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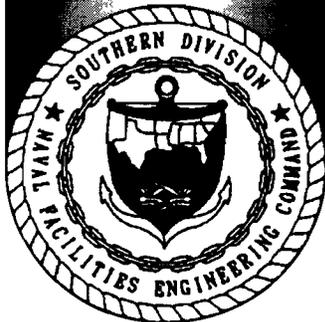
INTERIM MEASURE WORK PLAN SOIL AND NAPL REMOVAL SOLID WASTE
MANAGEMENT UNIT (SWMU 17) ZONE H CNC CHARLESTON SC
6/1/2001
CH2M HILL

INTERIM MEASURE WORK PLAN

Soil and NAPL Removal
Solid Waste Management Unit (SWMU) 17, Zone H



Charleston Naval Complex
North Charleston, South Carolina



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

PREPARED BY
CH2M-Jones

June 2001

Revision 0
Contract N62467-99-C-0960
158814.ZH.PR.09

INTERIM MEASURE WORK PLAN

Soil and NAPL Removal Solid Waste Management Unit (SWMU) 17, Zone H



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North Charleston, South Carolina***

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Certification Page for Interim Measure Work Plan (Revision 0) – SWMU 17, Zone H

Soil and NAPL Removal

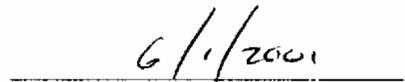
I, Dean Williamson, certify that this report has been prepared under my direct supervision. The data and information are, to the best of my knowledge, accurate and correct, and the report has been prepared in accordance with current standards of practice for engineering.

South Carolina

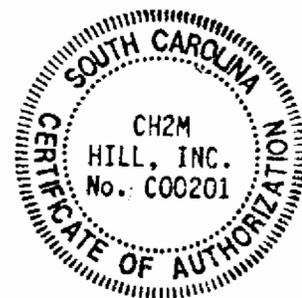
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Dean Williamson, P.E.



Date



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1 **Acronyms and Abbreviations**

2	CA	corrective action
3	CNC	Charleston Naval Complex
4	CMS	corrective measures study
5	COC	contaminant of concern
6	DNAPL	dense non-aqueous phase liquid
7	EGIS	Environmental Geographic Information System
8	EnSafe	EnSafe Inc.
9	EPA	U.S. Environmental Protection Agency
10	EPC	exposure point concentration
11	ft	feet
12	ft bls	feet below land surface
13	GPS	Global Positioning System
14	ILCR	Incremental Lifetime Cancer Risk
15	IM	interim measure
16	LNAPL	light non-aqueous phase liquid
17	MCS	media cleanup standard
18	MDL	method detection limit
19	mg/kg	milligrams per kilogram
20	NAPL	non-aqueous phase liquid
21	NAVFACEN-	Southern Division Naval Facilities Engineering Command
22	GCOM	
23	PPE	personal protective equipment
24	RCRA	Resource Conservation and Recovery Act
25	RFI	RCRA Facility Investigation
26	SCDHEC	South Carolina Department of Health and Environmental Control
27	SWMU	solid waste management unit
28	UCL ₉₅	95 percent upper confidence limit

SECTION 1.0

Introduction

1.0 Introduction

1.1 Purpose of the Interim Measure Work Plan

This Interim Measure (IM) Work Plan presents a proposal to remove surface soils contaminated with Aroclor-1260, and to remove non-aqueous phase liquid (NAPL) from groundwater at Solid Waste Management Unit (SWMU) 17 in Zone H at the Charleston Naval Complex (CNC). Surface soils that contain Aroclor-1260 at concentrations that exceed the 10^{-5} industrial risk-based cleanup standard will be excavated. NAPL will be removed from existing monitor wells using a vacuum truck. This IM Work Plan describes the statistical approach that will be used to delineate the soil excavation area, the waste disposal practices to be used for the NAPL and soils, and the proposed content of the IM Reports.

1.2 Regulatory Background

CH2M-Jones has prepared this IM Work Plan on behalf of the Southern Division Naval Facilities Engineering Command (NAVFACENGCOM). A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), a baseline risk assessment, and an RFI Addendum prepared by EnSafe Inc. (EnSafe) (EnSafe, 2000) have been completed for SWMU 17 and submitted to South Carolina Department of Health and Environmental Control (SCDHEC) for review. SCDHEC comments on the RFI Addendum are currently being resolved with the collection of additional soil and groundwater samples to complete the delineation of the extent of contamination. Currently, the overall nature and extent of contamination is generally well-established for the majority of the site.

The next step in the RCRA corrective action (CA) program for SWMU 17 is the Corrective Measures Study (CMS) process, which consists of a CMS Work Plan (Revision 1 is currently being reviewed by SCDHEC), the CMS report, and implementation of the selected corrective measure alternative. The CMS Report will evaluate a wide range of treatment technologies and alternatives for the contaminated media at SWMU 17. The IM for Aroclor-1260-contaminated soil and NAPL removal is being proposed because CH2M-Jones considers these corrective measures to be appropriate actions that will reduce long-term risk at the site, and they can be implemented quickly and in a cost-effective manner.

1 1.3 Site Setting and Extent of Contamination Targeted by IM

2 SWMU 17 is located at Building FBM 61, which is a former Fleet Ballistic Missile Training
3 Center that was used by the Navy from 1962 until June 1996. It is leased by the U.S. Border
4 Patrol and is used as a law enforcement training facility. Sources of contamination at SWMU
5 17 were previously described in detail in the CMS Work Plan and are shown in Figure 1-1. A
6 detailed summary of previous investigations was also provided in the CMS Work Plan. A
7 detailed list of contaminants of concern (COCs) was evaluated in the CMS Work Plan for
8 surface soil, subsurface soil, and groundwater. Based upon the results of this evaluation,
9 contaminants targeted for cleanup included Aroclor-1260 and NAPL.

