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NCBC GULFPORT
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DECISION DOCUMENT FOR SITE 4 GOLF COURSE LANDFILL NCBC GULFPORT MS

9/1/2010

TETRA TECH

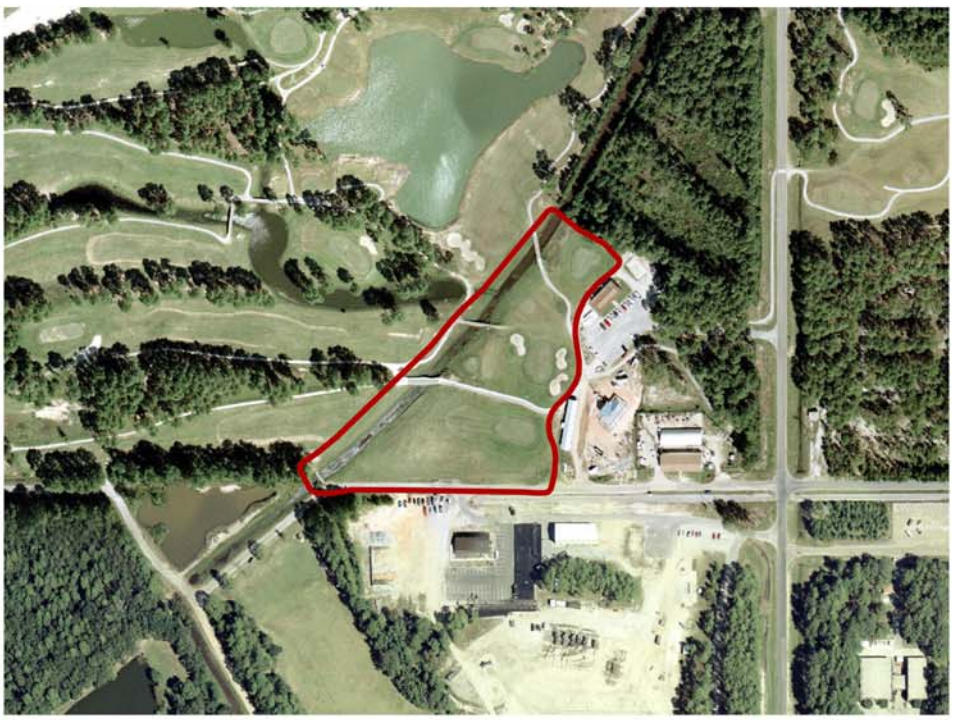
DECISION DOCUMENT

SITE 4 - GOLF COURSE LANDFILL

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT
GULFPORT, MISSISSIPPI

CONTRACT TASK ORDER 0168

NAVFAC
Naval Facilities Engineering Command



SEPTEMBER 2010

1.0 Declaration

1.1 Site Name and Location

Site 4 – Golf Course Landfill at Naval Construction Battalion Center (NCBC) Gulfport, Gulfport, Mississippi.

1.2 Statement of Basis and Purpose

This Decision Document (DD) presents the Selected Remedy for Site 4, Golf Course Landfill, at NCBC Gulfport, Mississippi (see Figure 1-1, Vicinity Map, and Figure 1-2, Location Map). The selected remedy for Site 4 was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and as implemented by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The selected remedy was also chosen in accordance with the Mississippi Commission on Environmental Quality Regulation SW-2 "Non-Hazardous Solid Waste Management Regulation and Criteria". The selected remedy is based on information contained in the Administrative Record file for this site. Information not specifically summarized in this DD or its references, but contained in the Administrative Record has been considered and is relevant to the selection of the remedy at Site 4. Thus, the DD is based upon and relies upon the entire Administrative Record file in making the decision.

NCBC Gulfport is not listed in the Comprehensive Environmental Response, Compensation, and Liability Information System and, therefore, does not have a United States Environmental Protection Agency (USEPA) identification number. NCBC Gulfport is also not included on the National Priority List (NPL), but is being managed as a non-NPL CERCLA site. The state of Mississippi, as represented by the Mississippi Department of Environmental Quality (MDEQ), has served as a supporting agency under CERCLA during the assessment and investigations at Site 4. The Navy provides funding for cleanup at Site 4. The remedy set forth in this DD has been selected by Navy and MDEQ concurrence.

Site 4 is one of six sites identified during the Initial Assessment Study (IAS) presented in July 1985 that was recommended for further investigation. The status of all the IAS sites at NCBC Gulfport can be found in the current version of the Administrative Record. This DD documents the final remedial action for Site 4 and does not include or affect any other sites at the facility.

1.3 Assessment of Site

The response action selected in this DD is necessary to protect the public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment. A CERCLA action is required because contaminants in soil, sediments, surface water, and groundwater at the site (see Table 1-1 for Chemicals of Concern [COCs]) pose unacceptable risk to human and/or ecological receptors.

