M-Jones, 2002]) are expected to clarify the excavation
24 limits necessary to achieve the MCSs for unrestricted (residential) land use RBCs. A
25 description of the overall approach used to develop the proposed MCSs, and to establish the
26 initial target excavation areas, are described in the following sections.

27 3.1 Health-Based MCSs

28 The surface soil samples collected during different sampling efforts indicated the presence
29 of pesticides at concentrations above industrial land use RBCs. An IM had been conducted

1 in a previously identified contamination area related to SMWU 3. However, subsequent
2 sampling efforts identified additional locations around the area with elevated pesticide
3 concentrations. This Phase II IM proposes to remediate the soils with elevated pesticide
4 concentrations around these additional contaminated locations.

5 SWMU 3 is located within an industrial area near two large aboveground storage tanks
6 (ASTs) within Zone G. The potential human receptors for this area are likely to be current
7 and future maintenance/industrial workers. SWMU 3 and the surrounding area are
8 designated in the proposed zoning as M-1, for marine industrial land use. Since the area will
9 likely remain industrial, practical target goals that protect the health of industrial workers
10 are applicable for this site. However, an unrestricted (residential) land use scenario was also
11 included in this Phase II IM to maintain a maximum flexibility for future land use for this
12 area, in the event it is feasible to achieve these more protective standards during
13 remediation without significant incremental effort.

14 Site surface soil concentrations are screened to evaluate COCs that may need remedial
15 actions based on current and proposed future industrial land use. The health-based MCSs
16 used for this screening evaluation include 1) residential land use RBCs, 2) industrial land
17 use RBCs, 3) leachability-based criteria (i.e., SSLs), and 4) "hot spot" evaluation criteria,
18 which are calculated at 3 x the RBC values. Table 3-1 presents the surface soil screening
19 criteria for COCs determined to require remedial action. Once an exceedance is identified,
20 the COCs are identified by comparing site concentrations against both industrial and
21 residential land use RBCs, and the SSLs.

22 The screening evaluation to identify the associated COCs includes the following three steps:

Step 1	Comparison of maximum concentrations to screening criteria.
Step 2	Comparison of the site-wide exposure point concentrations (EPCs) to these criteria (see Section 4.0 for details). The EPCs are the estimated 95-percent Upper Confidence Limit (UCL ₉₅) concentrations for comparison to RBCs and averages for SSLs.
Step 3	Comparison of maximum concentrations to "hot spot" criteria, to ensure that no hot spots are remaining at the site. The hot spot criteria are 3 times the RBC values for industrial and residential land uses.

23

24 Areas are identified as potentially needing remedial action based on individual sample
25 exceedances of acceptable risk criteria for industrial land use or exceedance of SSLs. Once
26 the COCs and areas needing remediation are identified by the above screening process, then

1 target areas are further evaluated to achieve unrestricted (residential) land use based on
2 residential criteria, to the extent practicable.

3 After remedial action is taken at this site, the residual site-wide averages and EPCs for
4 surface soil will meet the industrial RBCs and likely will meet residential RBCs (see Section
5 4.0). An individual sample may exceed an RBC, however, the site-wide exposures to the
6 COCs will meet the target concentrations.

7 The human health -based MCSs are the EPA Region III residential/industrial RBCs (October
8 2000). The leachability-based MCSs are the SSLs from the EPA *Soil Screening Guidance:
9 Technical Background Document* (1996). Site-specific SSL-based MCSs were not developed at
10 this time, as none of the chemicals indicated a need. Further details on leachability criteria
11 are included in Section 4.0.

12 **3.2 Surface and Subsurface Soil MCSs**

13 Surface and subsurface soils are evaluated to determine the need for remedial action by
14 screening the COCs against criteria protective against leaching from the soil to the
15 groundwater. As a preliminary step these MCSs are selected as the SSLs provided in the
16 EPA *Soil Screening Guidance: Technical Background Document*. These MCSs apply to average
17 concentrations in both surface and subsurface soil. In areas where exceedances are observed,
18 a localized subset of samples is used to estimate area averages as a conservatively protective
19 measure. For pesticides, the SSL with a DAF=10 is used, and for VOCs, the SSL with a
20 DAF=1 applies.

21 **3.3 Background Concentrations**

22 Many of the pesticides have been historically applied across the CNC as part of the general
23 facility maintenance. Most of these chlorinated pesticides were banned for use more than 30
24 years ago. Any concentrations detected within the range of background concentrations
25 established for the CNC, which may have resulted from facility maintenance application,
26 will be considered not related to site releases and will not be addressed further in this IM
27 Work Plan. Dieldrin is one such example, as it has been detected at very low levels and has
28 been found throughout the CNC in both surface and subsurface background soils. The
29 ranges of dieldrin concentrations identified in the grid-based background samples
30 throughout the CNC are listed in Table 3-2.

TABLE 3-1
 Surface Soil Screening Criteria for COCs Needing Remedial Action
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

COPC/COC	Maximum Detection (mg/kg)	Average Detection ¹ (mg/kg)	UCL ₉₅ ² (mg/kg)	Media Cleanup Standard for Site-wide Exposure Points		SSL ⁴ (mg/kg)	Media Cleanup Standard for 'Hot Spots'		COC Needing Remedial Action?
				RBC ³ (mg/kg)			3 X RBC ³ (mg/kg)		
				Residential	Industrial		Residential	Industrial	
Pesticides						(DAF=10)			
Chlordane	140	7.3	9.57	1.8	16	5	5.4	48	Yes
Alpha-chlordane	17	1.1	1.55	1.8	16	5	5.4	48	Yes
Gamma-chlordane	22	1.3	1.87	1.8	16	5	5.4	48	Yes
Dieldrin	0.41	0.47	0.18	0.3 ⁵	0.36	0.3 ⁵	NA	NA	Yes
DDD	310	8.7	17.5	2.7	24	8	8.1	72	Yes
DDE	44	1.6	2.7	1.9	17	27	5.7	51	Yes
DDT	2,500	73	141.7	1.9	17	16	5.7	51	Yes
Endosulfan	0.021	0.26	NC ²	47	1,200	9	141	3,600	No
Endrin	0.54	0.5	NC ²	2.3	610	0.5	6.9	1,830	No
Heptachlor	1.6	0.29	NC ²	0.14	1.3	11.5	0.42	3.9	Yes
VOCs						(DAF=1)			
Acetone	24	1.4	NC ²	780	200,000	0.8	2,340	600,000	Yes/No ⁶
Benzene	0.0034	0.0027	NC ²	12	100	0.002	36	300	Yes/No ⁶
Tetrachloroethylene	0	0.0026	NC ²	12	110	0.003	36	330	No

¹ Average of all detects and non-detects.

² UCL₉₅ values are calculated for chemicals with maximum concentrations exceeding Residential RBC.

³ RBC for carcinogens taken directly from table (EPA October 2000); RBC converted for HI = 0.1 for non-carcinogens.

⁴ SSL from *Soil Screening Guidance: Technical Background Document (Table A-1)*, EPA, May 1996.

⁵ Dieldrin residential RBC is 0.04 < maximum background of 0.3 mg/kg; dieldrin SSL is 0.002 < maximum background of 0.3 mg/kg.

TABLE 3-1
 Surface Soil Screening Criteria for COCs Needing Remedial Action
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

COPC/COC	Maximum Detection (mg/kg)	Average Detection ¹ (mg/kg)	UCL ₉₅ ² (mg/kg)	Media Cleanup Standard for Site-wide Exposure Points		SSL ⁴ (mg/kg)	Media Cleanup Standard for 'Hot Spots'		COC Needing Remedial Action?
				RBC ³ (mg/kg)			3 X RBC ³ (mg/kg)		
				Residential	Industrial		Residential	Industrial	

⁶ Acetone and benzene are not likely related to site pesticide activities, are isolated (limited to two and one occurrences, respectively), and were not detected in adjacent groundwater monitor well 003GW001 in April 1998. They are not carried forward as COCs.

- COC Chemical of concern
- DAF Dilution attenuation factor
- DDD Dichlorodiphenyldichloroethane
- DDE Dichlorodiphenyldichloroethene
- DDT Dichlorodiphenyltrichloroethane
- mg/kg Milligrams per kilogram
- NC Not calculated
- RBC Risk-based concentration
- SSL Soil screening level
- UCL₉₅ 95-percent Upper Confidence Limit
- VOC Volatile organic compound

TABLE 3-2
Background Concentration Ranges for Dieldrin (All Zones)
Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Soil Type	Range of Concentrations for Dieldrin (mg/kg)
Surface Soil	0.0005 – 0.3
Subsurface Soil	0.004 – 0.01

The background concentration ranges are based on data available from GIS database for dieldrin detects (Zones B, C, E, G, H for surface soil, and Zones C, E, H, I for subsurface soil).

mg/kg Milligram per kilogram

Section 4D

4.0 Technical Approach to the Soil Removal Interim Measure

This section outlines the technical approach to the soil removal IM, and includes the approach used to develop the initial target excavation area for soils contaminated with pesticides, the excavation methods, and the waste handling procedures. Figure 4-1 presents an indexed map of the exceedances and the excavation areas.

