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CORRECTIVE MEASURES STUDY WORK PLAN COMBINED SOLID WASTE MANAGEMENT
UNIT 9 ZONE H WITH TRANSMITTAL CNC CHARLESTON SC

2/1/2001
CH2M HILL

CORRECTIVE MEASURES STUDY WORK PLAN

Combined Solid Waste Management Unit 9, Zone H



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



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

PREPARED BY
CH2M-Jones

E022001022GNV

February 2001

*Revision 0
Contract N62467-99-C-0960
158814.ZH.PR.00*



DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

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

Subj: SUBMITTAL OF CORRECTIVE MEASURES STUDY WORK PLAN FOR
COMBINED SOLID WASTE UNIT 9

Dear Mr. Litton,

The purpose of this letter is to submit the Corrective Measures Study Work Plan (Revision 0) for Combined Solid Waste Unit (SWMU) 9 located at the Charleston Naval Complex. The Combined SWMU includes the landfill, the following SWMUs, and Areas of Concern (AOCs) located on the landfill SWMUs 19, 20, and 121, AOCs 649, 650, and 651. AOC 645 was a part of the RCRA Facility Investigation, however; it will be included in a different document. The work plan is submitted to fulfill the requirements of condition IV.E.2 of the RCRA Part B permit issued to the Navy by the South Carolina Department of Health and Environmental Control and the U.S. Environmental Protection Agency (EPA).

This document and the proposed rationale were discussed by the Charleston Naval Complex BRAC Cleanup Team. CH2M Hill has distributed the document under separate cover letter. Appropriate certification is provided under that correspondence. We request that the Department and the EPA review this document and provide comments or approval whichever is appropriate.

If you should have any questions, please contact Matthew Humphrey or myself at (843) 743-9985 and (843) 820-5551 respectively.

Sincerely,

ROBERT A. HARRELL, JR., P.E.
Environmental Engineer
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February 27, 2001

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Director
Division of Hazardous and Infectious Wastes
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Dear Mr. Litton:

Enclosed please find four copies of the Corrective Measures Study Work Plan for Combined SWMU 9, Zone H, at 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.

Please contact me if you have any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Dean Williamson".

Dean Williamson, P.E.

xc: Tony Hunt/Navy, w/att
Rob Harrell/Navy, w/att
Mihir Mehta/SCDHEC
Gary Foster/CH2M HILL w/att

CORRECTIVE MEASURES STUDY WORK PLAN

Combined Solid Waste Management Unit 9, Zone H



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



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

PREPARED BY
CH2M-Jones

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Certification Page for Corrective Measures Study Work Plan for Combined SWMU 9, Zone H

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

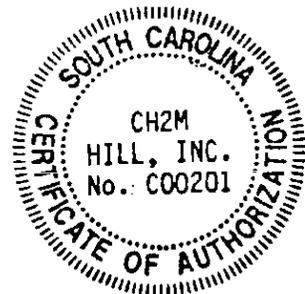
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Dean Williamson, P.E.



Date



Contents

Section	Page
Acronyms and Abbreviations	v
1.0 Introduction	1-1
1.1 Regulatory Background.....	1-1
1.2 Site Background and History.....	1-2
1.3 Description of AOCs/SWMUs located within SWMU 9	1-3
1.3.1 SWMU 19 – Solid Waste Transfer Station.....	1-3
1.3.2 SWMU 20 – Former Waste Disposal Area	1-3
1.3.3 SWMU 121 – Former Satellite Accumulation Area (SAA) associated with Recycling Operations.....	1-3
1.3.4 AOC 649, Former Storage Area for Ship Repair Supplies.....	1-3
1.3.5 AOC 650, Former Storage Area for Ship Repair Supplies.....	1-3
1.3.6 AOC 651, Former Storage Area for Ship Repair Supplies.....	1-4
1.4 Extent of Combined SWMU 9 Northern Boundary	1-4
1.5 Scope of Combined SWMU 9 CMS WP	1-4
1.6 Document Organization.....	1-4
Table 1-1 Combined SWMU 9 Site Descriptions	1-6
2.0 Corrective Measures Study Approach	2-1
2.1 Corrective Measures Study Basis.....	2-1
2.1.1 Remedial Action Objectives for SWMU 9.....	2-2
2.1.2 Surface Soil Remedial Action Objectives.....	2-2
2.1.3 Subsurface Soils Remedial Action Objectives	2-3
2.1.4 Sediment Remedial Action Objectives	2-4
2.1.5 Groundwater Remedial Action Objectives.....	2-4
2.1.6 Surface Water Remedial Action Objectives.....	2-5
2.2 Remedial Action Objectives for SWUs and AOCs within Combined SWMU 9	2-5

1	3.0	Corrective Measures Study Overview	3-1
2	3.1	Overview of Proposed Technical Approach	3-1
3	3.1.1	Corrective Action Objective and Media Cleanup Standards	
4		Development.....	3-2
5	3.1.2	Identification and Screening of Technologies.....	3-2
6	3.1.3	Corrective Measures Alternative Evaluation.....	3-4
7	3.1.4	Corrective Measures Study Report.....	3-6
8			
9	4.0	Project Management Plan.....	4-1
10	4.1	Project Organization and Responsibilities.....	4-1
11	4.1.1	Lead Regulatory Agency.....	4-1
12	4.1.2	Owner/Operator.....	4-1
13	4.1.3	Owner/Operator's Contractor.....	4-2
14			
15	5.0	Project Schedule.....	5-1
16	Table 5-1	Schedule for Production of SWMU 9 CMS.....	5-2
17			
18	6.0	References.....	6-1
19			
20	Appendix A		
21	Figure A-1	Combined SWMU 9 Landfill Boundary	
22	Figure A-2	Combined SWMU 9 Site Map	