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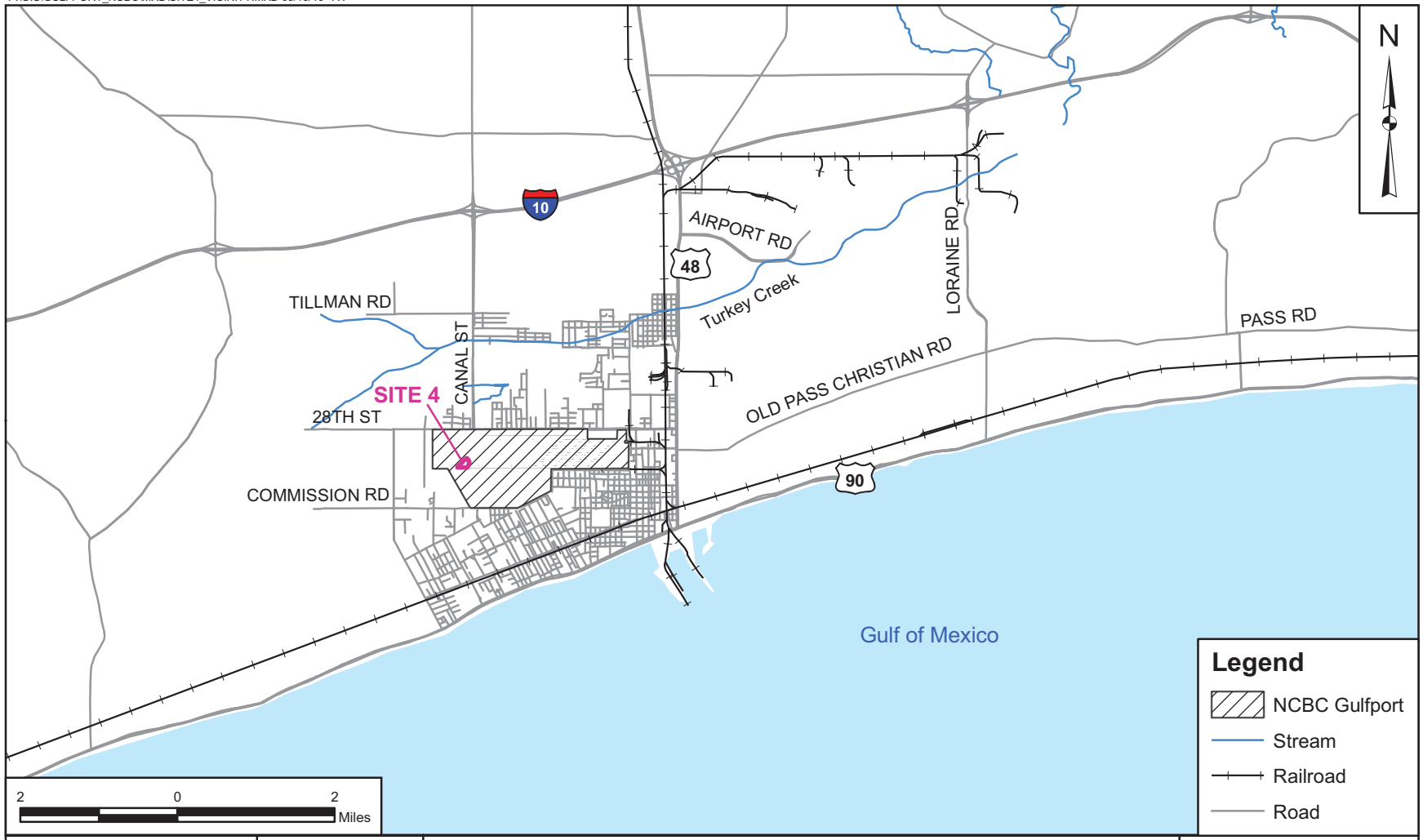

DRAWN BY K. MOORE	DATE 11/13/07	VICINITY MAP SITE 4 DECISION DOCUMENT NAVAL CONSTRUCTION BATTALION CENTER GULFPORT, MISSISSIPPI	CONTRACT NUMBER 0068
CHECKED BY Y. MARTINEZ	DATE 03/15/10		APPROVED BY ___ DATE ___
COST SCHEDULE AREA			APPROVED BY ___ DATE ___
SCALE AS NOTED			FIGURE NO. FIGURE 1-1 / REV 0

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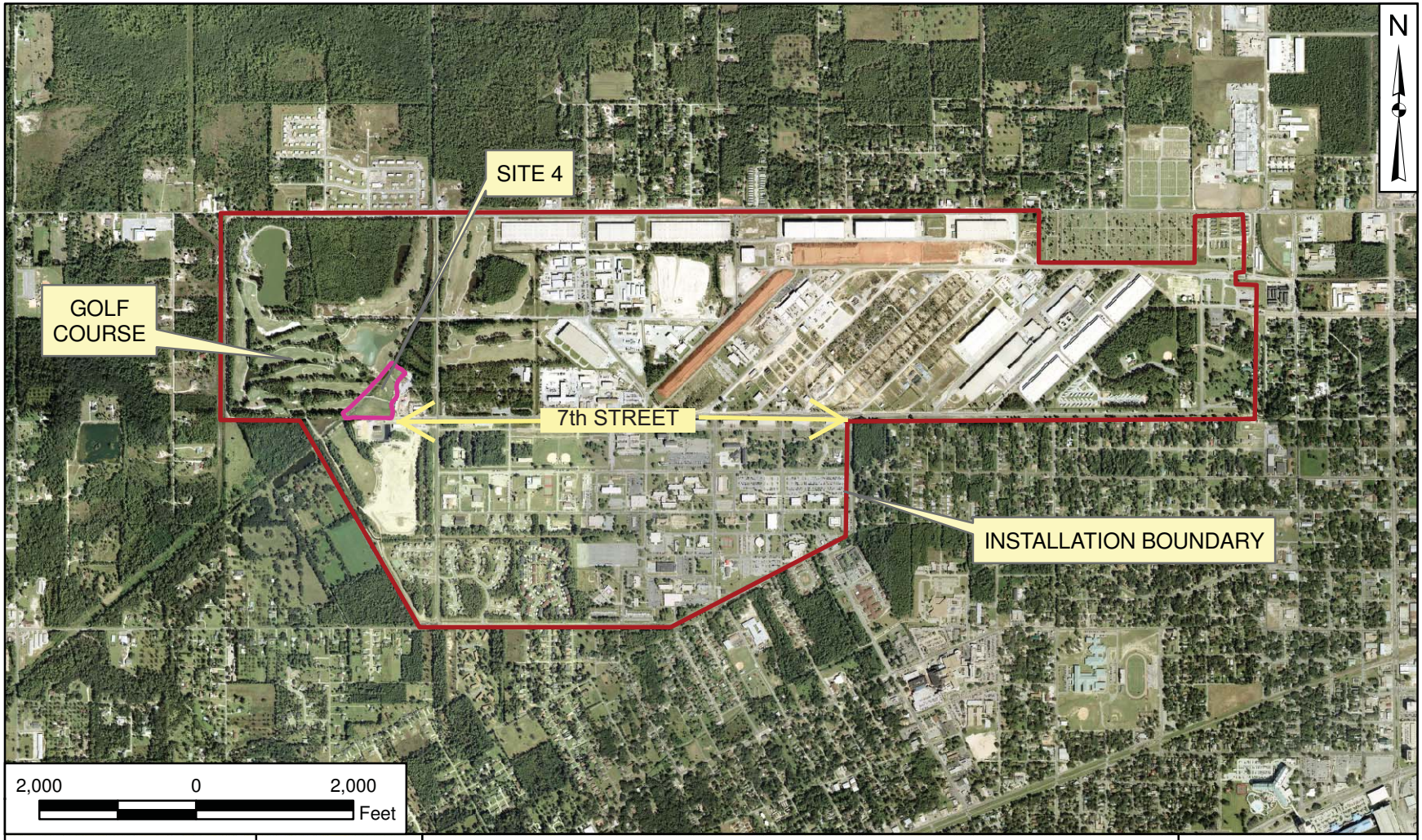