10 Aroclor-1260 was reported in surface soil at concentrations ranging between 0.036 to 180
11 milligrams per kilogram (mg/kg), as shown in Figure 1-2. Media cleanup standards (MCSs)
12 based upon risk were proposed in the CMS Work Plan for Aroclor-1260. A cleanup standard
13 for Aroclor-1260 in surface soil of 1 mg/kg was proposed as the MCS for unrestricted land
14 use, and an MCS of 10 mg/kg was proposed for industrial land use. An MCS of 10 mg/kg
15 corresponds to an Incremental Lifetime Cancer Risk (ILCR) of 10^{-5} for an industrial worker.

16 Measurements of NAPL thickness were collected in December 1999, January 2000 and July
17 2000, and are summarized in Table 1-1. The maximum thickness of light non-aqueous phase
18 liquid (LNAPL) measured was 1.52 feet (ft) in well H017SWL01. Dense non-aqueous phase
19 liquid (DNAPL) thicknesses have ranged from 0.04 ft to more than 1 ft in well H017GW002.
20 Locations of monitor wells where NAPL has been measured are shown in Figure 1-3.

21 This IM will address the removal of surface soils that exceed the industrial MCS for Aroclor-
22 1260 and the removal of NAPL from existing monitor wells.

23 1.4 Organization of the IM Work Plan

24 This IM Work Plan consists of the following five sections, including this introductory
25 section.

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

28 **2.0 Technical Approach** — Provides a brief description of the technical approach for the IM.

29 **3.0 Waste Management and Disposal** — Describes the procedures for waste management.

30 **4.0 IM Completion Report** — Describes the contents of the IM Reports.

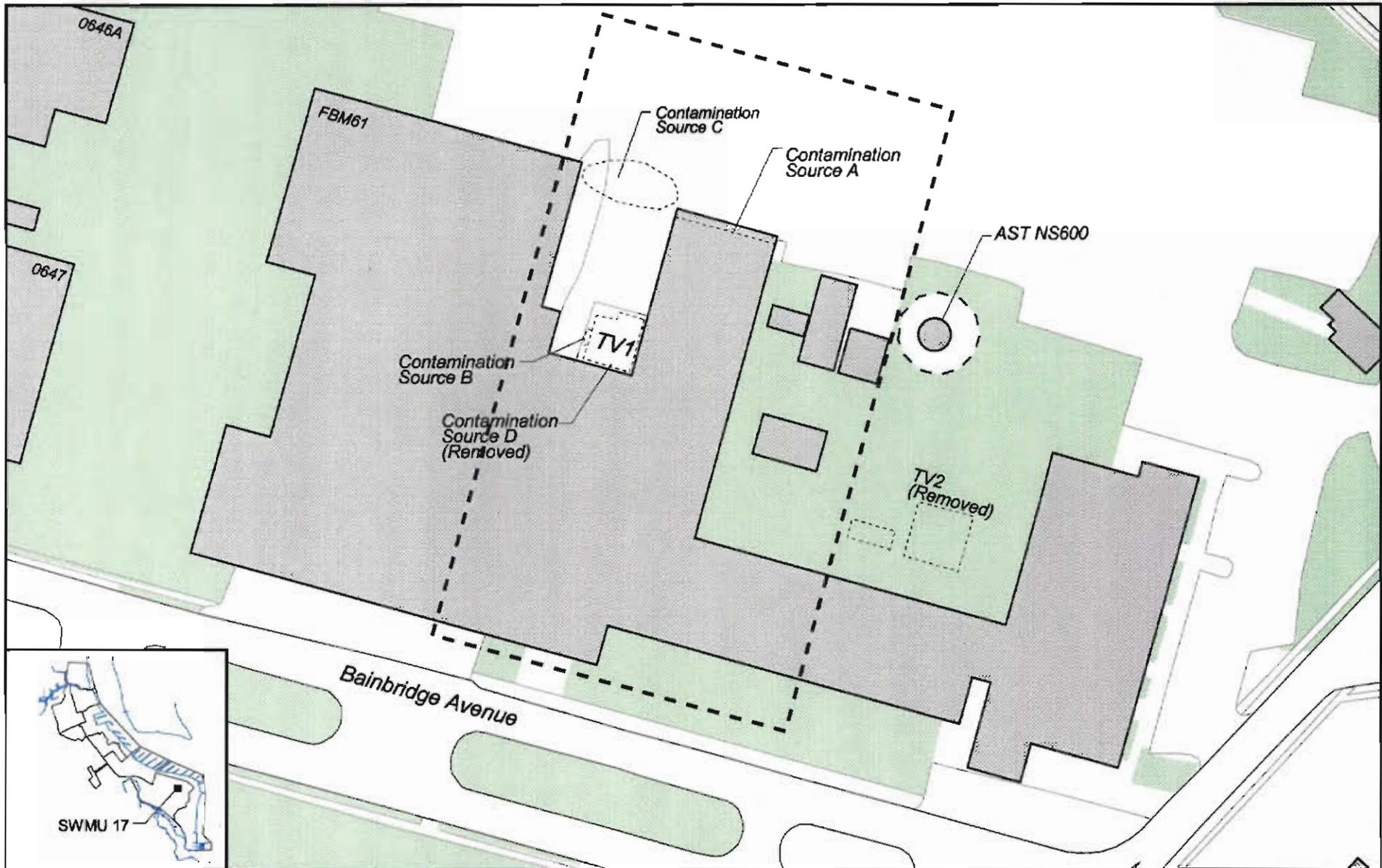
31 **5.0 References** — Lists the references used in this document.