1 Acronyms and Abbreviations

2	AOC	area of concern
3	BCT	BRAC Cleanup Team
4	BEQ	benzo(a)pyrene equivalent
5	bls	below land surface
6	BRA	baseline risk assessment
7	BRAC	Defense Base Realignment and Closure Act
8	CA	corrective action
9	CERCLA	Comprehensive Environmental Response, Compensation, and
10		Liability Act of 1980
11	CNC	Charleston Naval Complex
12	COC	chemical of concern
13	DET	Environmental Detachment Charleston
14	DPT	direct push technology
15	EnSafe	EnSafe Inc.
16	EPA	U.S. Environmental Protection Agency
17	GRA	general response action
18	ISM	interim stabilization measure
19	LTM	long-term monitoring
20	LUC	land use control
21	MCL	maximum contaminant level
22	MCS	media cleanup standard
23	mg/kg	milligram per kilogram
24	mg/L	milligram per liter
25	NAVBASE	Naval Base
26	NFA	no further action
27	O&M	operation and maintenance
28	OWS	oil/water separator

1	PCB	polychlorinated biphenyl
2	PMP	Project Management Plan
3	RAO	remedial action objective
4	RBC	risk-based concentration
5	RCRA	Resource Conservation and Recovery Act
6	RFA	RCRA Facility Assessment
7	RFI	RCRA Facility Investigation
8	RGO	remedial goal option
9	SAA	Satellite Accumulation Area
10	SCDHEC	South Carolina Department of Health and Environmental Control
11	SWMU	solid waste management unit
12	TMV	toxicity, mobility, volume

SECTION A
Introduction

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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.

In April 2000, CH2M-Jones was awarded a contract to provide environmental investigation and remediation services at the CNC. This work plan has been prepared by CH2M-Jones to present the approach and activities that will be performed to complete the Corrective Measures Study (CMS) for the Combined Solid Waste Management Unit (SWMU) 9. The CMS is part of the Resource Conservation and Recovery Act (RCRA) Corrective Action (CA) Program, and is intended to identify, develop, evaluate, and recommend CAs for implementation at the RCRA CA sites.

The Combined SWMU 9 includes an approximately 120-acre closed landfill at the base's southern end, and is generally bounded by Shipyard Creek to the southwest, Hobson Avenue to the northeast, and Holland Street to the southeast. The Combined SWMU 9, as it was investigated during the RCRA Facility Investigation (RFI), includes SWMU 9, the landfill itself, and the following SWMUs and Areas of Concern (AOCs) located on the landfill: SWMUs 19, 20, and 121; AOCs 649, 650, and 651. AOC 654 was also evaluated as part of the RFI performed for SWMU 9. However, since this site does not lie within the boundary of the SWMU 9 landfill, it will not be addressed as part of the CMS Work Plan.

1.1 Regulatory Background

The CA activities at the CNC are being conducted under RCRA, and in accordance with the Final RCRA Part B Permit for the facility (Permit No. SC0 170 022 560). The South Carolina Department of Health and Environmental Control (SCDHEC) is the lead agency for the CA activities at the CNC. An RFI and a Baseline Risk Assessment (BRA) have been completed for the Combined SWMU 9. In addition, interim stabilization measures (ISM) have been conducted to characterize and remove contaminant sources and contaminated media at some portions of the Combined SWMU 9. The next step in the RCRA CA program for the Combined SWMU 9 is the CMS process. The components of the CMS process are the CMS Work Plan and CMS report.

1 This CMS Work Plan has been developed based on the U.S. Environmental Protection
2 Agency (EPA)'s guidance for the RCRA CA program (EPA, 1994).

3 **1.2 Site Background and History**

4 SWMUs 19, 20, and 121 and AOCs 649, 650, and 651 will be included in the Combined
5 SWMU 9 CMS report as sites are located within the landfill's boundary. None of the
6 SWMUs or AOCs that were investigated as part of the Combined SWMU 9 are currently in
7 use. Figure A-2 shows SWMU 9 with the other SWMUs/AOCs that are located near and on
8 the landfill. This figure was prepared as part of a draft CMS that was not submitted to
9 SCDHEC.

10 The RCRA Facility Assessment (RFA) report states that:

11 "From the 1930s to 1973, all solid waste generated at the NAVBASE reportedly was
12 disposed onsite in a landfill. Most wastes from the industrial shops in the NSY were
13 disposed in the landfill. The landfill was operated as an area fill (i.e., no trenches were dug),
14 and, to reduce the volume, most wastes were burned "(U.S. Navy Southern Division Naval
15 Facilities Engineering Command [Navy], 1991).

16 It further states that :

17 "Before landfilling, this area was a tidal marsh bordering Shipyard Creek. Wastes were
18 deposited directly into the marsh and were often flooded by high tides. Materials which
19 would not burn (such as concrete rubble, drums, and metal scrap) were placed on the
20 leading edge of the fill, sometimes in the tidal waters. Combustible waste materials were
21 burned daily, and the burned residue was pushed into the marsh with a bulldozer. Cover
22 material was applied on an irregular, 'as-available' basis. Soils from onsite building
23 excavations, spoil dredged from the river, and bottom ash from the power plant were all
24 used as cover material" (Navy, 1991).