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COST SCHEDULE AREA. 2		
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LOCATION MAP
SITE 4 DECISION DOCUMENT
NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI

CONTRACT NUMBER 0068	
APPROVED BY ___	DATE ___
APPROVED BY ___	DATE ___
FIGURE NO. FIGURE . -2	REV 0

TABLE 1-1. CONTAMINANTS OF CONCERN

MEDIA	CONTAMINANTS
Soil	Dibenzo(a,h)anthracene
	Benzo(a)anthracene
Sediment	Dibenzo(a,h)anthracene
	Benzo(a)anthracene
	Dioxins
	4,4'-Dichlorodiphenyltrichloroethane (DDT)
	4-4'-Dichlorodiphenyldichloroethane (DDD)
	Aroclor-1260
	Lead
Groundwater	Iron
	Manganese
	cis-1,2-Dichloroethene (DCE)
	Trans-1,2-DCE
	Trichloroethene (TCE)
	Vinyl chloride (VC)
	Dioxins
Surface Water	Lead
	Dioxins

1.4 SELECTED REMEDY

The response action selected in this DD is necessary to protect the public health, welfare and/or the environment from actual or threatened releases of hazardous substances. Previous investigations have identified the presence of the COCs, which are contaminants detected at concentrations determined by human health and/or screening-level ecological risk assessment to represent potential risk to human and/or ecological receptors under current or future land use. The COCs for this site are shown on Table 1-1. Although arsenic concentrations in soil and sediment were greater than unrestricted use (MDEQ Tier 1) levels, they are comparable to background concentrations; therefore, arsenic was not retained as a COC.

Based on historical patterns of remedy selection for landfills, the USEPA encourages the selection of Presumptive Remedies (USEPA, 1993a) to increase the consistency in remedy selection and to streamline the investigative process. Following the RI for Site 4 (TtNUS, 2008), it was determined that a presumptive remedy was the best course of action for the site based on the characteristics of the materials in the landfill and low concentrations of the contaminants reported in the surficial aquifer. A containment remedy incorporating a low permeability cover was considered to be the overall site strategy most consistent with USEPA Guidance (USEPA, 1993b) and *Presumptive Remedy for CERCLA Municipal Landfill Sites,* (USEPA, 1993a); amended by the *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills*, (USEPA, 1996), as well as Mississippi Department of Environmental Quality (MDEQ) policy requiring a final cover (containment) for this category of landfill.

The Selected Remedy integrates the containment technologies of the landfill cap, discussed below, with land use control (LUCs) as applicable (i.e., groundwater and some soils). LUCs will be developed and implemented to prevent residential development, withdrawal of groundwater, or excavation. Periodic inspections will be required to ensure that the integrity of the cap has not been compromised and to determine whether maintenance to the surface protection is required. The cap will consist of the following three layers (from top to bottom): an erosion layer of topsoil, a low permeability layer, and a gas-venting layer. Prior to placing the cap, the site will be graded to promote drainage.

The low permeability layer will consist of 18 inches of soil with a maximum hydraulic conductivity of 1×10^{-5} centimeters per second or a layer with an equivalent hydraulic conductivity installed to minimize

the infiltration of rainwater into the landfill. The infiltration layer will minimize the amount of infiltration that would encounter the underlying waste. This action will result in minimizing infiltration through the waste and into the groundwater, which will reduce the transport of contaminants from the waste to groundwater.

Beneath the infiltration layer will be a gas-venting layer consisting of a granular material, a geocomposite, or a heavy needle-punched nonwoven geotextile to collect landfill gas. Below the gas-venting layer will be a 6-inch layer of common fill (or select waste) to protect the overlying layer(s) from puncture. Landfill gas will be collected and vented.

Overlying the infiltration layer would be a topsoil layer (MDEQ Regulation SW-2 "erosion layer"). A 6-inch layer of topsoil will be placed to provide the necessary slope to meet MDEQ requirements. Grading and final site layout will support existing conditions of the golf course or as required by a new site use.

Landfill gas would be managed by preventing the accumulation of methane gas below the cap. Specific details of the venting system would be identified in the design phase. A gas monitoring program, including vents and probes between the landfill and nearby structures, would also be developed in the design phase.

Groundwater monitoring will consist of semiannual groundwater sample collection and analysis of monitoring wells. Samples will be analyzed for VOCs, dioxins, and metals. Wells will be selected to monitor the existing plume and the downgradient side of the landfill.

LUCs will be implemented within the Site 4 boundaries to limit use of the property and to control access to the contaminated soil, groundwater, and buried waste remaining at the site. Consistent with the RAOs developed for the site, the specific performance objectives for the LUCs to be implemented at Site 4 are as follows:

- Prohibit residential or agricultural reuse of the site. Prohibited residential uses shall include, but are not limited to, any form of housing, child-care facilities, pre-schools, elementary schools, secondary schools, playgrounds, convalescent, or nursing care facilities.
- Restrict excavation/disturbance activities of soils on the site as described in the LUCs.
- Prohibit extraction of groundwater from the shallow surficial aquifer.
- Maintain the integrity of any existing or future monitoring or remediation system(s).

The following generally describes those LUCs that will be implemented at Site 4 to achieve the aforementioned LUC performance objectives:

- Preparation of a site plat describing the above-mentioned LUCs within the boundaries of the site, and filing of the plat with the Naval Facilities Engineering Command Southeast's real estate division to create a formal record of the LUCs.
- Install signs to warn potential trespassers and site users of potential for exposure to contaminated soil or groundwater.
- Incorporation of these restrictions into any real estate property documents (i.e., deeds or leases) associated with future sale or lease of the site.
- Annual inspections to ensure that there are no violations of these restrictions. The Installation Commander will provide annual certification of the inspections to MDEQ.

- If a violation of the restrictions occurs, a description of the violation and the corrective actions to be taken to restore protectiveness will be reported to MDEQ.

LUCs will be implemented and maintained by the Navy until concentrations of hazardous substances in soil are at levels that allow for unrestricted use and unlimited exposure. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs described in this DD. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain responsibility for the remedy integrity.

The LUC implementation actions including monitoring and enforcement requirements will be provided in a LUC Implementation Plan (LUCIP) that will be prepared by the Navy as the LUC component of the overall remedial design. The LUCIP for Site 4 shall contain implementation and maintenance actions, including periodic inspections. The Navy will maintain, monitor, and enforce the LUCs according to the LUCIP and the Memorandum of Agreement between the MDEQ and Navy.