TABLE 1-1
 NAPL Thicknesses at SWMU 17
IM Work Plan, Soil and NAPL Removal, SWMU 17, Zone H, Charleston Naval Complex

Well Location	NAPL Thickness (ft) 12/22/99	NAPL Thickness (ft) 1/6/00	NAPL Thickness (ft) 7/00
H017GW001	0.17 LNAPL	0.05 LNAPL	0.6 LNAPL
H017GW002	0.10 DNAPL	0.04 DNAPL	>1.0 DNAPL
H017SWB03	0.07 LNAPL	1.31 LNAPL	
H017SWD04	<.03 LNAPL	0.09 LNAPL	
H017SWL03	0.57 LNAPL	1.52 LNAPL	
H017SWL04	Trace LNAPL		
H017SWL07		0.65 LNAPL	

DNAPL dense non-aqueous phase liquid

LNAPL light non-aqueous phase liquid



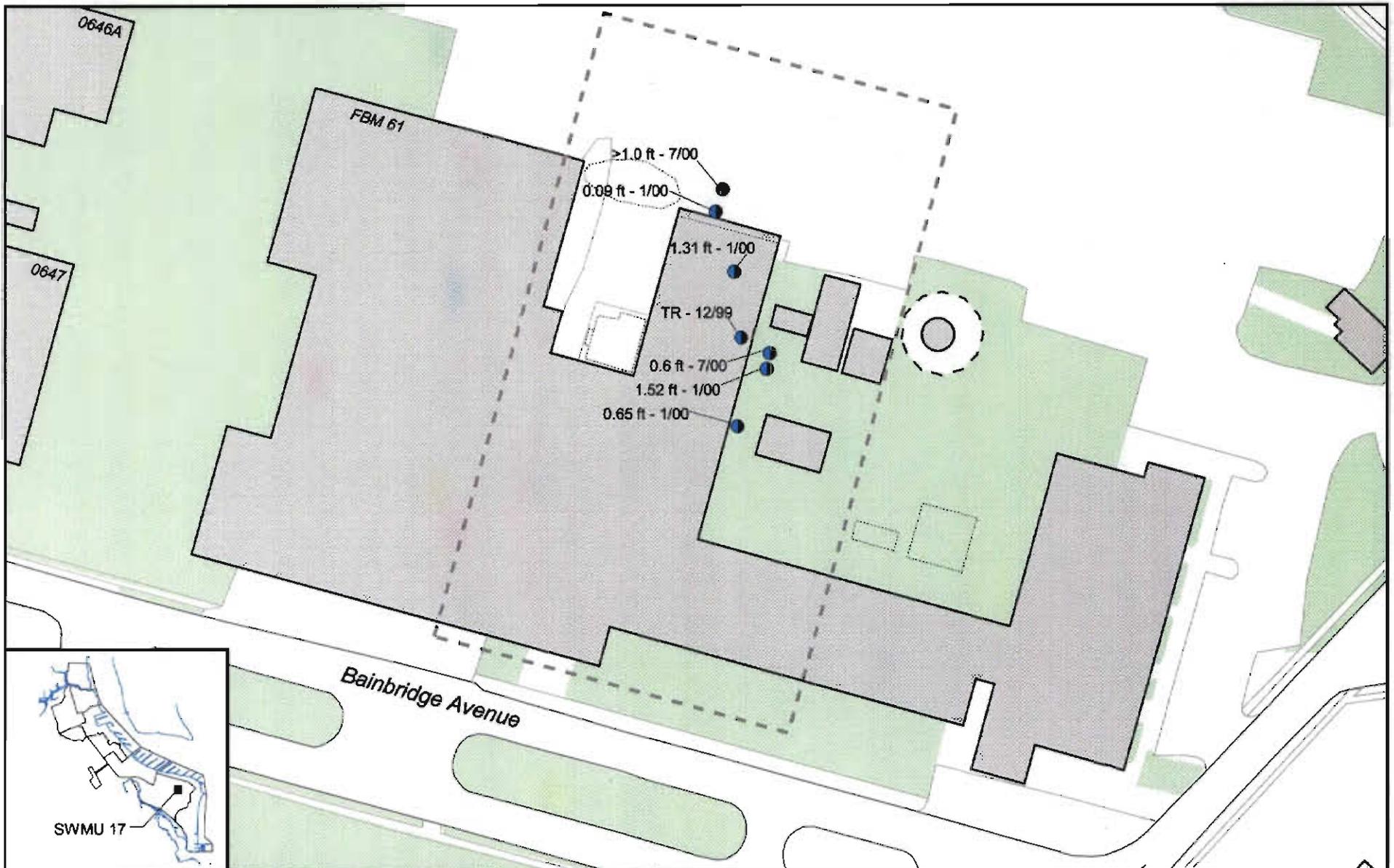
LEGEND

-  Non-paved Surfaces
-  Existing Structure
-  Contamination Source
-  SWMU Boundary



Figure 1-1
Sources of Contamination
SWMU 17, Zone H
Charleston Naval Complex

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LEGEND:

- DNAPL Sample Location
- LNAPL Sample Location

NOTES:

1. 1.0 ft - 6/00 = Liquid Thickness/Date Sampled
2. Liquid units in feet.
3. Maximum thickness displayed for each sample location
4. Refer to Table 2-4 for complete NAPL thickness history



Figure 1-3
Extent of LNAPL/DNAPL
In Groundwater
SWMU17, Zone H
Charleston Naval Complex

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SECTION 2.0

Technical Approach

2.0 Technical Approach

This section describes the following methods and procedures which are part of the technical approach to this interim measure: 1) the statistical approach that will be used to delineate the excavation area for surface soils contaminated with Aroclor-1260 above the 10^{-5} industrial risk-based MCS; 2) excavation methods; and 3) the procedure that will be used to extract NAPL from existing monitor wells using a vacuum truck.