4.1 Soil Removal Criteria and Delineation

The investigation of soil in the areas around Buildings 249 and 419 resulted in the identification of pesticide and VOC COCs potentially needing remedial action. The locations of these COC exceedances are shown in Figures 4-2 and 4-3 for Buildings 249 and 419, respectively.

4.1.1 Surface Soil

The UCL₉₅ concentration for each COC in surface soil was determined as an EPC for the site (at slightly more than ½-acre, but less than ¾-acre). The UCL₉₅ concentrations are presented in Table 4-1. The use of the UCL₉₅ concentration as the EPC is recommended by the *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)* (EPA, 1989); this approach is similar to that used elsewhere at the CNC during remedial actions. Because a risk assessment uses UCL₉₅ concentration as the EPC in determining risks from exposures to a site, a UCL₉₅ concentration that is below a target concentration (such as an MCS) indicates that risks are within or below acceptable limits.

The UCL₉₅ concentration for all pesticides at this site is expected to be below residential land use RBCs after remedial action. This will be a conservatively protective approach for future human exposures because the site use is more likely to continue to be used for industrial purposes based on the future zoning of this area as M-1 (marine/industrial reuse). This issue is discussed further in Section 3.0. During UCL₉₅ calculations, multiple iterations were performed:

- 1) UCL₉₅ was estimated with all the site samples included (presented in the first UCL₉₅ column in Table 4-1).

- 1 2) When the UCL_{95} result indicated an EPC greater than the MCS (i.e., residential RBC,
2 except for dieldrin), then
- 3 3) The areas with the greatest concentrations were removed until the UCL_{95} was equal to or
4 less than the MCS (presented in the second UCL_{95} column in Table 4-1).

5 The greatest concentration samples are identified in Table 4-1 as areas requiring remedial
6 action. The sample locations that require remedial actions in order to meet the target MCS
7 are also shown on Figure 4-2.

8 Although the EPC calculation effort identified one sample location requiring removal
9 actions due to presence of gamma-chlordane (G003SB003), this area was already remediated
10 as part of the Phase I IM, and therefore will not be addressed further in this section.

11 The delineation of the pesticides in surface soil is generally complete; however, additional
12 sampling is planned for the southeast and southwest areas of Building 249, and the
13 northeast side of Building 419 (see *Sampling and Analysis Plan* [CH2M Jones, 2002]) to
14 delineate outer extent.

15 The occurrences of acetone and benzene in G003SB024 exceed only the SSL (DAF=1);
16 acetone and benzene are not likely related to site pesticide activities, are isolated in
17 occurrence (limited to the single detection), and were not detected in the April 1998
18 sampling of groundwater in the adjacent monitoring well (G003GW001). Acetone and
19 benzene reported near detection limits are therefore not considered further for removal.
20 Additional sampling at the G003SB024 location is planned to confirm that these previous
21 detections are not significant (CH2M-Jones, 2002) .

22 **4.1.2 Leachability-Based Evaluation for Soil**

23 Samples in surface and subsurface soil are also compared with MCSs that are protective of
24 leachability to groundwater (i.e., SSLs). The sample mean concentrations were estimated for
25 surface and subsurface soils in Table 4-2. Any mean concentrations that exceed the MCSs
26 are identified for potential remedial action.

27 In addition, a separate average concentration was estimated for the area with high
28 concentrations of DDT in the subsurface soil, as presented in Table 4-3. The subsurface soil
29 that contains the greatest concentrations of DDT at sample location G003SB012 will be
30 remediated in order to reduce the potential for leachability to groundwater from this
31 subsurface soil area. All other soil concentrations of DDT remaining in place do not indicate
32 the potential for leachability to groundwater.

1 Tetrachloroethene (PCE) is identified as a potential COC in subsurface soil at Building 419.
2 However, PCE was not detected in an adjacent groundwater probe (LF037GP052) in June
3 1997. Additional soil and groundwater monitoring is planned for this area, but no removal
4 of subsurface soil is proposed at this time. If additional investigation activities confirm PCE
5 as a soil COC, additional corrective measures (such as soil vapor extraction) may be
6 implemented to address PCE or other VOCs in soil. No other COCs are identified in
7 subsurface soil.

8 **4.2 Excavation Limits**

9 The delineation of pesticides in surface soil to residential land use RBC screening criteria,
10 and the delineation of subsurface soil to SSLs continues concurrent with this IM Work Plan
11 and is addressed in the *Sampling and Analysis Plan* (CH2M-Jones, 2002). The contaminant
12 delineation for the IM discussed herein is based on the delineation data available at this time
13 (through the *Phase I IM Work Plan* [CH2M-Jones, 2001]; new data available from the further
14 delineation of the *Sampling and Analysis Plan* will be reviewed and the removal delineation
15 will be adjusted, if necessary.

16 The following three surface soil areas are identified as requiring removal actions:

- 17 • Building 249 North: COC is DDT in a small area around sample location G003SB016.
- 18 • Building 249 Southeast: COCs include DDT, DDD, and DDE located south and south
19 east of Building 249; includes samples G003SB012, G003SB018, G003SB028, G003SB034
20 and G003SB035.
- 21 • Building 249 Southwest: COCs include chlordane, alpha chlordane, and dieldrin around
22 sample location G003SB026.

23 This IM will remove achieve compliance with the MCSs around Building 249 based on the
24 approach which is discussed above. These areas are discussed in more detail in the
25 following subsections.

26 **4.2.1 Building 249 North**

27 The results of criteria comparisons and exceedances discussed in Section 4.1 above indicate
28 one small area north of Building 249 requiring remedial action. The size of the area is
29 approximately 25 ft², and is located at soil boring location G003SB016. The COC in this
30 location is DDT. The area is to be excavated to a depth of 1 foot (approximately 1 yd³) (see
31 Figure 4-2).

1 **4.2.2 Building 249 Southeast**

2 An area southeast of Building 249 includes boring locations where the UCL₉₅ concentrations
3 of at least one pesticide exceeds the MCS. DDT, DDD, and DDE are identified as COCs in
4 the area located south and southeast of Building 249, and includes sample locations
5 G003SB012, G003SB018, G003SB028, G003SB034 and G003SB035 (see Table 4-1). The
6 remedial actions in this general area also include sample locations G003SB029 and
7 G003SB017, although they are not required for removal based on EPC calculations. This area
8 (2,700 ft²) will be excavated to a depth of 1 ft (approximately 100 yd³). Sample location
9 G003SB012 also had an exceedance of the MCS in the subsurface soil (see Figure 4-2). An
10 additional 4 ft of excavation (total excavation depth of 5 ft) will be made at this location for
11 an approximate area of 10 by 10 ft at boring location G003SB012. The additional removal
12 involves approximately 15 additional cubic yards.

13 **4.2.3 Building 249 Southwest**

14 This area includes chlordane and dieldrin identified as COCs located southwest of Building
15 249 and includes sample G003SB026 (see Table 4-1). This smaller area is planned to be
16 excavated (20 by 15 ft, 300 ft²) to a depth of 1 ft (about 11 yd³). The exact area for removal
17 has not been defined around this sample, as the contamination boundaries need to be
18 further defined.

19 **4.2.4 Building 419**

20 Removal of pesticide-contaminated soil in the Building 419 area is not expected, but the
21 decision will be based on the results of additional soil samples that will be collected. The
22 results of this collection and analysis will be reviewed to determine the need for excavation
23 at this location. Only one boring location (G003SB040) had an exceedance of the residential
24 land use MCS (chlordane at 2.4 J mg/kg), versus a residential land use RBC of 1.8 mg/kg
25 and an industrial land use RBC of 16 mg/kg in surface soil. This is well below the
26 calculation of 3 x RBC criteria, as presented in Section 4.1 above. Provided that the EPC for
27 this area does not exceed the residential land use RBC, no remediation in this area is
28 expected. In subsurface soil, PCE exceeded its SSL (DAF=1) at three locations, but the
29 exceedances were at levels within one order of magnitude of the SSL. Removal of these low
30 levels is not planned, but the results of additional investigations will be reviewed to assess
31 the need for remediation of VOCs in soil before site closeout.

1 **4.2.5 General Soil Excavation Activities**

2 Most of the proposed excavation limits are paved, except for the area immediately adjacent
3 to Building 249. The pavement will be removed and the soil excavated to the required 1 ft or
4 5 ft depth below land surface (ft bls), or to groundwater level if it is shallower than 5 ft.