25 During exploratory investigations and trenching conducted by EnSafe during the RFI, a
26 variety of solid wastes were encountered including empty oil containers, medical wastes,
27 empty Freon cans, cargo netting, gas masks, concrete, wood, and domestic garbage.
28 Industrial wastes reportedly disposed of in the landfill include sanitary wastes, asbestos,
29 varnish sludge, mercury, acid neutralization sludge, paint waste and sludge, metal sludge,
30 and polychlorinated biphenyl (PCB) fluids (Navy, 1991).

31 The landfill was closed in 1973.

1.3 Description of AOCs/SWMUs located within SWMU 9

1.3.1 SWMU 19 – Solid Waste Transfer Station

SWMU 19 was the solid waste transfer station that temporarily stored solid waste before being transported offsite. Wastes stored on the bare ground were dry trash, tires, and empty 55-gallon drums.

Arsenic, lead, aroclor-1260, and benzo(a)pyrene equivalents (BEQs) were identified as chemicals of concern (COCs) at the site.

1.3.2 SWMU 20 – Former Waste Disposal Area

SWMU 20 was used for storage and disposal of waste materials, such as batteries, concrete, wood, and sand blasting residue beginning in 1985.

The sole COC in surface soil identified in the risk assessment at SWMU 20 was determined to be BEQs.

1.3.3 SWMU 121 – Former Satellite Accumulation Area (SAA) associated with Recycling Operations

SWMU 121 is the site of Building 801 and associated SAA. Since 1990, Building 801 has been used for collection, sorting, and storage of recyclable materials. The associated SAA was an 8-foot (ft)-by-8-ft sheet-metal building with a concrete floor on which hazardous waste was accumulated. The SAA did not include a secondary containment structure.

COCs in surface soil identified in the risk assessment at SWMU 121 were determined to be arsenic, lead, BEQs, aroclor-1254, and aroclor-1260.

1.3.4 AOC 649, Former Storage Area for Ship Repair Supplies.

AOC 649, the former Braswell Storage Area, is located east of Building 672. It was used to store sandblast media, welding supplies, and various other supplies used in repairing ships. Material was stored for an unknown length of time during the 1970s.

COCs in site soil identified in the risk assessment at AOC 642 were aroclor-1254 and BEQs.

1.3.5 AOC 650, Former Storage Area for Ship Repair Supplies.

AOC 650, the former Metal Trades storage area, is located east of Building 672. It was used to store unknown supplies used in ship repair. The exact dates of operation are unknown, but maps indicate that the area was in operation during the 1970s.

COCs in site soil identified in the risk assessment at AOC 642 were aroclor-1254 and BEQs.

1.3.6 AOC 651, Former Storage Area for Ship Repair Supplies.

AOC 651, the former sandblaster's storage area, is located east of Building 672. It was used to store sandblast media, presumably resulting from ship repair. The area was in operation from the 1970s until 1991.

COCs in site soil identified in the risk assessment at AOC 642 were aroclor-1254 and BEQs.

1.4 Extent of Combined SWMU 9 Northern Boundary

The location of the northern boundary has been evaluated as part of past investigations at the CNC. Several different interpretations have been presented over time and are provided in Figure A-1. This figure was prepared to support a Draft CMS. The Draft CMS was not submitted to SCDHEC.

As part of combined SWMU 9 CMS, the available historical data will be evaluated for the purpose of finalizing the northern boundary location. Historical data that will be evaluated will include the Zone H RFI, the geophysical investigation conducted by the Navy's Environmental Detachment Charleston (DET), historical aerial photos, historical site maps, and other work completed adjacent to the landfill (e.g., SWMU 8 Interim Measure). The basis for the placement of the northern boundary location will be presented as an appendix to the CMS.

1.5 Scope of Combined SWMU 9 CMS Work Plan

This CMS Work Plan addresses the original extent of Combined SWMU 9, as depicted in the Zone H RFI report (EnSafe, 1998), which includes SWMUs 9, 19, 20 and 121 and AOCs 649, 650 and 651, as shown in Figure A-2. Table 1-1 lists the sites that are collocated on SWMU 9 and a brief description of their past uses and/or present conditions as well as regulatory status.

1.6 Document Organization

This CMS Work Plan consists of the following sections, including this introductory section:

1.0 Introduction—Presents the project and site background information.

2.0 Corrective Measures Study Approach—Presents overall objectives and approach for the CA(s) at the Combined SWMU 9.

- 1 **3.0 Corrective Measures Study Overview**—Describes the activities and approach for
2 identifying and evaluating the corrective measure technologies and options for
3 implementation at the Combined SWMU 9.
- 4 **4.0 Project Management Plan**—Describes the overall project management approach
5 including roles and responsibilities, communication plan, and community relations plan.
- 6 **5.0 Project Schedule**—Describes the project schedule for conducting the CMS for the
7 Combined SWMU 9.
- 8 **6.0 References**—List the references used in this document.