2.1 Statistical Analysis of Aroclor-1260 Extent

Surface soil sample locations and the concentrations of Aroclor-1260 that were above the detection limit are shown in Figure 2-1. Aroclor-1260 is generally found in two areas at SWMU 17: the grass courtyard and the paved area between the Building FBM61 Annex and Building FBM61. The 95 percent Upper Confidence Limit (UCL_{95}) concentration for Aroclor-1260 was determined as an exposure point concentration (EPC) for each of the two separate areas. The use of the UCL_{95} concentration as the EPC is recommended by U.S. Environmental Protection Agency (EPA)-RAGS (EPA, 1989). Because a risk assessment uses the UCL_{95} concentration as the EPC in determining risks from exposures to a site, a UCL_{95} concentration that is below a target concentration (such as an MCS) indicates that risks are within or below the acceptable limits.

To determine the UCL_{95} concentration in a manner that is consistent with the EPA's recommended methodology, the data set is first tested to determine if it is from a normal or lognormal population. If the data set is taken from a normal population, the mean is calculated in a different manner than if the data set is from a lognormal population. The data set for Aroclor-1260 in surface soil at SWMU 17 was determined to be from a lognormal population; therefore the EPA-recommended statistical method for calculating the lognormal UCL_{95} concentration was used.

To estimate the UCL_{95} concentration, the non-detect sample concentrations were included at half of the reported detection limit value, following EPA guidance. When a value was not reported for a non-detect (i.e., it was assigned a reported value of 0.0), the method detection limit (MDL) value of 0.0066 mg/kg was assigned in place of the zero value.

Due primarily to the small sample size and large range in analytical values of the two data sets for SWMU 17, the lognormal UCL_{95} concentration that was calculated using the EPA-

1 recommended statistical method exceeded the maximum detected concentration in both
2 data sets. When this occurs, the EPC defaults to the maximum detected value in the data set,
3 as shown in Table 2-1. Again, this is consistent with EPA guidance.

4 In the grass courtyard data set, the removal of sample H017SWT02, with a detected
5 concentration of 180 mg/kg, reduced the EPC to 6 mg/kg (the next highest detected
6 concentration). Thus, the removal of the Aroclor-1260 "hot spot" of 180 mg/kg results in the
7 EPC being well below the MCS of 10 mg/kg, as shown in Table 2-2.

8 In the paved area data set, three samples (LH037SB013, H017SB006, and H017SB002) were
9 removed to reduce the EPC from 23 mg/kg to 3.85 mg/kg, which is well below the MCS of
10 10 mg/kg (refer to Table 2-2).

11 **2.2 Pre-excavation Sampling and Aroclor-1260 Delineation**

12 Pre-excavation sampling will be conducted to determine the areal extent to be excavated
13 around each of the Aroclor-1260 sample locations that cause the EPC to exceed the 10
14 mg/kg MCS. Pre-excavation sampling will also eliminate the need for post-excavation
15 sampling and will allow for minimal disruption of the U.S. Border Patrol training activities
16 at SWMU 17. The following tasks will be performed:

- 17 1) Prior to the commencement of excavation activities, the location of the RFI surface
18 samples that cause the EPC to exceed the MCS will be staked using coordinates derived
19 from the CNC Environmental Geographic Information System (EGIS) tool and hand-
20 held Global Positioning System (GPS) equipment.
- 21 2) The locations will be cross-checked with field notes to verify that sample locations were
22 input to EGIS accurately.
- 23 3) A 10-ft x 10-ft excavation footprint in the shape of a square will be laid out with the
24 sample location at the center.
- 25 4) Four delineation samples will be collected around the excavation footprint, from the 0 to
26 1-ft depth interval.
- 27 5) A confirmation sample will be collected at the original sample location from the 0 to 1-ft
28 interval as well as from the 1 to 2-ft depth interval.
- 29 6) Samples will be analyzed for Aroclor-1260 and the results will be evaluated to determine
30 the horizontal and vertical extent of excavation at each location.
- 31 7) If any of these samples causes the EPC to exceed the industrial MCS, additional soil
32 samples will be collected in a 10-ft x 10-ft excavation footprint centered around the
33 delineation sample where the exceedance occurred.

- 1 8) Delineation sampling will continue in this manner until the calculated EPC is less than
2 the industrial MCS of 10 mg/kg.
- 3 9) The final excavation footprint will be determined. The hypothetical excavation
4 footprints for the sample locations that cause the EPC to exceed the Aroclor-1260 MCS
5 are shown in Figure 2-2.

6 **2.3 Excavation of Soils**

7 At each location, excavation will be performed based on the delineation sampling approach
8 described above to an approximate depth of 1 ft below land surface (ft bls). A backhoe or
9 similar equipment will be used if there is sufficient clearance and access in the courtyard. If
10 there are access difficulties, hand excavation may be performed.