5 Dust control and runoff control measures will be implemented during pavement removal
6 and excavation to reduce the potential for contaminated soil to become airborne or migrate
7 to surface water. During excavation, the IM areas will be monitored for dust levels using
8 appropriate real-time measuring instruments. If dust levels are higher than the action levels
9 set forth in the CNC Health and Safety Plan (HSP), adequate dust suppression measures
10 will be taken. Excavated material will be stockpiled or placed directly into containers.
11 Stockpiles will be placed on plastic and covered to prevent saturation and migration of soil.
12 All sampling, excavation, and stockpiling activities will be performed according to the
13 approved CNC HSP. The excavations will be backfilled with clean soil and all pavement
14 layers will be replaced with material similar to that which is removed.

15 **4.2.6 Summary of Remediation Quantities**

16 Three locations around Building 249 are planned for soil excavation. Approximately 112 yd³
17 of surface soil and an additional 15 yd³ of subsurface soil will be removed and disposed of,
18 for a total quantity of 127 yd³ (in ground measurement). An equal amount of clean soil will
19 be required for backfill. Approximately 3,000 ft² (333 yd²) of pavement will be removed and
20 replaced.

21 **4.3 Confirmation Testing**

22 Because of the extensive testing of the surface and subsurface soil, the additional testing that
23 will be performed prior to implementation of the IM (see *Sampling and Analysis Plan* [CH2M
24 Jones, 2002]), and the UCL₉₅ concentration for all contaminants being well below MCSs, no
25 further confirmation testing for assessing the lateral extent of contamination is proposed. If
26 results of the proposed additional delineation testing indicate an unbounded area of
27 contamination exceeding MCSs, then additional testing will be proposed during the IM as
28 appropriate.

29 For the excavation area southeast of Building 249, four soil samples will be collected from
30 the floor of the excavation, in the vicinity of soil boring locations G003SB028, G003SB034,
31 G003SB0018, and one at a discretionary location (i.e., where soil stains are observed) to
32 ensure that subsurface soil concentrations in soil remaining in that area do not represent a

1 leaching hazard. Similarly, for the excavation area southwest of Building 249, two soil
2 samples will be collected from the excavation floor to ensure the remaining soil does not
3 represent a leaching hazard.

4 **4.4 Waste Management and Disposal**

5 Four waste streams will be generated as part of this IM:

- 6 • Pavement debris from the parking lot
- 7 • Excavated soils
- 8 • Decontamination wastes
- 9 • Personal protective equipment (PPE) and stockpile liners

10 Uncontaminated pavement debris will be disposed of in a construction debris landfill.

11 Excavated soils will be characterized in accordance with South Carolina Hazardous Waste
12 Management Regulations (Section SCDHEC R.61-79.261) and disposed of in accordance
13 with all applicable regulations and permits. Excavated soil will be transferred directly to
14 disposal containers (e.g., lined roll-off box or similar container), or covered in a stockpile
15 until removal.

16 Decontamination wastes and PPE will be disposed in accordance with the appropriate
17 regulations. Offsite transportation and disposal will be performed by properly permitted
18 and licensed subcontractors. Materials designated for offsite disposal will be documented,
19 tracked, and their disposition verified. This information will be documented in the IM
20 Completion Report generated for SWMU 3.

TABLE 4-1
 Sample Locations Identified for Remedial Actions Around SWMU 3
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

COCs	MCS	UCL ₉₅ (all samples)	Sample Locations to be Removed	UCL ₉₅ (after removal)	Statistical Basis
Chlordane	1.8	9.57	G003SB026	0.70	Non-parametric (Bootstrap)
Alpha-chlordane	1.8	1.55	G003SB026	1.05	Non-parametric (Bootstrap)
Gamma-chlordane	1.8	1.87	G003SB003	1.08	Non-parametric (Bootstrap)
Dieldrin	0.33	0.18	G003SB026	0.05	Non-parametric (Bootstrap)
DDD	2.7	17.50	G003SB018	1.39	Non-parametric (Bootstrap)
DDE	1.9	2.72	G003SB018	0.65	Non-parametric (Bootstrap)
DDT	1.9	141.37	G003SB012, G003SB016, G003SB018, G003SB028, G003SB034, G003SB035	1.19	Non-parametric (Bootstrap)

Values that are in bold text and outlined within the table exceed MCSs.

- COC Chemical of concern
- DDD Dichlorodiphenyldichloroethane
- DDE Dichlorodiphenyldichloroethene
- DDT Dichlorodiphenyltrichloroethane
- MCS Media cleanup standard
- UCL₉₅ 95-percent upper confidence limit

TABLE 4-2
 Soil Leachability Evaluation for Surface and Subsurface Soil Remedial Actions at SWMU 3
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Chemical	No. of Samples	No. of Detects	Maximum Detect (mg/kg)	Average Detect (mg/kg)	Mean ¹ (mg/kg)	SSL (mg/kg)	COC ² Leachability?	Comment	Mean ¹ After Removal (mg/kg)
Surface Soil									
Acetone	20	11	24	2.5	1.4	0.80	Yes/No	Not in groundwater	
Alpha-chlordane	40	18	17	2.0	1.1	5.0	No		
Benzene	20	1	0.0034	0.0034	0.0027	0.0020	Yes/No	Not in groundwater	
Chlordane	21	3	140	48	7.3	5.0	Yes	See Table 4-1 for the sample locations being removed	0.3
Dieldrin	40	10	0.41	0.063	0.47	0.33	No		
Endosulfan I	40	3	0.021	0.0091	0.26	9.0	No		
Endrin	40	2	0.54	0.27	0.50	0.50	No	See Table 4-1 for the sample locations being removed	0.01
Gamma-chlordane	40	23	22	1.9	1.3	5.0	No		
Heptachlor	40	5	1.6	0.48	0.29	12	No		
p,p'-DDD	40	24	310	14	8.7	8.0	Yes	See Table 4-1 for the sample locations being removed	0.07
p,p'-DDE	40	37	44	1.7	1.6	27	No		
p,p'-DDT	40	37	2,500	79	73	16	Yes	See Table 4-1 for the sample locations being removed	0.44
Subsurface Soil									
Acetone	20	13	0.42	0.14	0.11	0.80	No		
Alpha-chlordane	40	12	0.098	0.027	0.012	5.0	No		

TABLE 4-2
 Soil Leachability Evaluation for Surface and Subsurface Soil Remedial Actions at SWMU 3
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Chemical	No. of Samples	No. of Detects	Maximum Detect (mg/kg)	Average Detect (mg/kg)	Mean ¹ (mg/kg)	SSL (mg/kg)	COC ² Leachability?	Comment	Mean ¹ After Removal (mg/kg)
Subsurface Soil									
Benzene	20	0	0	0	0.0025	0.0020	No	No detects	
Chlordane	21	4	0.63	0.22	0.11	5.0	No		
Dieldrin	40	6	0.048	0.010	0.0087	0.33	No		
Endosulfan I	40	1	3.10E-04	3.10E-04	0.0042	9.0	No		
Endrin	40	0	0	0	0.0083	0.50	No		
Gamma-chlordane	40	14	0.11	0.026	0.013	5.0	No		
Heptachlor	40	3	0.010	0.0067	0.0046	12	No		
p,p'-DDD	40	18	6.1	0.37	0.17	8.0	No		
p,p'-DDE	40	23	1.5	0.084	0.049	27	No		
p,p'-DDT	40	27	73	3.2	2.1	16	No ³	See Table 4-3 for the soils being removed	
Tetrachloroethene (PCE)	20	3	0.027	0.013	0.0040	0.0030	Yes/No ⁴		

Values in bold text and outlined in boxes within the table exceed MCSs.

¹ Mean of all detects and non-detects.

² Does the mean exceed the SSL?

³ A localized area average where maximum is detected indicates a need to remove the highest DDT concentration.

⁴ PCE was not detected in adjacent groundwater probe LF037GP052 in June 1997. Additional groundwater monitoring is planned for this area, but no removal of subsurface soil is proposed at this time.

TABLE 4-2
 Soil Leachability Evaluation for Surface and Subsurface Soil Remedial Actions at SWMU 3
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Chemical	No. of Samples	No. of Detects	Maximum Detect (mg/kg)	Average Detect (mg/kg)	Mean ¹ (mg/kg)	SSL (mg/kg)	COC ² Leachability?	Comment	Mean ¹ After Removal (mg/kg)
COC	Chemical of concern								
DDD	Dichlorodiphenyldichloroethane								
DDE	Dichlorodiphenyldichloroethene								
DDT	Dichlorodiphenyltrichloroethane								
mg/kg	Milligrams per kilogram								
SSL	Soil screening level								

TABLE 4-3
 Localized Average Concentrations of DDT in Subsurface Soil Near G003SB012
 Phase II IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Chemical	Station IDs	Average before Removal (mg/kg)	SSL (mg/kg)	Residual Average (after G003SB012 removal) (mg/kg) ¹
DDT	G003SB012 G003SB017 G003SB018 G003SB034 G003SB035	16.78	16	2.71

¹ Area averages will be lower than those presented here as some of the lower concentration areas were not included in this average estimates.