TABLE 1-1
 Combined SWMU 9 Site Descriptions
CMS Work Plan, SWMU 9, Zone H, Charleston Naval Complex

Site Name	Description	RCRA CA History
SWMU 9	Closed former landfill	RFI including geophysical and cover thickness investigations complete
SWMU 19	Former solid waste transfer station	RFI complete
SWMU 20	Waste disposal area primarily for construction and demolition debris	RFI complete
SWMU 121	SAA associated with a recycling operation, Building 801	RFI complete
AOC 649	Former storage area for sandblast media, welding supplies, etc. for ship repair supplies	RFI complete
AOC 650	Former storage area for metals for ship repair	RFI complete
AOC 651	Former storage area for sandblast media resulting from ship repair	RFI complete

Corrective Measures Study Approach

2.0 Corrective Measures Study Approach

This section presents an overview of the CMS approach that will be conducted to identify, evaluate, and select the final corrective measures for the Combined SWMU 9. In addition, remedial action objectives (RAOs) which will be considered in the CMS are also discussed in this section.

2.1 Corrective Measures Study Basis

A key basis for conducting the CMS for the Combined SWMU 9 is the application of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Municipal Landfill Presumptive Remedy to Military Landfills (EPA, 1993). Presumptive remedies are the preferred technologies for common categories of sites (such as landfills), based on EPA's scientific and engineering evaluation of performance data on technology implementation. Application of the presumptive remedy to SWMU 9 provides protection to human health and the environment, streamlines the CMS process, and results in consistent remedy selection and decision-making.

The presumptive remedies for landfills allow leaving the landfilled waste in place at SWMU 9, and applying containment as the primary corrective measure. In-place containment of landfilled waste has been developed as the presumptive remedy based on EPA's past and repeated conclusion that the containment is effective, easily implemented, and provides cost-savings. Removal and offsite re-disposal (with or without treatment) of landfilled waste from SWMU 9 would not only be cost-prohibitive, but could also result in releases of hazardous constituents to the environment during the excavation, handling, transport, and re-disposal of wastes. The removal and re-disposal activities would also result in the potential for worker exposure to hazardous constituents.

Under the presumptive remedy approach, the primary RAO for landfilled waste at SMWU 9 will be to prevent ingestion and direct/dermal contact with surface soils having unacceptable carcinogenic risks and non-carcinogenic health effects as well as migration of contaminated groundwater from the landfill area. The presumptive remedy for landfills, which is containment, will be engineered to achieve adequate protection of human health and the environment by eliminating or reducing exposure of receptors to waste constituents. Supplemental technologies may also be implemented to ensure integrity and long-term reliability of the containment corrective measure. These supplemental

1 technologies may include long-term monitoring (LTM), maintenance of engineered
2 controls, land use controls, groundwater containment or treatment, or other methods
3 required to protect human health and the environment.

4 The selected corrective measure for the Combined SWMU 9 will integrate the corrective
5 measures for individual SWMUs and AOCs that lie on top of the landfill to meet the RAOs.
6 A variety of general response actions (GRAs) (containment, removal, treatment, offsite
7 disposal, etc.) will be considered for the SWMUs/AOCs that lie on top of SWMU 9.

8 **2.1.1 Remedial Action Objectives for SWMU 9**

9 Under RCRA CA, RAOs are established for various media of concern for a particular
10 exposure route. For example, an RAO for surface soil cleanup could be to remediate surface
11 soil such that it does not pose an unacceptable risk to a site maintenance worker who may
12 be onsite periodically performing specific maintenance activities.

13 After RAOs are established, remedial goal options (RGOs) are typically developed for each
14 RAO. RGOs are often developed after the risk assessment is completed and are based on
15 assumptions about a particular land use scenario and include different residual risk levels
16 for comparison. For the example RAO presented above (remediating surface soils to protect
17 an onsite maintenance worker), RGOs could include remediating the surface soil to
18 anthropogenic background levels, or remediating to one of a variety of specific risk levels
19 (such as 1E-06 or 1E-04). For each RGO, a specific media cleanup standard (MCS) is
20 determined for specific chemicals. These MCSs are expressed in conventional concentration
21 units, such as milligram per kilogram (mg/kg) or milligram per liter (mg/L) for specific
22 chemicals. Remediating the site to those specific MCSs would be suitable to demonstrate
23 that the RAO has been achieved.

24 RAOs for various media at Combined SWMU 9 are discussed in the following section. The
25 approach that will be used in the CMS to develop proposed RGOs and MCSs for various
26 media is also discussed.

27 **2.1.2 Surface Soil Remedial Action Objectives**

28 Surface soil is defined as the top 12 inches of soil. At Combined SWMU 9, surface soil
29 includes fill material and soil that overlies most of the landfill, as well as soil that may have
30 been contaminated as a result of operations at other SWMUs and AOCs that overlie the
31 Combined SWMU 9 area.

32 The RAOs for surface soil are to contain or remediate surface soils to achieve protection of
33 human health and the environment. RGOs to meet this RAO should apply to the expected

1 future land use scenario. Because SCDHEC regulations and the zoning applied to this
2 portion of the CNC do not allow residential development, surface soils do not require
3 remediation for unrestricted future land use. Therefore, RGOs for surface soil at the
4 Combined SWMU 9 for human health protection will be to attain MCSs that are protective
5 of workers involved in the LTM and maintenance of the closed landfill.

6 Potential MCSs for achieving RGOs protective of potentially exposed human receptors (site
7 workers involved in monitoring and maintenance) under the anticipated future land use
8 will be presented in the CMS. Remedial alternatives for achieving these potential MCSs will
9 be evaluated and described in the CMS.