11 Excavated soils will be stockpiled in a staging area within the grass courtyard at SWMU 17.
12 The staging area will be prepared by creating berms using clean soil that will ultimately be
13 used for fill, and lining the bermed area with impervious plastic liners. As excavation
14 progresses, the stockpile will be covered with impervious plastic sheeting to prevent
15 introduction of rainwater and to prevent dust migration.

16 During excavation, the excavation areas will be monitored for dust levels using appropriate
17 real-time measuring instruments. If dust levels are higher than the action levels set forth in
18 the CNC Health and Safety Plan, adequate dust suppression measures will be taken by
19 using water spray. All sampling, excavation, and stockpiling activities will be performed
20 according to the approved CNC Health and Safety Plan.

21 **2.4 Post-excavation of Soils**

22 The excavated areas will be backfilled with clean soil soon after contaminated soil removal.
23 In addition, sod will be installed to restore the grass courtyard to its original condition as
24 quickly as possible. Asphalt that has been removed from the paved area will also be
25 replaced as quickly as possible. If possible, excavation, backfill, revegetation, and paving
26 activities will be completed in the least amount of time possible in order to minimize
27 disruption of activities at SWMU 17.

28 **2.5 NAPL Extraction via Vacuum Truck**

29 A vacuum truck will be used to periodically and aggressively pull a vacuum on existing
30 wells that contain NAPL, in order to extract NAPL and limited quantities of contaminated
31 groundwater. Suitable vendors will be identified that can apply this or a similar technology,

1 and if necessary, monitor wells will be modified such that an airtight coupling to the
2 wellhead can be achieved when the vacuum is applied.

3 Prior to extraction, a site worker will use an interface probe to measure the NAPL
4 thicknesses in the wells shown in Figure 2-3. Initially, all wells at which NAPL was
5 previously reported will be used to extract NAPL. Once the measured NAPL is less than 0.1
6 inch, the wells will no longer be used as extraction points. Instead, these wells will be
7 monitored periodically to determine if the NAPL levels are increasing in thickness.

8 For the monitor wells that contain LNAPL, intermittent LNAPL measurements will taken
9 with an interface probe. The overall goal of the IM for NAPL will be to continue until the
10 LNAPL thickness is less than 0.1 inch. For the monitor well that contains DNAPL, an
11 attempt will be made to extract the contaminated groundwater until the hose encounters
12 and can extract DNAPL. Intermittent DNAPL measurements will be taken with an interface
13 probe and extraction will continue until the DNAPL thickness is less than 0.1 inch. If
14 insufficient drawdown occurs, or this technical approach is determined to be not sufficiently
15 effective, future attempts to extract the LNAPL or DNAPL may be abandoned.

16 The frequency of vacuum truck extraction will depend upon NAPL recovery rates and
17 volumes recovered. Initially, it is anticipated that NAPL may be removed on a weekly or bi-
18 weekly basis; later, NAPL may be removed on a monthly or quarterly basis. As stated
19 above, once NAPL thicknesses in the wells are less than 0.1 inch, extraction will cease.
20 Thereafter, wells will be monitored for NAPL recovery. The frequency of NAPL monitoring
21 may vary depending upon seasonal fluctuations in water levels and precipitation and trends
22 in the monitoring data.

TABLE 2-1
 Statistical Exposure Point Concentrations in the Paved Area and Grass Courtyard
IM Work Plan, Soil and NAPL Removal, SWMU 17, Zone H, Charleston Naval Complex