DDT Dichlorodiphenyltrichloroethane

mg/kg Milligrams per kilogram

SSL Soil screening level

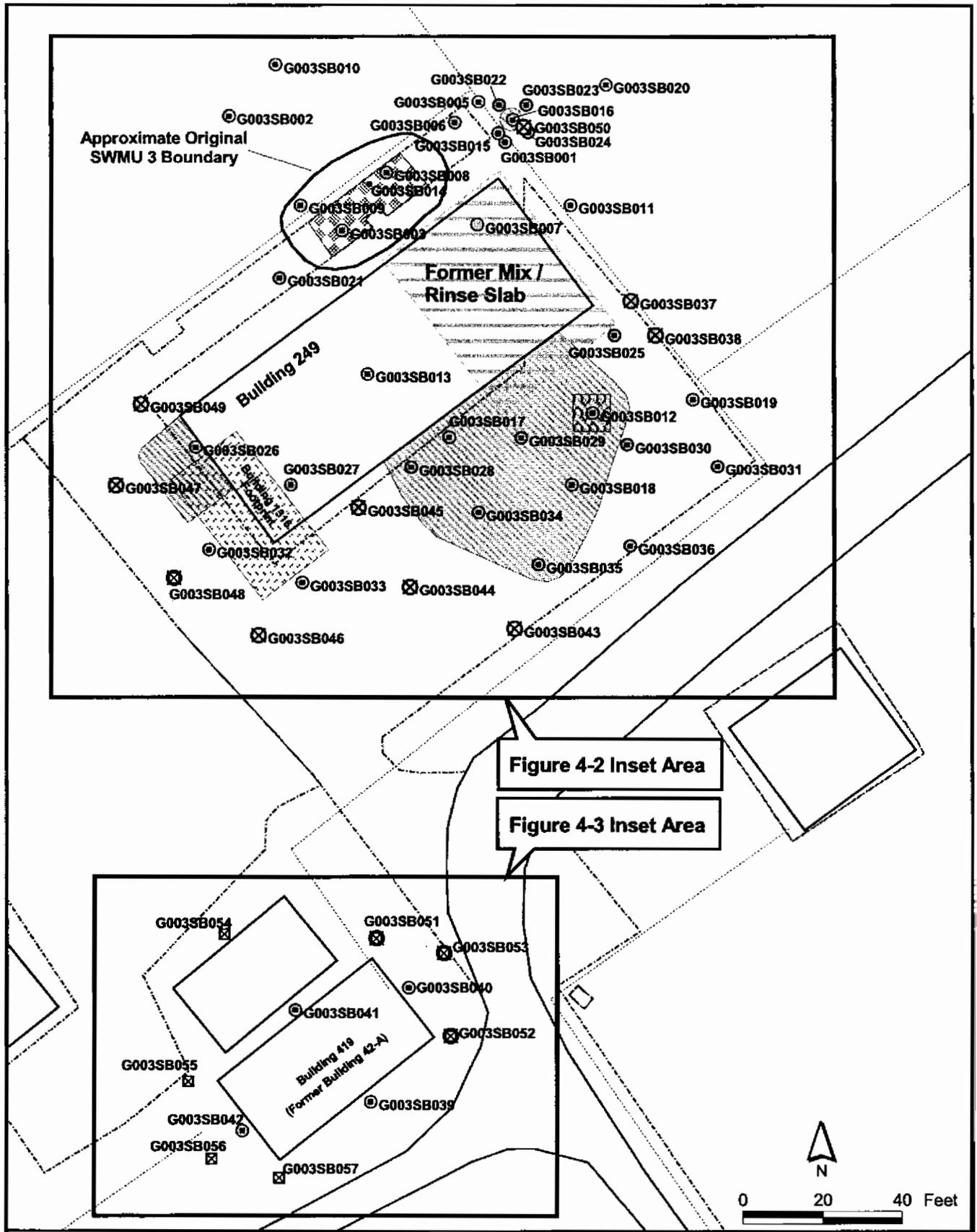


Figure 4-2 Inset Area

Figure 4-3 Inset Area

- | | |
|------------------------------------|---------------------------------|
| ■ Subsurface Soil Samples | ▨ Building 1316 Footprint |
| ● Proposed Subsurface Soil Samples | ▭ SWMU Boundary |
| ⊙ Surface Soil Samples | ▭ Former IM Excavation Area |
| ⊗ Proposed Surface Soil Samples | ▭ Buildings |
| ▨ Pavement | ▨ Former Mix / Rinse Slab |
| ▨ Roads | ▨ Excavation Area: 1 Foot Depth |
| ▨ Fence | ▨ Excavation Area: 5 Foot Depth |

Figure 4-1
 Index Map of Exceedances and
 Excavation Areas
 SWMU 3, Zone G
 Charleston Naval Complex