The Selected Remedy meets the statutory requirements and is protective of human health and the environment, complies with federal and state regulations that are applicable or relevant and appropriate to the remedial action, is cost-effective, utilizes permanent solutions to the maximum extent practicable, and satisfies the preference for treatment as a principle element of the remedy. Based on the USEPA presumptive remedy guidance for landfills, the presumptive remedy of covering the landfill and addressing the existing groundwater and sediment contamination was evaluated following the CERCLA process Because this remedy will result in pollutants or contaminants remaining onsite in groundwater above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after the initiation of the remedial action to ensure that the remedy is protective of human health and the environment.

1.5 DATA CERTIFICATION CHECKLIST

The locations in Section 2.0, Decision Summary, of the information required to be included in the DD are summarized in Table 1-2. Additional information can be found in the Administrative Record file for NCBC Gulfport.

TABLE 1-2. DECISION DOCUMENT DATA CERTIFICATION CHECKLIST

DATA	LOCATION IN DECISION DOCUMENT
COCs and their respective concentrations	Section 2.3
Risk represented by the COCs	Section 2.5
Cleanup levels established for COCs and the basis for these levels	Section 2.4
How source materials constituting principal threats are addressed	Section 2.6
Current and reasonably anticipated future land use assumptions used in the risk assessment	Section 2.4
Potential land and groundwater uses that will be available at the sites as a result of the Selected Remedy	Section 2.9.3
Estimated capital, operating and maintenance (O&M), and net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix A
Key factors that led to the selection of the remedy	Section 2.9

1.6 AUTHORIZING SIGNATURES

L. V. Cariello
Captain, CEC
Commanding Officer
Naval Construction Battalion Center

3/28/11
Date

2.0 Decision Summary

2.1 SITE DESCRIPTION AND HISTORY

NCBC Gulfport is located in the western portion of Gulfport, Mississippi, in the southeastern part of Harrison County about 1.2 miles north of the Gulf of Mexico. A Vicinity Map is provided as Figure 1-1. Site 4, a former landfill of approximately 4 acres in size, is located in the western section of NCBC Gulfport northeast of the intersection of 7th Street and Canal No. 1. A Location Map is provided as Figure 1-2. Geological cross-section locations are presented as Figure 2-1, and geological cross-sections are presented as Figure 2-2. The northwestern boundary is the golf course, and the western boundaries of the landfill are defined by Canal No. 1. The southern boundary is 7th Street.

The landfill operated from 1966 to 1972 and was the only operating landfill on the base during this time. Solid waste such as construction debris and general refuse made up the bulk of the materials disposed of at Site 4. According to previous investigations, nearly 16,000 tons of solid waste (including building and infrastructure debris from damage due to Hurricane Camille in 1969) were disposed of at the landfill. Additionally, as much as 20,000 gallons of waste liquids (including fuels, oils, solvents, paints, paint thinners) were disposed of at the site. After waste disposal activities ceased, the site was covered with 4 to 6 feet of fine- to medium-grained sand.

The most recent site use is as a practice green, the 9th green, and the 1st tee of the Pine Bayou Golf Course. Although the golf course is closed, NCBC Gulfport plans to retain this portion as a "Golf Experience". Therefore, the anticipated future use remains similar. The site, which is covered with grass typical of a golf course, is mostly free of dense or high vegetation and is surrounded by trees and various other types of vegetation on all sides except the northeastern edge. The NCBC Gulfport boundary is located about 1,200 feet to the west, and family housing is located approximately 1,500 feet south of the site.

2.2 PREVIOUS INVESTIGATIONS

Site 4 was characterized under numerous investigations and studies between 1997 and the present. Based on the investigation findings, the COCs at Site 4 by media are:

- Soil: Dibenzo(a,h)anthracene and Benzo(a)anthracene
- Sediment: Dibenzo(a,h)anthracene; Benzo(a)anthracene; Dioxins; 4,4'- DDT; 4-4'-DDD; Aroclor-1260; and Lead
- Groundwater: Iron; Manganese; cis-1,2-DCE; trans-1,2-DCE; TCE; VC; and Dioxins
- Surface Water: Lead and Dioxins

The Table 2-1 provides a chronological list and brief summary of previous investigations conducted at Site 4. The results and recommendations provided below are specific to Site 4. The respective investigations are a part of the Administrative Record and can be referenced for further details for specific sampling strategies, media investigations, and when and where the sampling was performed.