10 In addition to the protection of human health, the surface soil RAO for the protection of the
11 environment will be to achieve MCSs that are protective of ecological receptors. As the
12 closed landfill will be mowed and maintained but not developed, the closed Combined
13 SWMU 9 will not be a significant habitat for ecological receptors. MCSs developed for the
14 surface soil medium for ecological protection will be based on aquatic receptor protection
15 and consistent with criteria to protect against runoff of contaminated sediment.

16 **2.1.3 Subsurface Soils Remedial Action Objectives**

17 Subsurface soils include materials from 12 inches below land surface (bls) to the top of the
18 shallow water table aquifer at the Combined SWMU 9 site. At the Combined SWMU 9, the
19 subsurface soils may include landfill cover soils and landfilled wastes and debris.

20 Subsurface soils may have been impacted as a result of operations at other SWMUs and
21 AOCs that overlie the Combined SWMU 9 boundary.

22 The RAOs for subsurface soils at the Combined SWMU 9 are to contain the subsurface soils
23 to achieve protection of human health and the environment for the current and future use
24 of the site, which is the LTM and maintenance of the closed landfill. No MCSs are required
25 for subsurface soil since the wastes will be left in place.

26 The protection of groundwater against leaching of contaminants from subsurface soils is
27 addressed under the monitoring and contingency CAs for the groundwater medium. This
28 approach is consistent with the presumptive remedy for landfills. The RAO will also
29 include goals to maintain the integrity of the containment RAO over time.

30 **2.1.4 Sediment Remedial Action Objectives**

31 The Zone H RFI report (EnSafe, 1998) concluded that no sediment contamination was
32 detected outside of the water bodies, and hence, there was no need for further evaluation of
33 corrective measures for sediment at the Combined SWMU 9 site. Sediment contamination

1 below the mean high water line in Shipyard Creek adjacent to SWMU 9 is part of Zone J
2 and is not part of SWMU 9. Any required remediation of this sediment would be addressed
3 under the Zone J activities.

4 **2.1.5 Groundwater Remedial Action Objectives**

5 The surficial aquifer at Combined SWMU 9 includes two separate permeable zones: a
6 shallow and a deeper zone. The shallow portion of the surficial aquifer (approximately 7 to
7 12 ft bls) has shown some presence of several chemicals. The deeper permeable portion of
8 the surficial aquifer (approximately 25 to 40 ft bls) is separated from the shallow portion of
9 the aquifer by the Marsh clay, which ranges from about 15 to 30 ft thick in this portion of
10 the CNC. Contamination in the deeper permeable portion of the surficial aquifer at the
11 Combined SWMU 9 has not been confirmed. The available data indicate that the Marsh clay
12 provides a significant barrier to downward contaminant and shallow groundwater
13 migration.

14 The EPA-specified presumptive remedy for groundwater at a landfill site is "source area
15 groundwater control to contain the plume." Consistent with the presumptive remedy, the
16 RAOs for groundwater at the Combined SWMU 9 is to contain the groundwater plume
17 posing unacceptable risks to human health and the environment within the compliance
18 boundary. Based on available information, contaminated groundwater has not been found
19 migrating out of the landfill boundary under the current conditions.

20 Should future LTM of the site indicate migration of the groundwater plume from the
21 landfill area, groundwater containment would be considered the primary contingency
22 corrective measure. Various containment options would be evaluated to identify the best-
23 suited approach. A secondary contingency RAO to remediate the groundwater would be
24 evaluated in the event the containment RAO is ineffective in achieving containment of the
25 plume that is protective human health and the environment within the compliance
26 boundary under future site conditions.

27 Accordingly, a discussion will be provided in the CMS addressing the use of contingent
28 actions in the event that contaminated groundwater is found to migrate. The CMS will
29 describe a process to evaluate and select appropriate mitigation strategies to contain and/or
30 remediate groundwater to achieve the protection of human health and the environment in
31 this event. A compliance boundary will be proposed and a long-term groundwater
32 monitoring strategy will also be presented in the CMS.

1 The compliance boundaries for the Combined SWMU 9 groundwater may be established
2 based on the land use controls (LUCs) in effect and appropriate MCSs. The following
3 approach will be considered in triggering the contingent RAOs:

- 4 1. LTM (detection monitoring) would continue, if no unacceptable levels of chemicals are
5 found in the groundwater beyond the footprint of the landfill
- 6 2. A containment contingent remedy would be implemented to contain the plume within
7 the landfill footprint, if unacceptable levels of chemicals are found in the groundwater
8 beyond the footprint of the landfill
- 9 3. A remediation contingent remedy would be implemented if the containment contingent
10 remedy fails to reduce the plume concentrations to within acceptable levels consistent
11 with the LUCs that are in effect within a compliance boundary

12 **2.1.6 Surface Water Remedial Action Objectives**

13 No contaminants were detected in the surface water at the Combined SWMU 9 site at
14 concentrations that were of concern. Therefore, no RAOs are warranted for the surface
15 water medium at the site to achieve protection of human health and the environment.

16 **2.2 Remedial Action Objectives for SWUs and AOCs within** 17 **Combined SWMU 9**

18 Generally, RAOs for SWMUs and AOCs that lie within the footprint of SWMU 9 will be
19 approached in a similar fashion to SWMU 9. RAOs for surface soil will be to remediate or
20 contain surface soil to be protective of a site maintenance worker. RAOs for subsurface soil
21 will be to effectively contain subsurface soil to be protective of a site worker. RAOs for
22 sediment will be to contain or remediate sediments to minimize or eliminate offsite
23 migration of contaminated sediment to achieve protection of ecological receptors.