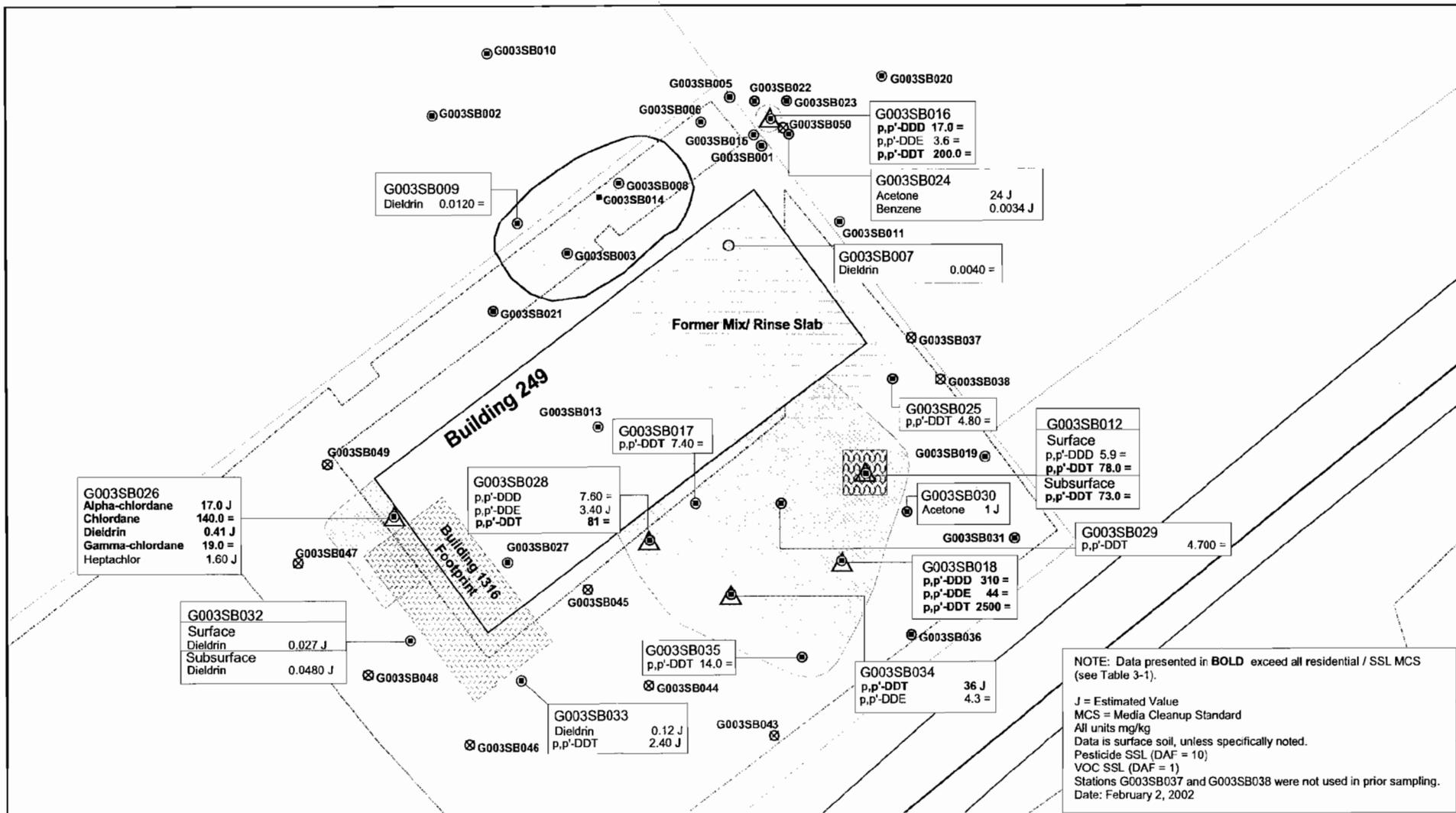
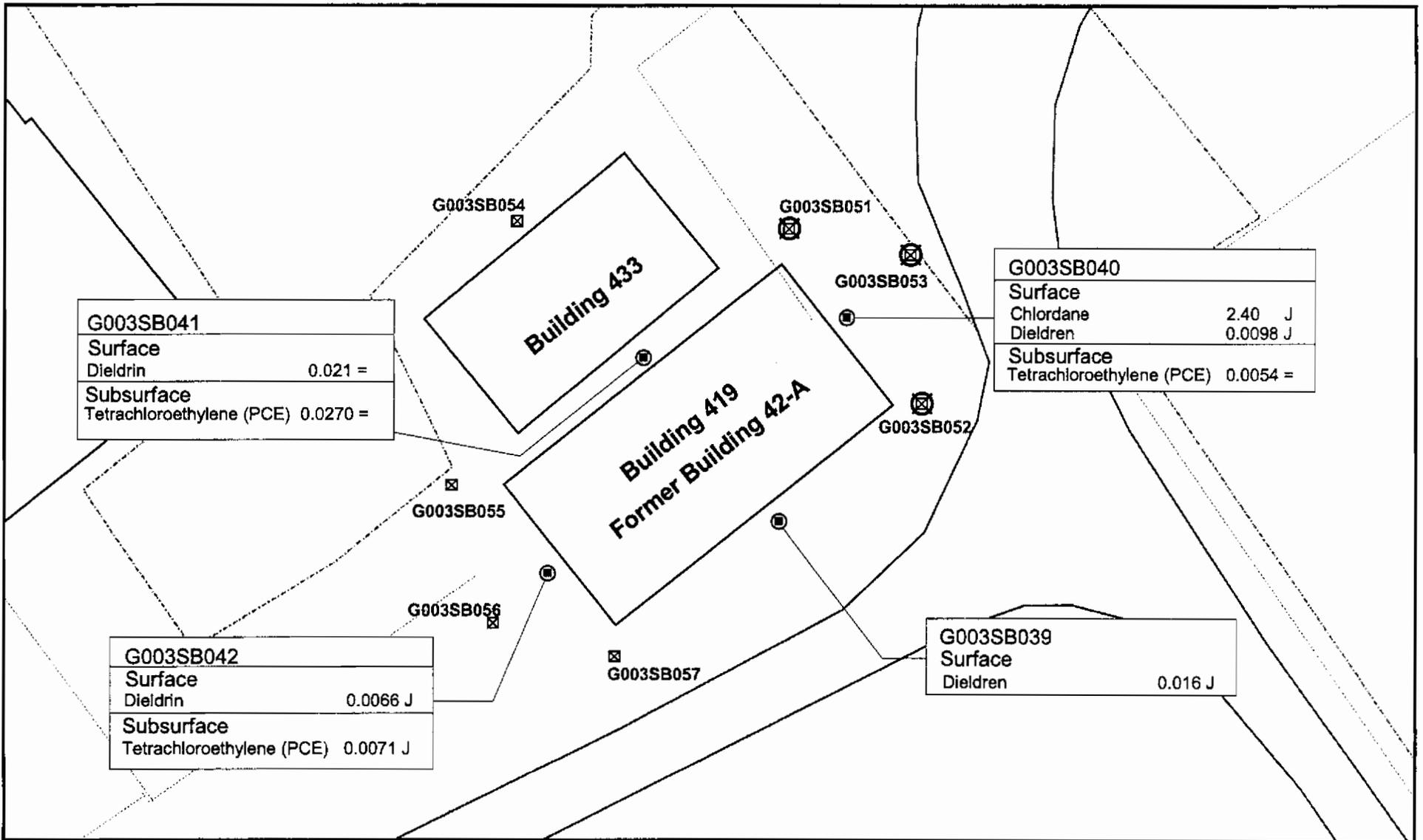


Figure 4-2
 Soil Screening Exceedances
 and Excavation Areas - Building 249
 SWMU 3, Zone G
 Charleston Naval Complex

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- Subsurface Soil Samples
- Surface Soil Samples
- ⊗ Proposed Surface Soil Samples
- ⊠ Proposed Subsurface Soil Samples
- ▭ Buildings
- Roads
- - - Fence
- ▨ Pavement

NOTE:
 J = Estimated Value
 All Units in mg/kg
 Pesticide SSL (DAF = 10)
 VOC SSL (DAF = 1)
 MCS = Media Cleanup Standard
 No data exceed all residential / SSL MCS, see Table 3-1

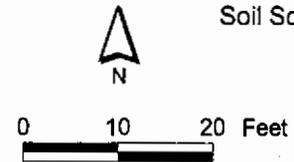


Figure 4-3
 Soil Screening Exceedances - Building 419
 SWMU 3, Zone G
 Charleston Naval Complex

Section 50

5.0 Phase II Interim Measure Completion Report

An IM Completion Report will be submitted within 60 days of receipt of the final data for the Phase II soil removal IM. The report will summarize the actions that were taken and provide the following information:

- Analytical data reports from the Phase I (CH2M-Jones, 2001) and additional sampling (CH2M-Jones, 2002) investigations
- Excavated area measurements and volumes of excavated soil
- Nature and volume of excavated wastes generated
- Waste transportation and disposal records
- Site photographs
- Problems encountered during the excavation IM, if any, and the corrective measures implemented

Section 60

1 **6.0 References**

- 2 EnSafe Inc. *Zone G RFI Report, Revision 0*. February 20, 1998.
- 3 CH2M-Jones. *Phase I Interim Measure Work Plan, SWMU 3, Zone G*. Revision 0. October 2001.
- 4 CH2M-Jones. *Sampling and Analysis Plan, SWMU 3, Zone G*. Revision 0. February 2002.
- 5 Geraghty and Miller. *Confirmation Study – Assessment of Potential Oil and Hazardous Waste*
- 6 *Contamination of Soil and Groundwater at the Charleston Naval Shipyard*. 1982.
- 7 U.S. Environmental Protection Agency. *Risk Assessment Guidance for Superfund, Volume I,*
- 8 *Human Health Evaluation Manual (Part A)*. Interim Final. EPA/540/1-89/002. December 1989.
- 9 U.S. Environmental Protection Agency. *Soil Screening Guidance: Technical Background*
- 10 *Document (Table A-1)*. EPA/540/R-95/128. May 1996.
- 11 U.S. Environmental Protection Agency. *Risk-Based Concentration Tables*. Region III. October 5,
- 12 2000.

PHASE I INTERIM MEASURE WORK PLAN

SWMU 3, Zone G



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

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

PREPARED BY
CH2M-Jones

October 2001

Revision 0
Contract N62467-99-C-0960
158814.ZG.PR.11

Certification Page for Phase 1 Interim Measure Work Plan (Revision 0) – SWMU 3, Zone G

Surface and Subsurface Soil Delineation

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

South Carolina

Temporary Permit No. T2000358



Casey Hudson, P.E.

10-17-01

Date



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1 Acronyms and Abbreviations

2	BCT	BRAC Cleanup Team
3	BRAC	Base Realignment and Closure Act
4	CA	corrective action
5	CMS	corrective measures study
6	CNC	Charleston Naval Complex
7	COC	chemical of concern
8	COPC	chemical of potential concern
9	CSAP	Comprehensive Sampling and Analysis Plan
10	DAF	dilution attenuation factor
11	DMP	Data Management Plan
12	DQO	Data Quality Objective
13	EnSafe	EnSafe Inc.
14	EPA	U.S. Environmental Protection Agency
15	ft bls	feet below land surface
16	IDW	investigation-derived waste
17	IM	interim measure
18	MCS	media cleanup standard
19	NAVBASE	Naval Base
20	OP	organo-phosphorus
21	PCB	polychlorinated biphenyl
22	PPE	personal protective equipment
23	QAP	Quality Assurance Plan
24	RBC	risk-based concentration
25	RCRA	Resource Conservation and Recovery Act
26	RFI	RCRA Facility Investigation
27	SCDHEC	South Carolina Department of Health and Environmental Control
28	SSL	soil screening level
29	SWMU	solid waste management unit
30	y ³	cubic yards

Section 1.0

1.0 Introduction

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

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

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This submittal has been prepared by CH2M-Jones to document the basis for an Interim Measure (IM) Work Plan at Solid Waste Management Unit (SWMU) 3 in Zone G of the CNC. The land use zoning for this site is M-1, for marine industrial use. Figure 1-1 presents the location of SWMU 3 in Zone G.