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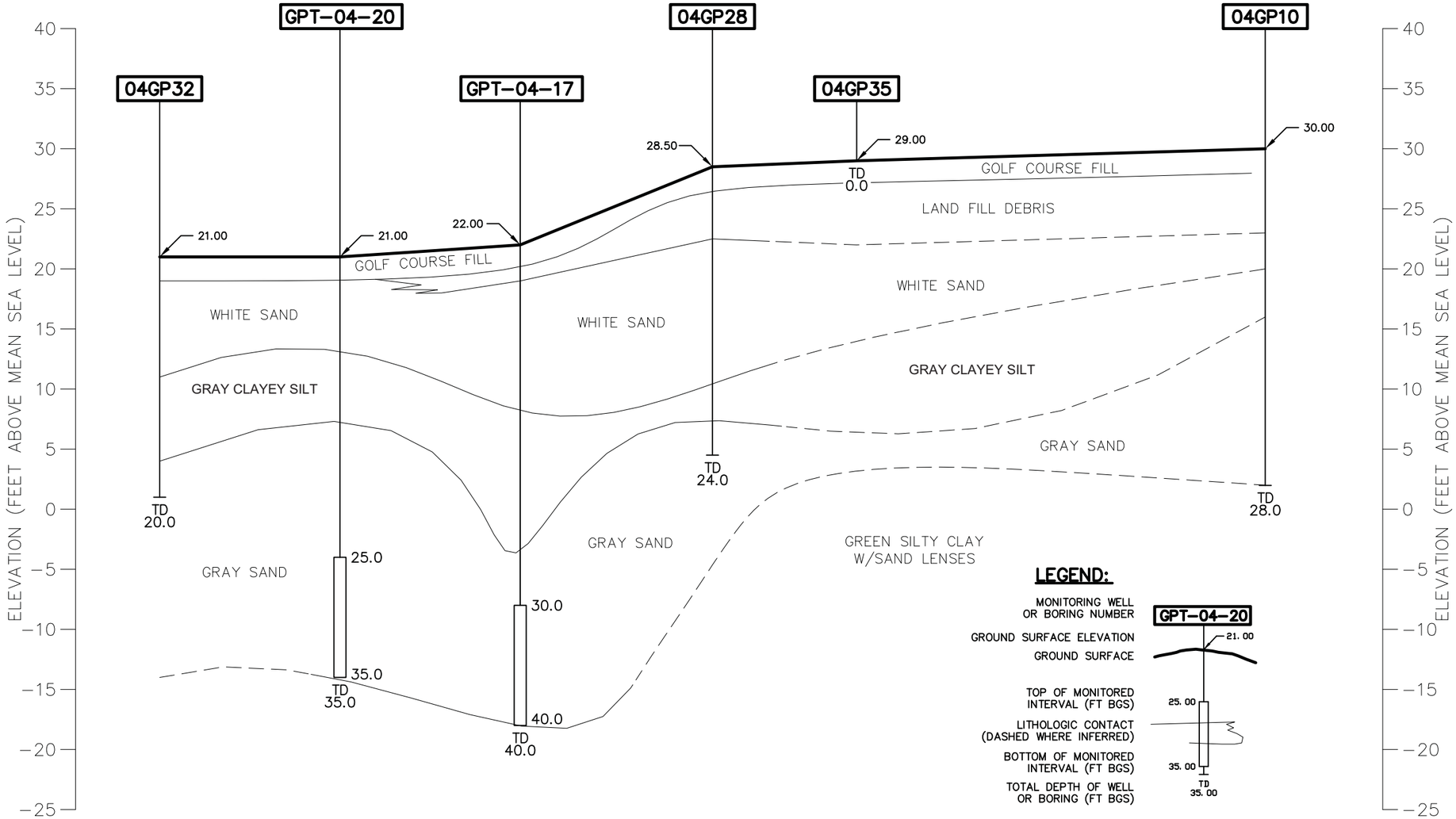

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HORIZONTAL SCALE IN FEET

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VERTICAL SCALE IN FEET

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NAVFAC

GEOLOGICAL CROSS SECTION
SITE 4 DECISION DOCUMENT
NCBC GULFPORT
GULFPORT, MISSISSIPPI

CONTRACT NO. CTO 068	
OWNER NO.	
APPROVED BY	DATE
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TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
IAS	1985	This report identified and assessed NCBC Gulfport sites posing a potential threat to human health and the environment. Among the nine sites identified, Site 4 was one of six sites recommended for further investigation. The IAS included a records search, on-site survey including geophysics to define site boundaries, site ranking, and an outline for Confirmation Study.
Confirmation Study	1987	This investigation, conducted to confirm the information obtained during the IAS, included collection of surface water, groundwater, and soil samples at locations on the southern and western sides of Site 4; however, the study incorrectly assumed that surface water and groundwater flowed south, resulting in upgradient and cross-gradient samples that yielded no contaminants in excess of action levels at that time.
Surface Water and Sediment Dioxin Delineation Report	1997	This was a comprehensive study regarding drainage systems at NCBC Gulfport that were potentially related to Site 8 and herbicide orange (HO) storage. One of the main purposes of the study was to verify if active landfills during the period of HO storage, such as Site 4, received any HO drums. Surface water, sediment, seep, and groundwater samples were collected from the ditches in and around Site 4, and the results indicated disposal of HO in the landfill was unlikely. Dioxins were detected at concentrations ranging from 0.65 to 26.4 parts per quadrillion in groundwater samples (all less than the Target Remediation Goal [TRG]). One of the seep samples had a dioxin concentration of 82.9 picograms per liter (pg/L), significantly greater than the drinking water screening level of 30 pg/L. This concentration of dioxins in surface water is also greater than current USEPA ecological screening criterion. The types of dioxin congeners in the seep sample were consistent with the byproducts of incineration. Typically, solid wastes were burned in the disposal trenches before being covered. In other analyses, chlorinated volatile organic compounds (VOCs) were detected in monitoring well GPT-04-05. The maximum concentrations were VC at 37 parts per billion (ppb), 1,2-DCE at 180 ppb, and TCE at 4.7 ppb.
Interim Action	1998	The interim action included a small soil and groundwater investigation prior to the placement of activated carbon beds along the bank of Canal No. 1 on the southern side of Site 4 to prevent seeps from impacting surface water quality. The study included the collection of 10 soil samples and 3 groundwater samples. Arsenic concentrations in soil were greater than MDEQ Tier 1 TRG risk screening levels. Low levels of dioxins and furans were detected significantly below risk screening levels. The tetrachlorodibenzo-p-dioxin (TCDD) congener, which is the dioxin congener directly linked to HO, was not detected supporting the previous conclusion that HO was not disposed at Site 4. Post-interim action sampling of the seeps was conducted over a 3-year period, and dioxins were consistently reported as non-detects.
Groundwater Monitoring Report	1999	This report was an in-depth study of groundwater conditions at Site 4 specifically to verify the potential contamination of dioxins and furans because of the HO storage. Direct-push technology (DPT) results indicated widespread low levels of dioxin and furan congeners in groundwater. The main congeners observed in the DPT samples were octachlorodibenzo-p-dioxin and heptachlorodibenzo-p-dioxin indicating that HO is not a likely source. No TCDD was detected in any of the groundwater samples.
Final Remedial Investigation (RI) Report	2009	An RI was performed from 2004 through 2007 to delineate the nature and extent of soil, groundwater, surface water, and sediment contamination at Site 4 and to characterize risks to human health and the environment. Information gathered during previous investigations, as mentioned above, was redefined the comprehensive multi-media investigation. The Final RI reported the site was a good candidate for presumptive remedy and included a health risk assessment and a screening-level ecological risk assessment.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	DATE	ACTIVITIES
Final Feasibility Study (FS)	2009	An FS was completed in 2009 that evaluated alternatives to address the contaminated media (soil, sediment, surface water, and groundwater) and COCs. Based on the USEPA presumptive remedy guidance for landfills, the presumptive remedy of covering the landfill and addressing the existing groundwater and sediment contamination was evaluated following the CERCLA process.
Proposed Plan	2009	Based on the FS, the preferred alternative of capping, ditch lining, LUCs, and monitoring was presented to the community through the Proposed Plan.