24 This approach is consistent with the containment approach specified in the presumptive
25 remedy guidance document. For each SWMU and AOC, the specific COCs may differ and
26 thus individual SWMUs and AOCs may have different MCSs; however, the overall RAO
27 and RGOs will be the same as those for SWMU 9.

SECTION 33

Corrective Measures Study Overview

3.0 Corrective Measures Study Overview

The CMS will consist of several steps to identify and develop the best-suited technologies and processes to implement the containment presumptive remedy for the Combined SWMU 9 site. The CMS will also identify and develop the best-suited corrective measures that are consistent with the presumptive remedy for other SWMUs and AOCs that overlie the SWMU 9 boundary. They include the following steps:

- Develop RGOs and MCSs for media of concern
- Describe the general response action (containment) based on the EPA presumptive remedies for municipal landfill sites
- Identify and screen corrective measure technologies that are consistent with the containment option
- Identify and screen corrective measure alternatives based on the feasible corrective measure technologies
- Develop and evaluate selected corrective measure alternatives
- Prepare a CMS report to document the process and describe the conclusions of the CMS activities

3.1 Overview of Proposed Technical Approach

In accordance with the EPA guidance on presumptive remedies for municipal landfills (EPA, 1993), the CMS will evaluate technology options for the containment remedy for the combined SWMU 9 site. Within the containment remedy framework, land use restrictions and engineering controls will be used. These will be supplemented by removal and treatment technologies where appropriate.

The presumptive remedy guidance document does not specifically address exposure pathways outside a contained landfill source area. Therefore, the CMS will address potential exposure pathways associated with SWMUs and AOCs collocated on the SWMU 9 landfill (e.g., surface soil impacted by the operation of SWMUs and AOCs).

In addition, the presumptive remedy guidance does not specifically include long-term groundwater response action that may be necessary to contain the groundwater plume to

1 protect human health and the environment. Therefore, the CMS will address potential
2 exposure pathways for groundwater plumes through development and achievement of
3 contingency RAOs. Therefore, approaches to the implementation of the contingency RAOs
4 may include a site-specific risk assessment and development and evaluation of appropriate
5 corrective measures that are compatible with the comprehensive site response. The CMS
6 will provide a discussion of development and implementation of the contingency RAOs for
7 the groundwater medium.

8 Specific corrective measure technology and alternative evaluation activities that will be
9 conducted during the CMS are described below.

10 **3.1.1 Corrective Action Objective and Media Cleanup Standards Development**

11 The information from the RFI, BRA, and ISMs will be used to develop MCSs for surface soil
12 and groundwater. A point of compliance will be proposed for groundwater MCSs. MCSs
13 will be based on the RCRA regulations, other applicable federal and state regulations and
14 guidances, risk-derived standards and the available site information. RAOs will be
15 developed only to protect the site worker scenario. As this landfill is not projected to be
16 used for residential purposes, development of RAOs for a residential scenario is not
17 warranted.

18 **3.1.2 Identification and Screening of Technologies**

19 The typical components of the landfill presumptive remedy includes the following:

- 20 • Landfill cap
- 21 • Source area groundwater control to contain plume
- 22 • Leachate collection and treatment
- 23 • Landfill gas collection and treatment
- 24 • Institutional controls to supplement engineering controls

25 The landfill is currently closed and has a soil cover overlying the waste. Therefore, no
26 additional landfill cap is necessary. Options for the long-term maintenance of the existing
27 cap will be evaluated. These may include surface water drainage and vegetative cover
28 improvements. However, if the surface soil at other SWMUs and AOCs overlying the
29 SWMU 9 boundary pose unacceptable human health or ecological risks, containment will
30 be evaluated as the primary technology. In addition, secondary technologies such as
31 removal and offsite treatment/disposal will be evaluated. This approach is consistent with
32 the surface soil RAOs described in Section 2.0, Corrective Measures Study Approach.

1 The identification and screening of the technologies will be conducted to address any site-
2 specific unacceptable exposure risks present due to the landfill wastes or waste constituents
3 that may have resulted from associated SWMUs and AOCs.

4 In addition, a process to evaluate technologies for groundwater monitoring and plume
5 control, if found to be necessary in the future, will be defined. The plume control
6 technologies (e.g., permeable reactive barriers, hydraulic control systems) may be identified
7 as contingency actions in the event that the groundwater monitoring results indicate
8 presence and migration of impacted groundwater beyond an established compliance
9 boundary.

10 Although SWMU 9 does not have a bottom liner or a leachate collection system, the
11 available geologic data indicate that the Marsh clay below the landfill is contiguous and
12 appears to effectively function in preventing downward migration of contaminated
13 groundwater. Thus, because downward migration of leachate appears to be precluded by
14 the Marsh clay and because there has been no documented lateral migration of leachate
15 outside of the landfill footprint, no specific leachate collection and treatment technology
16 identification and screening is warranted.

17 During the RFI, soil gas samples were collected and analyzed (see Zone H RFI, Appendix
18 E). The soil gas results did not indicate an active landfill gas generation at the site. Further,
19 the landfill waste was last placed at the site approximately 30 years ago. The potential for
20 landfill generation is minimal, as confirmed by the RFI soil gas survey. Therefore, no
21 landfill gas collection or removal technology identification and screening is warranted.