1.1 Purpose of the Phase I IM Work Plan

This Phase I IM Work Plan presents a technical approach for the delineation of soils containing pesticide residues from the ground surrounding a former pesticide mix/rinse area adjacent to Building 249 and Waste Oil Tank 39-D, which is located in Zone G of the CNC. The delineation will be made to residential (unrestricted) land use criteria.

A Phase II IM Work Plan will be subsequently provided that will present the target soil excavation areas and media cleanup standards (MCSs) that will be applied.

Removal/remediation of surface soils containing pesticides to levels below the U.S. Environmental Protection Agency (EPA) risk-based concentrations (RBCs) for industrial use is necessary to adequately reduce direct exposure risks to allow for industrial use. Removal of isolated areas of subsurface soils to levels below the EPA generic soil screening level (SSL) (dilution attenuation factor [DAF] = 10) may also be required to protect groundwater quality.

1 This IM will be performed, documented, and reported in a manner consistent with the
2 investigative and corrective action goals and requirements of the existing RCRA permit for
3 the facility.

4 **1.2 Site Background and Setting**

5 SWMU 3 is an approximately 50 by 30-ft area where the former Building 42-A was located.
6 The building was a shed where pesticides were mixed prior to 1971. Equipment for
7 spraying and mixing pesticides was reportedly rinsed on the ground outside, with the
8 rinsate allowed to infiltrate the soil. During the 1982 Confirmation Study (Geraghty and
9 Miller, 1982), a portion of the area surrounding the slab for Building 42-A was also noted to
10 be devoid of vegetation. This once devoid area is now covered with grass. The northwest
11 wall of Building 249 was constructed later over a portion of the area.

12 Soil and groundwater samples collected during the Confirmation Study revealed the
13 presence of low concentrations of various pesticides and associated degradation products,
14 consistent with the types of pesticides documented as having been used there. Pesticides
15 detected included DDT and metabolites, heptachlor, and beta/delta BHC. Groundwater
16 sample results were below detection limits for pesticides, herbicides, polychlorinated
17 biphenyls (PCBs), and arsenic.

18 **1.3 Organization of the Phase I IM Work Plan**

19 This Phase I IM Work Plan consists of the following sections, including this introductory
20 section:

21 **1.0 Introduction** — Presents the purpose of the Phase I IM Work Plan and background
22 information regarding the site.

23 **2.0 Previous Investigations** — Provides a brief description of previous investigations at
24 SWMU 3.

25 **3.0 Technical Approach** — Provides a brief description of the technical approach for
26 completing the soil delineation.

27 **4.0 Investigation-Derived Waste** — Describes the procedures to be implemented for
28 management of investigation-derived waste (IDW).

29 **5.0 References** — Lists the references used in this document.

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



- | | |
|---------------|-----------|
| Buildings | Roads |
| SWMU Boundary | Fence |
| Zone Boundary | Railroads |
| Pavement | |
| Sidewalk | |



Figure1-1
 Site Location Map
 SWMU 3, Zone G
 Charleston Naval Complex

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2.0 Previous Investigations

An initial Confirmation Study performed by Geraghty and Miller in 1982 investigated soil and groundwater around the former Building 42-A concrete slab used for pesticide mixing/rinsing. Soil sampling results indicated the presence of low levels of pesticides and associated degradation products, including DDT and its metabolites, heptachlor, and BHC.

In late 1996 and early 1997, a RCRA Facility Investigation (RFI) was conducted at SWMU 3 to further investigate the nature and extent of pesticides in soils, and to determine if any corrective actions would be required to eliminate or minimize unacceptable risks to human health or the environment. The work included soil sample collection from ten soil borings with analyses for metals, PCBs, and pesticides including organo-phosphorus (OP) pesticides. Three shallow monitoring wells were also installed and sampled four times, with analyses for metals, pesticides/PCBs, and OP-pesticides.

The RFI identified the following chemicals of potential concern (COPCs) in surface soils at depths of 0 to 1 foot below land surface (ft bls): 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Aroclor-1248, Heptachlor, alpha-Chlordane, and gamma-Chlordane. No pesticides were detected in groundwater, but other COPCs that were identified in groundwater included aluminum, beryllium, chromium, antimony, and thallium. A corrective measures study (CMS) for surface soils and groundwater was proposed.

The Environmental Detachment conducted an IM in July 1998 to remove pesticide and PCB-contaminated soils to a depth of 2 ft from the area around a transformer pad on the north side of Building 249. A total of approximately 22 cubic yards (y³) of contaminated soils were removed, and the excavation area was backfilled. The IM activities required the in-place abandonment of monitoring well G003GW003.

After completion of the IM, a second phase of soil boring investigations was performed, in which borings G003SB011 through G003SB014 were installed outside of the SWMU boundary to address SCDHEC concerns about areas adjacent to the south side of the former concrete mix/rinse slab. Samples from boring G003SB012 contained levels of DDD and DDT that exceeded their RBC for unrestricted land use.

Additional RFI investigations were conducted under an RFI Work Plan Addendum in late 1999 and early 2000. The work included additional surface soil (0 to 1 ft bls) and subsurface soil (3 to 5 ft bls) sample collection and analysis for pesticides. These additional borings were located outside of the existing SWMU boundary and IM area, to evaluate soils on the

1 northern, eastern, and southern sides of the former concrete slab mix/rinse area. This
2 additional work was performed at the request of SCDHEC and included the advancement
3 of two additional soil borings (G003SB015 and G003SB016) to sample surface and
4 subsurface soil northeast and northwest of boring G003SB001; three additional soil borings
5 (G003SB017 through G003SB019) were sampled to evaluate the area south of the former
6 concrete slab; and boring G003SB020 was sampled to evaluate the area east of the slab
7 outside the fence. All samples were analyzed for pesticides and degradation products at
8 Data Quality Objective (DQO) Level III. Pesticides were detected in borings G003SB016,
9 G003SB017, and G003SB018.

10 **2.1 Summary**

11 Soil samples collected on both the north and south sides of existing Building 249 contained
12 pesticide residues at levels in excess of applicable RBCs and SSLs. The exceedances are
13 predominantly in surface soils; analytical results for surface and subsurface soils are
14 summarized in Tables 2-1 and 2-2. Locations of surface and subsurface soil exceedances and
15 the IM excavation area are illustrated on Figure 2-1.

16 As shown on the figure, the surface soils exceeding RBCs in borings G003SB003 and
17 G003SB008 were removed during the IM excavation, and monitoring well G003GW003 was
18 abandoned during the IM. No further excavation of soils is necessary at these locations.

19 Further delineation and possible excavation of surface soils is required at the locations of
20 soil borings G003SB016 and G003SB017, and further delineation and possible excavation of
21 subsurface soils is required around borings G003SB012 and G003SB018.

TABLE 2-1
 Pesticide Exceedances in Surface Soils
 Phase I IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

Sample ID	Parameter	Results (mg/kg)	Qualifier	Residential RBC (HI= 0.1)	Industrial RBC (HI= 0.1)	EPA Generic SSL (DAF= 10)
003SB01201	4,4'-DDD	5.9	=	2.70	24	8
003SB01601	4,4'-DDD	17	=	2.70	24	8
003SB01801	4,4'-DDD	310	=	2.70	24	8
003SB00301b	4,4'-DDE	2.6	J	1.90	17	27
003SB01601	4,4'-DDE	3.6	=	1.90	17	27
003SB01801	4,4'-DDE	44	=	1.90	17	27
003SB01201	4,4'-DDT	78	=	1.90	17	16
003SB01601	4,4'-DDT	200	=	1.90	17	16
003SB01701	4,4'-DDT	7.4	=	1.90	17	16
003SB01801	4,4'-DDT	2,500	=	1.90	17	16
003SB00301b	alpha-Chlordane	16	=	1.82	16 ^a	5
003SB00301b	Aroclor-1248	28	J	0.32	2.9	--
003SB00301b	gamma-Chlordane	22	=	1.82	16 ^a	5
003SB00301b	Heptachlor	0.52	=	0.14	1.3	12
003SB00801a	Heptachlor	0.21	=	0.14	1.3	12

^a RBC for chlordane

= Analyte was detected, the reported concentration is the actual concentration.