2.3 SITE CHARACTERISTICS

2.3.1 Physical Characteristics

The site is flat with the exception of minimal topographic features associated with the golf course. A concrete golf cart pathway with a bridge is currently located within the site boundaries. Canal No. 1, the drainage ditch at Site 4, is approximately 30 feet wide, and the water in the ditch is typically around 4 feet deep.

2.3.2 Nature and Extent of Contamination

Table 2-2 summarizes the RI analytical results and the associated MDEQ Tier 1 TRGs by medium for the COC that will be addressed by the remediation effort. Figures 2-3 and 2-4 present the soil and sediment COCs. Figure 2-5 presents surface water COCs. Figure 2-6 presents groundwater COCs with concentrations greater than MDEQ Tier I TRGs.

2.4 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Site 4 was most recently used as a practice green, the 9th green, and the 1st tee of the Pine Bayou Golf Course. The property is in a transition from a golf course to a recreational area; however, the use of this area will remain golf related. The 9th and 18th greens are to be replaced and used in conjunction with a "golf experience". These land uses are expected to continue at Site 4, and there is no other planned land use.

2.5 SUMMARY OF SITE RISKS

Potential human health and ecological risks at Site 4 were evaluated and documented in the RI and are summarized below.

2.5.1 Summary of Human Health Risk

The human health risk assessment included in the RI report provided a Reasonable Maximum Exposure (RME) and Central Tendency Exposure (CTE) risk value for all receptors evaluated. The cancer risk (CR) RME exceeded the MDEQ acceptable value of 1 x 10^{-6} (1 in a million) for the site worker, occupational worker, adolescent and adult trespassers, and future child and adult residents. The CTE value for the site worker was less than the MDEQ acceptable value presented above. The NCBC Gulfport Risk Managers evaluated the conditions associated with the site work and chose to use the CTE values and eliminate the site worker as an "at risk" receptor moving forward. The hazard index, which evaluates potential non-cancer risks, exceeds the acceptable value of 1.0 for future child residents exposed to groundwater only. Table 2-3 represents a summary of the CTE CRs and hazard quotients (HQs) for soils, sediments, surface water, and groundwater.

TABLE 2-2. SUMMARY OF ANALYTICAL RESULTS – TIER I TRGS AND ESVS FOR SOILS, SEDIMENTS, SURFACE WATER, AND GROUNDWATER

COC	MEDIUM	FREQUENCY OF DETECTION	RANGE OF DETECTED CONCENTRATIONS	MDEQ TRGS		
				TIER I RESTRICTED	TIER I UNRESTRICTED	GROUNDWATER
Benzo(a)anthracene	Soil	1/10	0.76 mg/kg	7.84 mg/kg	0.875 mg/kg	NA
	Sediment	4/8	0.043-1.6 mg/kg	7.84 mg/kg	0.875 mg/kg	NA
Dibenzo(a,h) anthracene	Soil	1/10	0.21 mg/kg	0.784 mg/kg	0.0875 mg/kg	NA
	Sediment	1/8	0.54 mg/kg	0.784 mg/kg	0.0875 mg/kg	NA
cis-1,2,-DCE	Groundwater	12/38	0.2-280 µg/L	NA	NA	70 µg/L
trans-1,2-DCE	Groundwater	10/38	7-190 µg/L	NA	NA	100 µg/L
TCE	Groundwater	8/38	0.8-20.04 µg/L	NA	NA	5 µg/L
VC	Groundwater	14/38	0.2-10 µg/L	NA	NA	2 µg/L
Dioxins	Groundwater	3/13	2.1-10 pg/L	NA	NA	30 pg/L
	Surface Water	1/3	4.9 pg/L	NA	NA	30 pg/L
	Sediment	2/2	3.4- 30.5 ng/kg	38.2 ng/kg	4.26 ng/kg	NC
Iron	Groundwater	6/23	370-69,700 µg/L	NA	NA	11,000 µg/L
Manganese	Groundwater	23/23	35.1-465 µg/L	NA	NA	730 µg/L
Lead	Sediment	7/8	5.1-43.4 mg/kg	1700 mg/kg	400 mg/kg	NC
	Surface Water	1/3	3.2 µg/L	NA	NA	150 µg/L
4,4'-DDT	Sediment	1/8	0.005 mg/kg	16.8 mg/kg	1.88 mg/kg	NA
4,4'-DDD	Sediment	2/8	0.0026-0.012 mg/kg	23.8 mg/kg	2.66 mg/kg	NA
Aroclor-1260	Sediment	4/8	0.046-0.24 mg/kg	1 mg/kg	10 mg/kg	NA

Surface water analytical results are compared to groundwater criteria for Human Health Risk Evaluation.
ESV = Ecological Screening Value
mg/kg = Milligram per kilogram
NA = Not applicable; analyte not a COC in that media
µg/L = Microgram per liter
ng/kg = Nanogram per kilogram
NC = No criterion

2.5.2 Summary of Ecological Risk

Contaminant concentrations in sediment and surface water samples from Canal No. 1 were greater than conservative screening levels as evaluated in the ecological risk assessment. During the screening-level ecological risk assessment, more probable exposure assumptions and factors that affect potential exposure (such as quality and size of the habitat and actual use of the site by receptors) were considered. The conclusion was, due to the lack of current natural habitat, there is little potential for significant exposure to ecological receptors. Therefore, ecological risk is considered acceptable and no remedial action objectives were developed to address specifically ecological risk in the FS. Table 2-4 represents a summary of the ecological HQs and ESVs for sediment and surface water.