22 Institutional controls that are necessary to ensure the integrity of the CA will be identified
23 and evaluated during this CMS step. The institutional controls may include the following
24 components:

- 25 • Deed restrictions for future land use
- 26 • Restriction to prohibit installation and use of production and consumptive use wells
27 during the operational life of the remedy
- 28 • Site access restrictions (e.g., fence)
- 29 • Warning signs
- 30 • An inspection program to ensure the integrity and effectiveness of institutional controls

1 The various technologies and processes identified as described above will be screened
2 based on their effectiveness, ease of implementation, and relative cost. On the basis of the
3 technology screening results, a manageable number of potentially feasible corrective
4 measures alternatives will be developed for further evaluation, as described below.

5 **3.1.3 Corrective Measures Alternative Evaluation**

6 Corrective measures alternatives, which eliminate, control, and/or reduce unacceptable risk
7 to human health or the environment to acceptable levels for each pathway, will be
8 developed and evaluated. These alternatives will be screened based on effectiveness, ease of
9 implementation, and cost. A critical objective of any alternative will be to stop further
10 environmental degradation by controlling releases that may pose a threat to human health
11 and the environment.

12 A detailed analysis of each alternative selected and identified in the above step will be
13 conducted. In addition to the individual assessment, a comparative analysis will be
14 performed to determine the relative performance of alternatives. The analysis will focus on
15 sub-factors and criteria most pertinent to each site as well as the scope and complexity of
16 the proposed action. The alternative for each site will be selected or recommended.

17 The individual and comparative analysis of the alternatives will be performed by
18 evaluating the performance of the alternatives under several evaluation factors. These
19 evaluation factors are the following:

20 **Protection of Human Health and the Environment**

21 Under this criterion, each alternative will be evaluated to determine its ability to reduce risk
22 to human health and the environment. The evaluation will also be used to assess whether
23 the alternative poses unacceptable short-term or cross-media impacts.

24 **Attainment of Media Cleanup Standards**

25 CAs must achieve the MCSs developed in accordance with the requirements, criteria,
26 standards, and limitations under federal, state, and local environmental laws, as well as the
27 hazardous substances or circumstances at a site. Each alternative will be evaluated for the
28 ease of achieving the MCSs during implementation, and the alternative's ability to comply
29 with the MCSs during the operation and maintenance (O&M) period.

1 **Control of Sources of Release**

2 The alternative's ability to prevent further environmental degradation will be considered.
3 This attribute of the alternative will be critical to ensure the long-term effectiveness and
4 permanence of the corrective measure.

5 **Compliance with Applicable Standards for Management of Wastes**

6 Each alternative is evaluated to determine the applicable federal and state requirements and
7 procedures to comply with such requirements governing the waste management during the
8 CA. Management of wastes generated during the CA is also addressed under this
9 evaluation factor.

10 Other evaluation factors that should be considered are the following:

11 **Long-Term Reliability and Effectiveness**

12 The proven effectiveness of the alternative is evaluated for the conditions specific to the site.
13 The useful life (the length of time that effectiveness can be maintained) of the alternative is
14 considered, as effectiveness may deteriorate with time. Operation, monitoring, and
15 maintenance options that are necessary to ensure the reliability of the alternative
16 performance and to extend the useful life of the alternative are also considered.

17 **Reduction of Toxicity, Mobility, or Volume through Treatment**

18 The statutory preference is a CA that employs treatment to reduce the toxicity, mobility, or
19 volume (TMV) of hazardous substances. However, the presumptive remedy for the landfill
20 is containment and TMV will be considered as evaluation factor for those technologies that
21 control or eliminate unacceptable exposure risks and groundwater plume control.

22 **Short-term Effectiveness**

23 This criterion considers the short-term effects of an alternative on human health and the
24 environment during its implementation. This evaluation factor will also consider reliability
25 and ease with which engineering controls can be implemented to mitigate unacceptable
26 short-term impacts.

27 **Ease of Implementation**

28 The implementation factor will evaluate the difficulties of constructing and operating an
29 alternative, and the availability of materials and services required.

1 **Cost**

2 Preliminary cost estimates will be developed for each remedial alternative. These cost
3 estimates will be used for the relative evaluation of the alternatives, not to bid on or budget
4 the work. These estimates will be based on information available at the time of the CMS and
5 based on a conceptual design of the alternative. The cost estimates should be considered
6 "rough-order-of-magnitude" estimates and generally have an expected accuracy of -30
7 percent to +50 percent for the scope of action described. The estimates will be divided into
8 capital costs and O&M costs.

9 In addition to the evaluation criteria described above, the agency and community
10 acceptance of the proposed CA is an important element in the decision to select and to
11 implement the proposed CA. Concerns of the regulators and the local community must be
12 addressed during the CMS review and remedy selection process.

13 **3.1.4 Corrective Measures Study Report**

14 This CMS report will present the identification, development, and evaluation of potential
15 corrective measures for the Combined SWMU 9 site.

SECTION 01
Project Management Plan

4.0 Project Management Plan

This Project Management Plan (PMP) has been prepared to define the project organization, identify key personnel and their responsibilities, and establish reporting requirements and lines of communications for the performance of the CMS, and for the preparation of the CMS Report of the Combined SWMU 9 site. This PMP also includes a project schedule, a list of anticipated meetings, and the project deliverables required during the CMS project. This plan has been developed to maintain consistency in procedures and communications during the execution of the CMS project.

4.1 Project Organization and Responsibilities

The organizations that will participate in the completion of the CMS for the Combined SWMU 9 site are described in this subsection. These organizations have specific functions according to their project responsibilities.