DAF Dilution attenuation factor

HI Hazard index

J Analyte was detected, the reported concentration is an estimated concentration.

mg/kg Milligrams per kilogram

RBC Risk-based concentration; EPA Region III RBC (April 2000)

SSL Soil screening level; generic EPA Soil Screening Level (1996)

TABLE 2-2
Pesticide Exceedances in Subsurface Soils
Phase I IM Work Plan, SWMU 3, Zone G, Charleston Naval Complex

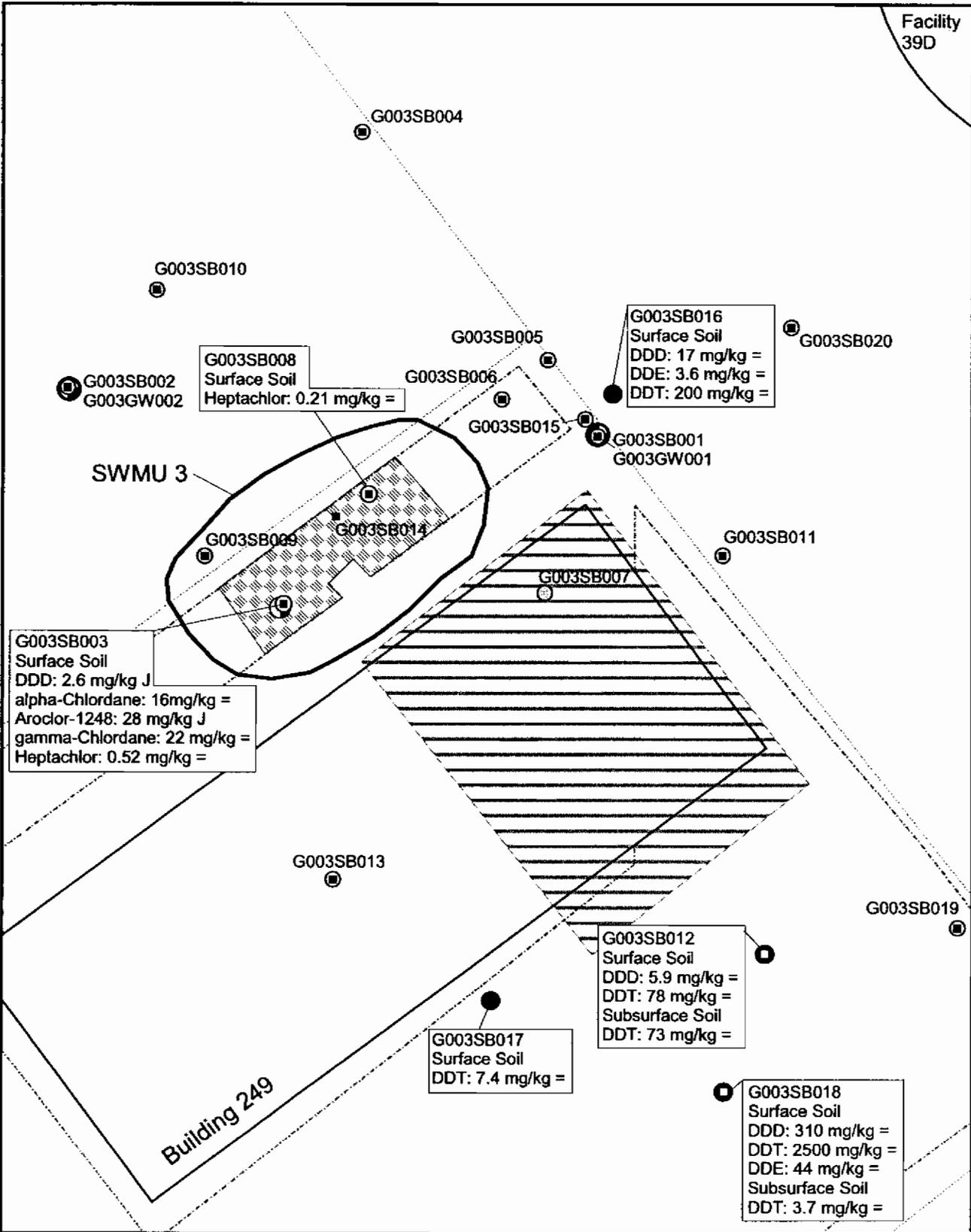
Sample ID	Parameter	Results (mg/kg)	Qualifier	EPA Generic SSL (DAF= 10)
003SB01202	p,p'-DDD	6.1	=	8.00
003SB01202	p,p'-DDT	73	=	16.00

= Analyte was detected, the reported concentration is the actual concentration.

DAF Dilution attenuation factor

mg/kg Milligrams per kilogram

SSL Soil screening level; generic EPA Soil Screening Level (1996)



- | | |
|------------------------------|------------------------|
| ■ Subsurface Soil Samples | ▨ Former Concrete Slab |
| ○ Surface Soil Samples | ▩ IM Excavation Area |
| ○ Former Surface Soil Sample | ▭ SWMU 3 Boundary |
| □ Exceeds SSL | ▭ Buildings |
| ● Exceeds RBC | ∧ Roads |
| ⊕ Groundwater Wells | ∟ Fence |
| ⊖ Abandoned Groundwater Well | ∟ Pavement |

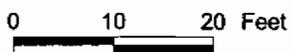


Figure 2-1
Previous Sampling Locations
and Exceedence Results
SWMU 3, Zone G
Charleston Naval Complex



Section 3.0

3.0 Technical Approach

Based on an evaluation of the data collected during the RFI and a comparison to COPC screening criteria currently used by the BRAC Cleanup Team (BCT), several organo-chlorine pesticides require further delineation in soils in order to complete RFI activities. A full evaluation and presentation of the COPC screening against current criteria as well as a COPC/chemical of concern (COC) refinement analysis will be provided in an RFI Report Addendum, after the collection and analyses of the samples proposed herein. Specific sampling locations and proposed analyses are presented below.

Soils surrounding known exceedances will be sampled and analyzed with a quick turn-around time requested for results. The proposed sample locations are anticipated to bound and define the extent of excessively contaminated soils. However, if necessary, additional samples will be collected to fully delineate the extent of pesticides present above the residential RBCs or other appropriate action levels.

3.1 Media Cleanup Standard

SWMU 3 is zoned for industrial use. Accordingly, the anticipated MCS for surface soils will be the lower of the EPA Region III industrial RBC or the SSL. For subsurface soils, the expected MCS for each compound will be the EPA SSLs. These criteria are listed in Tables 2-1 and 2-2.

3.2 Delineation/Confirmation Sample Collection

During Phase I of the IM, collection of a series of advance soil samples for chemical analysis is proposed to expedite characterization and subsequent removal of impacted soils during Phase II. The sampling will consist of soil borings with a surface (0 to 1 ft bls) and subsurface (3 to 5 ft bls) sample collected from each of the proposed boring locations. Prior to sampling, proposed locations will be surveyed and marked using the coordinates of the RFI borings as points of reference. The marked locations will then be surveyed for underground utility clearance prior to commencing fieldwork.

The locations of the proposed IM delineation soil samples are presented in Figure 3-1.

Three soil borings will be positioned around the existing G003SB016 RFI boring location to complete delineation of pesticides in surface soils. The borings will be advanced

1 approximately 5 ft from the RFI boring, positioned as shown in Figure 3-1 to determine the
2 local extent of impacted surface soil. RFI borings G003SB001, G003SB015, and G003SB005
3 did not detect pesticides, and bound this area to the west at distances less than 10 ft. To the
4 north, east, and south, the area is also bounded at distances greater than 20 ft by borings
5 G003SB004, G003SB020, and G003SB011, respectively, none of which detected pesticides.

6 On the south side of Building 249 in the area adjacent to the former mix/rinse slab,
7 pesticides were detected in surface and subsurface soils from borings that are not bounded
8 by unaffected borings to the west, south, or east. To complete delineation in this area, eight
9 soil borings are proposed in locations shown on Figure 3-1. These borings are proposed to
10 delineate the horizontal extent of impacted surface and subsurface soils on south side of
11 Building 249. Both a surface soil sample and a subsurface soil sample will be collected from
12 each boring. CH2M-Jones team members at the CNC will choose the final sampling
13 locations in the field, based on site conditions (such as the presence of pavement, trees, or
14 other obstructions).

15 The overall sampling strategy and procedures will be performed in accordance with the
16 Environmental Services Division *Standard Operating Procedures and Quality Assurance*
17 *Manual* (ESDSOPQAM) (EPA, 1996c).

18 **3.3 Soil Sample Analysis**

19 An estimated total of 24 delineation samples will be collected and hand-delivered or sent
20 via overnight carrier to an offsite laboratory, where they will be analyzed for pesticides by
21 EPA methods. Surface and subsurface soil samples will be submitted for immediate
22 analysis with rapid turn-around, as designated on the Chain of Custody forms.