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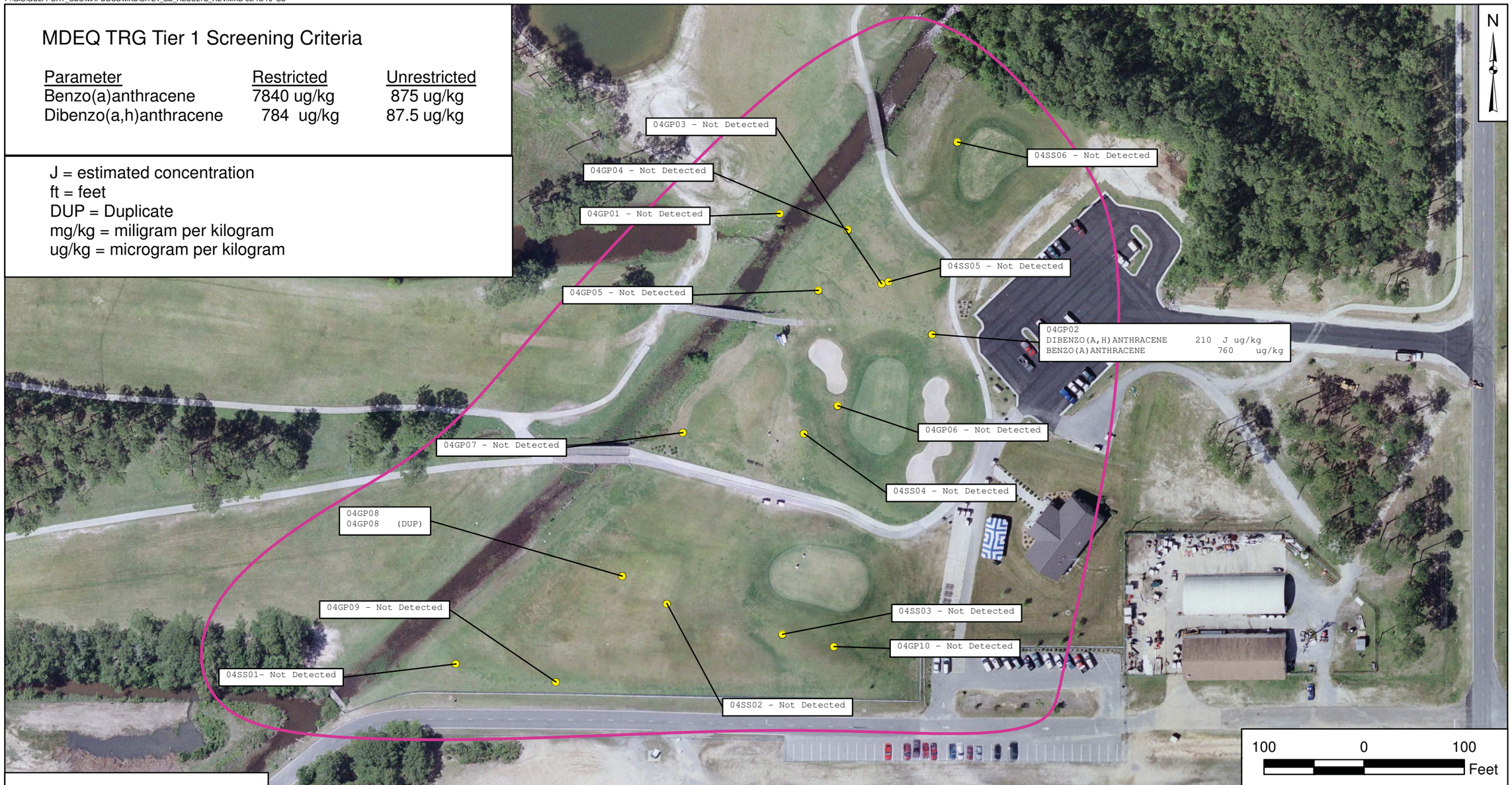
MDEQ TRG Tier 1 Screening Criteria

Parameter	Restricted	Unrestricted
Benzo(a)anthracene	7840 ug/kg	875 ug/kg
Dibenzo(a,h)anthracene	784 ug/kg	87.5 ug/kg

J = estimated concentration
ft = feet
DUP = Duplicate
mg/kg = miligram per kilogram
ug/kg = microgram per kilogram



Legend

- Soil Boring Location
- Site 4 Boundary

100 0 100 Feet

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COST/SCHEDULE-AREA	
SCALE AS NOTED	

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CHEMICALS OF CONCERN
SOIL
SITE 4 DECISION DOCUMENT
NCBC GULFPORT
GULFPORT, MISSISSIPPI

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MDEQ TRG Tier 1 Screening Criteria

Parameter	GCTL
Iron	71000 ug/L
Vinyl Chloride	2 ug/L
CIS-1,2 - Dichloroethene	7 ug/L
Trans-1,2-Dichloroethene	100 ug/L
Trichloroethene	5 ug/L

GPT-04-14
VINYL CHLORIDE 14 ug/L

GPT-04-16
CIS-1,2-DICHLOROETHENE 170 ug/L
TRANS-1,2-DICHLOROETHENE 190 ug/L
TRICHLOROETHENE 8 ug/L
VINYL CHLORIDE 84 ug/L
IRON 38600 ug/L

GPT-04-13
VINYL CHLORIDE 25 ug/L
IRON 24200 ug/L

04GP13
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TRANS-1,2-DICHLOROETHENE 170 ug/L
TRICHLOROETHENE 20.4 ug/L
VINYL CHLORIDE 172 ug/L

04GP05
IRON 13100 J ug/L

04GP11
CIS-1,2-DICHLOROETHENE 155 ug/L
TRANS-1,2-DICHLOROETHENE 108 ug/L
TRICHLOROETHENE 5.46 ug/L
VINYL CHLORIDE 88.2 ug/L

04GP03
IRON 14400 J ug/L

04GP06
IRON 17300 J ug/L

04GP12
CIS-1,2-DICHLOROETHENE 134 ug/L
TRICHLOROETHENE 15.5 ug/L
VINYL CHLORIDE 57.8 ug/L

GPT-04-19
IRON 15700 ug/L

04GP24
VINYL CHLORIDE 26 ug/L

04GP08
VINYL CHLORIDE 4 J ug/L
IRON 66600 ug/L
04GP08 (DUP)
VINYL CHLORIDE 4 J ug/L
IRON 69700 ug/L

04GP18
VINYL CHLORIDE 6.64 ug/L

04GP25
VINYL CHLORIDE 7 ug/L

04GP28
Depth = 8.00-12.00'
CIS-1,2-DICHLOROETHENE 120 ug/L
TRICHLOROETHENE 9.3 ug/L
VINYL CHLORIDE 130 ug/L
Depth = 9.00-13.00'
CIS-1,2-DICHLOROETHENE 560 ug/L
TRANS-1,2-DICHLOROETHENE 630 ug/L
TRICHLOROETHENE 34 ug/L
VINYL CHLORIDE 1600 ug/L
Depth = 12.00-16.00'
CIS-1,2-DICHLOROETHENE 450 ug/L
TRANS-1,2-DICHLOROETHENE 420 ug/L
TRICHLOROETHENE 39 ug/L
VINYL CHLORIDE 1000 ug/L
Depth = 13.00-17.00'
CIS-1,2-DICHLOROETHENE 970 ug/L
TRANS-1,2-DICHLOROETHENE 800 ug/L
TRICHLOROETHENE 120 ug/L
VINYL CHLORIDE 1500 ug/L