The project organizations include the following:

- Lead Regulatory Agency —South Carolina Department of Health and Environmental Control
- Supporting Regulatory Agency — U.S. Environmental Protection Agency
- Owner/Operator —U.S. Navy
- Owner's Contractor —CH2M-Jones

4.1.1 Lead Regulatory Agency

SCDHEC will assign a lead engineer and hydrogeologist for the review and completion of the CMS. Dann Spariosu will be the contact person from EPA for this project.

4.1.2 Owner/Operator

The U.S. Navy is the Owner/Operator for the site. Tony Hunt will be the primary contact from the Navy for SCDHEC and EPA. The Navy is ultimately responsible for completing the CMS and implementing the agency-approved CA.

1 **4.1.3 Owner/Operator's Contractor**

2 CH2M-Jones is the Navy's contractor and is responsible for completing this project for the
3 Navy. Dean Williamson is the primary point of contact from the CH2M-Jones team, and
4 will be assisted by Srinu Dasappa, who will serve as the alternate point of contact for the
5 project.

SECTION 4.1

Project Schedule

1 **5.0 Project Schedule**

2 The project schedule for completing the CMS for the Combined SWMU 9 is presented in
3 this subsection. The project schedule is developed based on the CMS tasks and associated
4 subtasks described in Section 2.0, Corrective Measures Study Approach. The schedule
5 presented in Table 5-1 includes the following:

- 6 • the CMS tasks and associated subtasks
- 7 • the duration, and the predecessor(s) for each subtask
- 8 • the project milestones including completion for each work item

9 The project schedule presented in Table 5-1 will be finalized based on the input from the
10 reviewers of this document. It should be noted that the team preparing the CMS may decide
11 to meet internally at various milestones to discuss issues such as defining the extent of the
12 SWMU 9 boundary, and establishing MCSs for various media (surface soil and
13 groundwater). Thus, additional meetings may be held and various pre-meeting scoping
14 packages may be prepared that are not reflected in this schedule.

1

TABLE 5-1
Schedule for Production of SWMU 9 CMS
CMS Work Plan, SWMU 9, Zone H, Charleston Naval Complex

Activity	Expected Completion Date
Submit Revision 0 CMS work plan	February 28, 2001
SCDHEC Review of Revision 0 CMS WP	April 13, 2001
Review/scoping meeting to complete CMS WP	To be determined
Prepare/Submit Revision 1 CMS WP	May 4, 2001
Begin CMS for SWMU 9	March 1, 2001
Submit Revision 0 CMS for SWMU 9	May 31, 2001

~~Section 44~~
References

1 6.0 References

- 2 U.S. Navy Southern Division Naval Facilities Engineering Command (Navy). *RCRA Facility*
3 *Assessment Report*. Charleston, SC. 1991.
- 4 EnSafe Inc. [EnSafe]. *Final Zone H RFI Work Plan, NAVBASE Charleston*. October, 1994.
- 5 EnSafe. *Final RCRA Facility Investigation Report for Zone H, NAVBASE Charleston*. Revision 1.
6 June, 1998.
- 7 U.S. Environmental Protection Agency (EPA). *Presumptive Remedy for CERCLA Municipal*
8 *Landfill Sites*. OSWER Directive 9355.0-49FS, EPA 540-F-93-035. September, 1993.
- 9 EPA. *RCRA Corrective Action Plan, Final*. OSWER Directive 9902.3-2A. May, 1994.

APPENDIX A
Combined SWMI & Landfill Boundary
and Site Map Drawings



LEGEND

	EXISTING SMMU 9 SOUTHERN BOUNDARY
	ESTIMATED SMMU 9 NORTHERN BOUNDARY
	ESTIMATED SMMU 9 NORTHERN BOUNDARY ORIGINAL STAKEOUT LOCATIONS
	TEST PIT LOCATION, NOT EXCAVATED
	EXCAVATED TEST PIT LOCATION FILL OF WY FOREIGN MATERIAL
	EXCAVATED TEST PIT LOCATION FOREIGN MATERIAL PRESENT
	ERC POSER ACTUAL SMMU 9 NORTHERN BOUNDARY BASED ON GEOPHYSICAL SURVEY
	EMVA CONSERVATIVE SMMU 9 NORTHERN BOUNDARY AS DETERMINED BY SOUTHERN
	EXISTING VERTICE BENCHMARK

(AS IDENTIFIED BY JANUARY 1989 GEOPHYSICAL SURVEY, ENVIRONMENTAL DETACHMENT CHARLESTON)



REVISION			
Rev Number: 000	Rev Date: 05/05/95	Rev By: LMM	Rev Desc: LMM
Rev Number: 000	Rev Date: 05/05/95	Rev By: LMM	Rev Desc: LMM
Rev Number: 000	Rev Date: 05/05/95	Rev By: LMM	Rev Desc: LMM
Rev Number: 000	Rev Date: 05/05/95	Rev By: LMM	Rev Desc: LMM
Rev Number: 000	Rev Date: 05/05/95	Rev By: LMM	Rev Desc: LMM

ZONE II COMBINED SMMU 9 OAS REPORT CHARLESTON NAVAL COMPLEX CHARLESTON, S.C.

FIGURE 2.24 COMBINED SMMU 9 LANDFILL BOUNDARY

Dr. by: N/A	Dr. by: LMM	Sheet: 1
CS by: MURKIN	App. by: MME	Of: 1
Date: 11/21/99	DWG Number: 2000023	