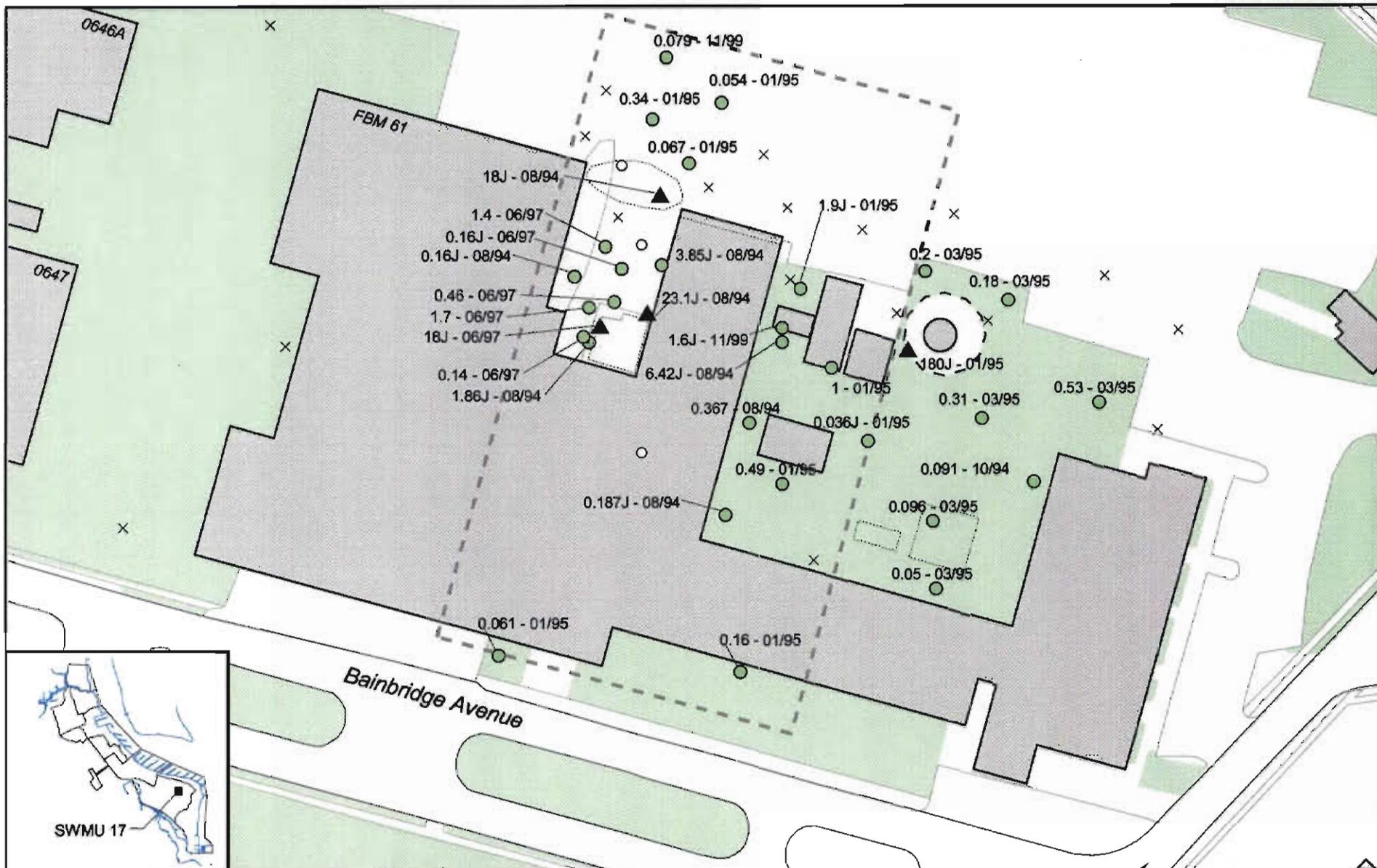
Paved Area		Grass Courtyard	
Sample ID	Aroclor-1260 Concentration (mg/kg)	Sample ID	Aroclor-1260 Concentration (mg/kg)
H017SB001	1.86	H017SB011	0.187
LH037SB014	0.14	H017SB022	0.49
LH037SB013	18	H017SB010	0.0367
LH037SB012	1.7	H017SB021	0.036
LH037SB011	0.46	HGDHSB040	0.091
H017SB003	0.16	H017SB031	0.096
LH037SB010	0.16	H017SB032	0.05
LH037SB009	1.4	H017SB030	0.31
H017SB004	3.85	H017SB029	0.53
H017SB006	18	H017SWT02	180.00
H017SB016	0.067	H017SB023	1.00
H017SB014	0.34	H017SB009	6.42
H017SB015	0.054	H017SWL01	1.60
H017SB035	0.079	H017SB019	1.90
H017SB002	23.1	H017SB027	0.20
H017SB005	0.0066	H017SB028	0.18
H017SB012	0.0066	H017SB033	0.0066
H017SB007	0.0066	H017SWT03	0.0066
H017SB036	0.0066	H017SWT01	0.0066
		H017SWB02	0.0066
Arithmetic Mean		Arithmetic Mean	9.7
Geometric Mean		Geometric Mean	0.18
EPC (=maximum detected concentration due to lognormal distribution)		EPC (=maximum detected concentration due to lognormal distribution)	180

EPC exposure point concentration

TABLE 2-2
 Exposure Point Concentrations in Paved Area and Grass Courtyard with Selected Samples Removed
IM Work Plan, Soil and NAPL Removal, SWMU 17, Zone H, Charleston Naval Complex

Paved Area – Three Samples Removed		Grass Courtyard – Hot Spot Removed	
Sample ID	Aroclor-1260 Concentration (mg/kg)	Sample ID	Aroclor-1260 Concentration (mg/kg)
H017SB001	1.86	H017SB011	0.187
LH037SB014	0.14	H017SB022	0.49
LH037SB013	Removed	H017SB010	0.0367
LH037SB012	1.7	H017SB021	0.036
LH037SB011	0.46	HGDHSB040	0.091
H017SB003	0.16	H017SB031	0.096
LH037SB010	0.16	H017SB032	0.05
LH037SB009	1.4	H017SB030	0.31
H017SB004	3.85	H017SB029	0.53
H017SB006	Removed	H017SWT02	Removed
H017SB016	0.067	H017SB023	1.00
H017SB014	0.34	H017SB009	6.42
H017SB015	0.054	H017SWL01	1.60
H017SB035	0.079	H017SB019	1.90
H017SB002	Removed	H017SB027	0.20
H017SB005	0.0066	H017SB028	0.18
H017SB012	0.0066	H017SB033	0.0066
H017SB007	0.0066	H017SWT03	0.0066
H017SB036	0.0066	H017SWT01	0.0066
		H017SWB02	0.0066
Arithmetic Mean	0.64	Arithmetic Mean	0.71
Geometric Mean	0.11	Geometric Mean	0.13
EPC (=maximum detected concentration due to lognormal distribution)	3.85	EPC (=maximum detected concentration due to lognormal distribution)	6.42

EPC exposure point concentration



LEGEND:

- Surface Soil Sample Locations
- ▲ Concentration > 10 mg/kg MCS
- Concentration < MCS
- Not Sampled
- X Not Detected

NOTES:

1. 18J - 11/97 = Concentration/Qualifier/Date Sampled
2. J = Estimated Concentration
3. Units in mg/kg