23 The soil analysis will follow the procedures provided in the approved Comprehensive
24 Sampling and Analysis Plan (CSAP) portion of the *Final Comprehensive RFI Work Plan*
25 (EnSafe Inc. [EnSafe]/Allen & Hoshall, 1994). The CSAP outlines all monitoring procedures
26 to be performed during the investigation to characterize the environmental setting, source,
27 and releases of hazardous constituents. In addition, the CSAP includes the Quality
28 Assurance Plan (QAP) and Data Management Plan (DMP) to verify that all information and
29 data are valid and properly documented. Sample analysis will be conducted in accordance
30 with the guidance in the EPA's *Test Methods for Evaluating Solid Waste, SW-846, 3rd Ed.*,
31 Office of Solid Waste and Emergency Response (SW846) and in the EPA Environmental
32 Services Division *Laboratory Operations and Quality Control Manual* (ESDLOQCM).

1 **3.4 Soil Excavation**

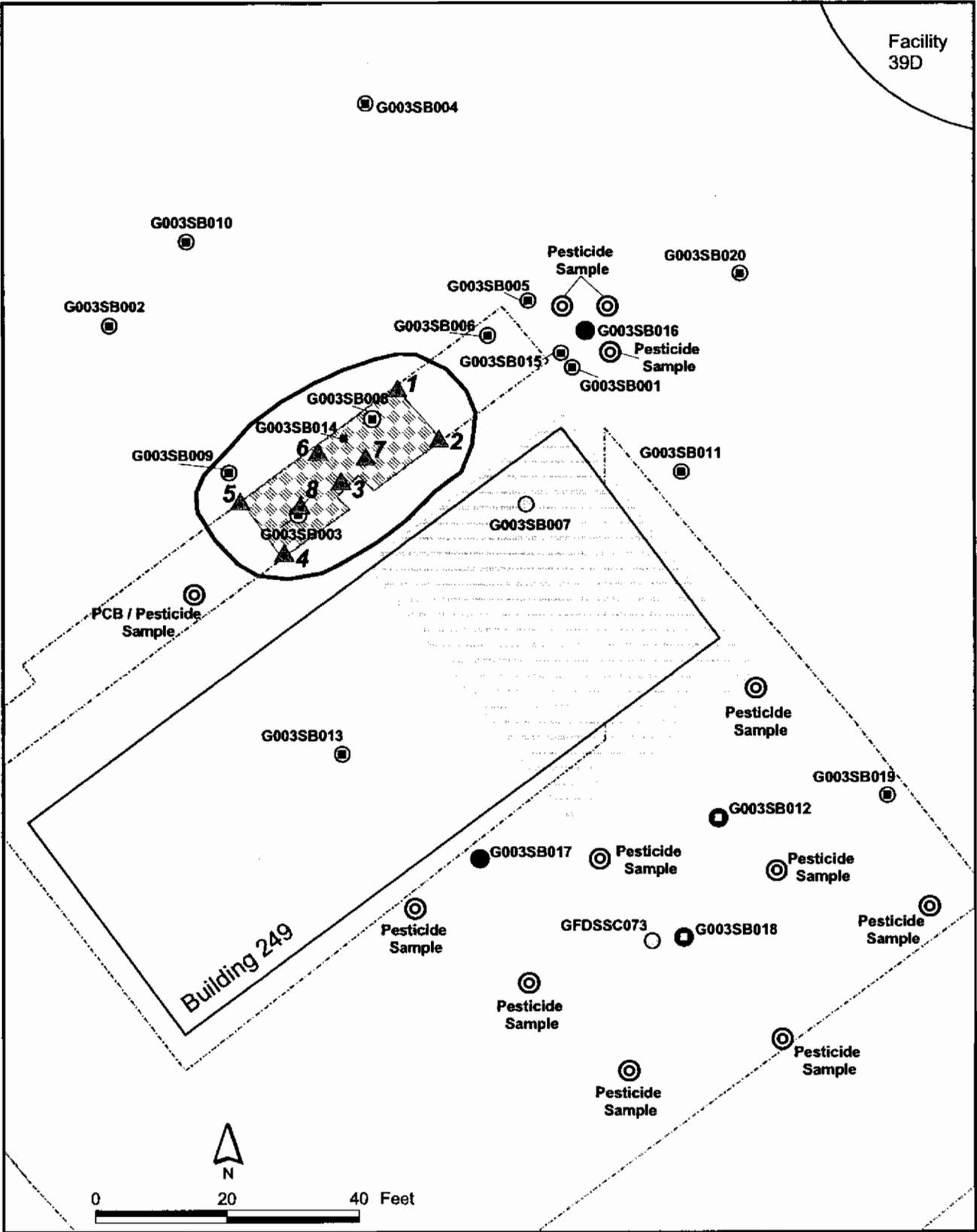
2 No soil excavation will be conducted during this phase of the IM. The results of the
3 delineation sampling will be utilized to develop a Phase II soil excavation IM Work Plan
4 outlining the proposed areas to be excavated. Depending on the IM sampling results, areas
5 surrounding affected borings will either be excavated independently, or may be merged
6 into one larger excavation area. In Phase II prior to excavation, additional focused
7 delineation-confirmation samples may be collected to refine the actual volumes and
8 locations of soil to be excavated.

9 **3.5 Reporting**

10 The results of both IM phases will be summarized in IM Completion Report that will be
11 included as part of an RFI Report Addendum. The RFI Report Addendum will document
12 the IM field activities and will provide the final analytical results from the
13 delineation/confirmation samples collected, will present the actual volumes of material
14 removed from each location, and will document the disposal methods for excavated
15 material.

16 **3.6 Site Restoration**

17 Following completion of any excavation in Phase II, the excavations will be backfilled with
18 appropriate clean fill material. The grade of the sites will be restored to match the original
19 grade. Any pavement repairs required will also be made at that time. Details of anticipated
20 site restoration activities will be presented in the Phase II IM Work Plan.



- ▲ Previous IM Samples
- ⊙ Proposed Confirmatory Samples
- Surface Exceedences / Removed Sample
- Surface Exceedences / Existing Sample
- Surface Soil Samples
- Subsurface Soil Samples
- ▨ Pavement
- ▭ SWMU 3 Boundary
- ▭ Buildings
- ▭ Concrete Slab
- ▨ Excavation Area
- Subsurface Exceedences

Figure 3-1
Proposed Delineation Samples
SWMU 3, Zone G
Charleston Naval Complex

Section 4.0

1 **4.0 Investigation-Derived Waste**

2 Three waste streams will be generated in this phase of the IM: soil cuttings,
3 decontamination wastes, and personal protective equipment (PPE). Hazardous wastes are
4 not expected to be generated as a result of this IM.

5 Whenever possible, soil cuttings from sample borings will be returned to their respective
6 boreholes upon completion of sampling activities. Excess soil cuttings and water used in
7 decontamination activities will be containerized separately and characterized in accordance
8 with South Carolina Hazardous Waste Management Regulations (Section SCDHEC R.61-
9 79.261) and disposed of in accordance with all applicable regulations and permits.

10 Assuming that soils and decontamination waste will be characterized as non-hazardous, the
11 soil will be sent to a subtitle D landfill, and the water will be sent to the sanitary sewer once
12 approval is received from the City of North Charleston. PPE will be disposed of as a
13 municipal solid waste.

14 Offsite transportation and disposal of the soil cuttings and decontamination water will be
15 performed by properly permitted and licensed subcontractors. Materials designated for
16 offsite disposal will be documented, tracked, and their disposition verified. This
17 information will be reported in the IM Completion Report.

Section 5.0

1 **5.0 References**

- 2 EnSafe Inc. *Zone G RFI Report, NAVBASE Charleston*. Revision 0. February 28, 1998.
- 3 EnSafe Inc. *Zone G RFI Report Workplan Addendum, NAVBASE Charleston*. January 17, 2000.
- 4 EnSafe Inc./ Allen & Hoshall. *Final Comprehensive RFI Work Plan*. 1994.
- 5 Environmental Detachment Charleston, 1998. *Completion Report for Interim Stabilization*
- 6 *Measure, SWMU 3, Charleston Naval Complex, Charleston, SC*. September 10, 1998.
- 7 EPA, 1996a. *Soil Screening Guidance: User's Guide*. Office of Solid Waste and Emergency
- 8 Response (OSWER). April 1996.
- 9 EPA, 1996b. *Soil Screening Guidance: Technical Background Document*. Office of Solid Waste
- 10 and Emergency Response (OSWER). May 1996.
- 11 EPA, 1996c. U.S. Environmental Protection Agency [EPA]. *Operating Procedures and Quality*
- 12 *Assurance Manual (ESDSOPQAM)*. 1996.
- 13 Geraghty and Miller. *Confirmation Study – Assessment of Potential Oil and Hazardous Waste*
- 14 *Contamination of Soil and Groundwater at the Charleston Naval Shipyard*. 1982.