Figure 2-1
Extent of Aroclor-1260 in Surface Soils
at Concentrations > than MCS (10 mg/kg)
SWMU 17, Zone H
Charleston Naval Complex

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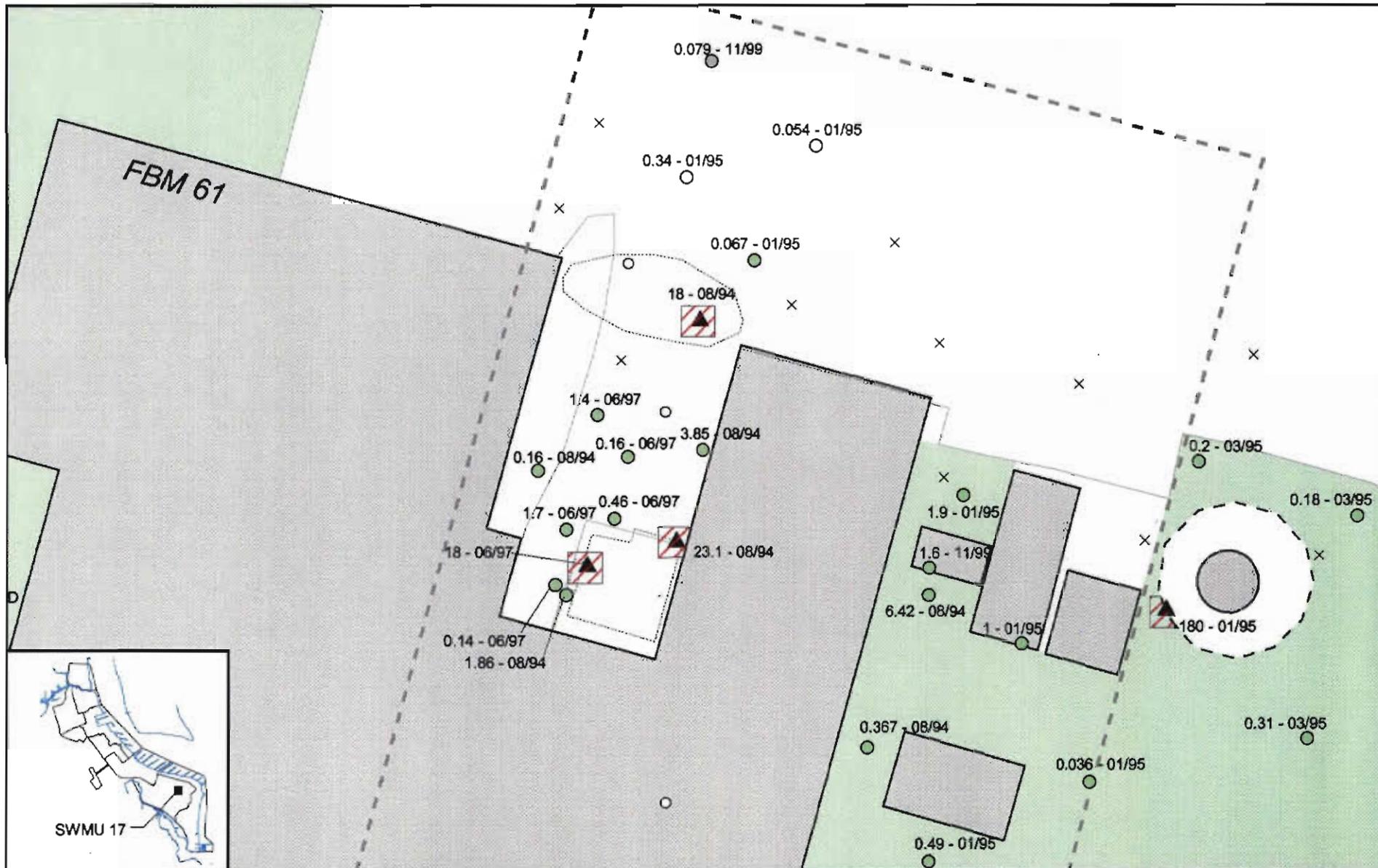
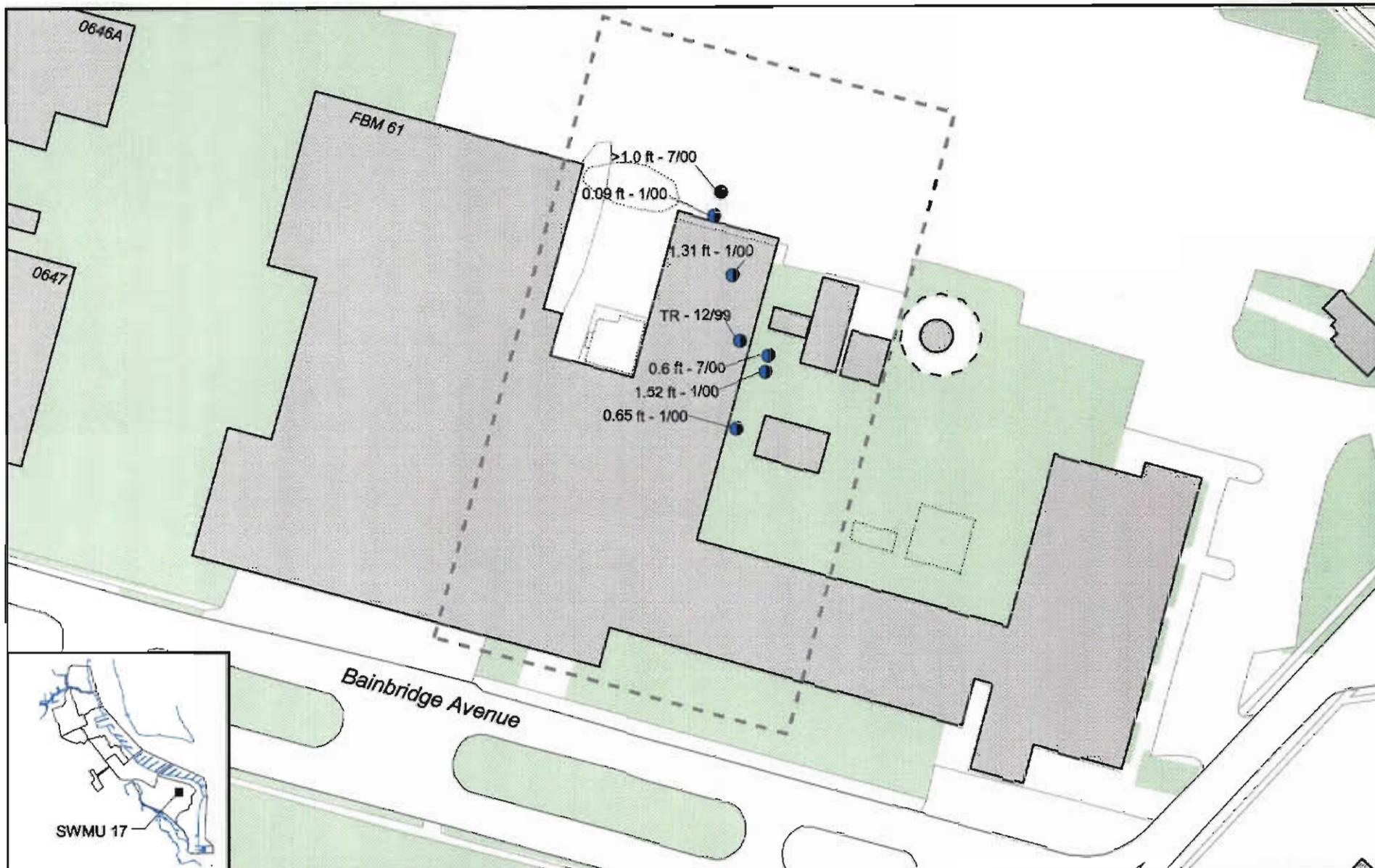


Figure 2-2
 Hypothetical Excavation Footprints
 for Aroclor-1260 in Surface Soils
 SWMU 17, Zone H
 Charleston Naval Complex

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LEGEND:

- DNAPL Sample Location
- LNAPL Sample Location

NOTES:

1. 1.0 ft - 6/00 = Liquid Thickness/Date Sampled
2. Liquid units in feet.
3. Maximum thickness displayed for each sample location
4. Refer to Table 2-4 for complete NAPL thickness history



Figure 2-3
 Monitor Well Locations
 to be Used For
 Vacuum Truck Extraction of NAPL
 SWMU17, Zone H
 Charleston Naval Complex
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SECTION 3.0

Waste Management and Disposal

1 **3.0 Waste Management and Disposal**

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

- 3 • Liquids that are a combination of LNAPL/DNAPL and groundwater
- 4 • Excavated soils and pavement debris
- 5 • Decontamination wastes
- 6 • Personal protective equipment (PPE) and liners

7 NAPL, contaminated groundwater, and excavated soils will be tested for pertinent
8 compounds, and will be disposed of in accordance with South Carolina Hazardous Waste
9 Management Regulations and all applicable regulations and permits. Decontamination
10 wastes, PPE, and soil liners will also be disposed of in accordance with regulations.

11 Offsite transportation and disposal will be performed by properly permitted and licensed
12 subcontractors. Materials designated for offsite disposal will be documented, tracked, and
13 their disposition verified. This information will be included in the IM Reports generated for
14 SWMU 17.

SECTION 4.0

Interim Measure Reports

4.0 Interim Measure Reports

Two types of IM reports will be produced. A soil IM Completion Report will be submitted within 60 days of receipt of the final data for the surface soil excavation IM. The Completion Report will summarize the actions that were taken and provide the following information:

- Analytical data reports from pre-excavation sampling
- Excavated area and volume of excavated soil
- Nature and volume of excavation wastes generated
- Waste transportation and disposal records
- Site photographs
- Problems encountered during the excavation IM, if any, and the corrective measures implemented

In addition, periodic NAPL IM Progress Reports will be submitted for the NAPL extraction IM. The periodic reports will summarize the actions that were taken during the previous time interval and will include the following information:

- NAPL measurements in monitor wells
- Volume of extracted liquids
- Waste transportation and disposal records
- Site photographs, if any
- Problems encountered during the NAPL IM, if any, and the corrective measures implemented

Periodic reports will be submitted on a monthly or bimonthly basis depending on the frequency of the NAPL recovery events. At the conclusion of the NAPL IM, a Completion Report will be produced. The Completion Report will essentially summarize the information contained in the periodic reports, as described above.

SECTION 5.0

References

1 **5.0 References**

- 2 EnSafe Inc. (EnSafe). *RCRA Facility Investigation Addendum, NAVBASE Charleston*. 2000.
- 3 U.S. Environmental Protection Agency (EPA). Risk Assessment Guidance for Superfund,
- 4 Volume I, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002.
- 5 December 1989.