GPT-04-27
VINYL CHLORIDE 11 ug/L

04GP29
Depth = 5.00-9.00'
VINYL CHLORIDE 8.9 ug/L
Depth = 9.00-13.00'
VINYL CHLORIDE 7.9 ug/L
Depth = 13.00-17.00'
VINYL CHLORIDE 8.5 ug/L

GPT-04-21
VINYL CHLORIDE 18 ug/L

04GP34
Depth = 9.00-13.00'
CIS-1,2-DICHLOROETHENE 120 ug/L
TRICHLOROETHENE 8.2 ug/L
VINYL CHLORIDE 15 ug/L
Depth = 13.00-17.00'
CIS-1,2-DICHLOROETHENE 86 ug/L
TRICHLOROETHENE 5.5 ug/L
VINYL CHLORIDE 12 ug/L

GPT-04-22
CIS-1,2-DICHLOROETHENE 470 ug/L
TRANS-1,2-DICHLOROETHENE 310 ug/L
TRICHLOROETHENE 110 ug/L
VINYL CHLORIDE 190 ug/L

04GP19
CIS-1,2-DICHLOROETHENE 91.2 ug/L
TRICHLOROETHENE 8.17 ug/L
VINYL CHLORIDE 23.9 ug/L

04MP01
IRON 23200 ug/L

04GP39
CIS-1,2-DICHLOROETHENE 110 ug/L
CIS-1,2-DICHLOROETHENE 130 ug/L
TRICHLOROETHENE 12 ug/L
TRICHLOROETHENE 15 ug/L
VINYL CHLORIDE 4 ug/L
VINYL CHLORIDE 16 ug/L
VINYL CHLORIDE 19 ug/L

04GP43
Depth = 8.00-12.00'
VINYL CHLORIDE 4.5 ug/L
Depth = 12.00-16.00'
CIS-1,2-DICHLOROETHENE 110 ug/L
TRICHLOROETHENE 6.8 ug/L
VINYL CHLORIDE 38 ug/L
Depth = 16.00-20.00'
VINYL CHLORIDE 22 ug/L
Depth = 20.00-24.00'
CIS-1,2-DICHLOROETHENE 100 ug/L
VINYL CHLORIDE 39 ug/L

N

200 0 200 Feet

Legend

- Monitoring Well
- Monitoring Well With No Exceedances
- Site 4 Boundary

DRAWN BY J. ENGLISH	DATE 03/22/10
CHECKED BY B. OLSON	DATE 09/10/10
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

CHEMICALS OF CONCERN
EXCEEDING TRG IN GROUNDWATER
SITE 4 DECISION DOCUMENT
NCBC GULFPORT
GULFPORT, MISSISSIPPI

CONTRACT NUMBER
CTO 0068

APPROVED BY — DATE —

APPROVED BY — DATE —

FIGURE NO. FIGURE 2-6 REV 0

TABLE 2-3. SUMMARY OF CTE CANCER RISKS AND HQS FOR SOILS, SEDIMENTS, SURFACE WATER, AND GROUNDWATER

COC	Medium	Frequency of Detection	Range of Detected Concentrations	Receptor		
				Future Child Resident	Future Adult Resident	Life-long Trespasser (T) or Resident (R)
Benzo(a)anthracene (PAHs)	Soil	1/10	0.76 mg/kg	CR > 1E-6	CR < 1E-6	CR < 1E-6
Dibenzo(a,h) anthracene (PAHs)	Soil	1/10	0.21 mg/kg	CR > 1E-6	CR < 1E-6	CR < 1E-6
cis-1,2,-DCE	Groundwater	12/38	0.2-280 µg/L	HQ > 1	HQ < 1	HQ < 1 (R)
trans-1,2-DCE	Groundwater	10/38	7-190 µg/L	HQ > 1	HQ < 1	HQ < 1 (R)
TCE	Groundwater	8/38	0.8-20.04 µg/L	HQ > 1	HQ < 1	HQ < 1 (R)
VC	Groundwater	14/38	0.2-10 µg/L	CR > 1E-5 HQ > 1	CR > 1E-5	CR > 1E-4 (R)
Dioxins (TEQ)	Groundwater	3/13	2.1-10 pg/L	CR > 1E-6	CR > 1E-5	CR > 1E-5 (R)
	Surface Water	1/3	4.9 pg/L	CR < 1E-6	CR < 1E-6	CR > 1E-6 (R/T)
Iron	Groundwater	6/23	370-69,700 µg/L	HQ > 1	HQ < 1	HQ < 1 (R)
Manganese	Groundwater	23/23	35.1-465 µg/L	HQ > 1	HQ < 1	HQ < 1 (R)

PAH = Polynuclear aromatic hydrocarbon
TEQ = Toxicity Equivalent Quotient

TABLE 2-4. SUMMARY OF ECOLOGICAL HQS AND ESVS FOR SEDIMENT AND SURFACE WATER

COC	Medium	Frequency of Detection	Range of Detected Concentrations	ESV	HQ
Benzo(a)anthracene	Sediment	4/8	0.043-1.6 mg/kg	0.33 mg/kg	4.85
Dibenzo(a,h)anthracene	Sediment	1/8	0.54 mg/kg	0.33 mg/kg	1.64
Dioxins (TEQ)	Sediment	2/2	3.4-30.5 ng/kg	2.5 ng/kg	12.19
Lead	Sediment	7/8	5.1-43.4 mg/kg	30.2 mg/kg	1.44
	Surface Water	1/3	3.2 µg/L	1.55 µg/L	2.1
4,4'-DDT	Sediment	1/8	0.005 mg/kg	0.003 mg/kg	1.67
4,4'-DDD	Sediment	2/8	0.0026-0.012 mg/kg	0.003 mg/kg	4.00
Aroclor-1260	Sediment	4/8	0.046-0.24 mg/kg	0.033 mg/kg	7.27

ESV = Ecological Screening Value
ng/kg = nanogram per kilogram
µg/L = Microgram per liter
mg/kg = Milligram per kilogram

2.5.3 Basis for Response Action

Unacceptable human health risks were estimated for hypothetical future residential exposure to soil and water at Site 4 due to VOCs, dioxins, PAHs, and metals including cancer risks for future child, adult, and lifelong residents and non-cancer hazards for future child residents. Because risks were identified under the current land use scenario for hypothetical future residential receptors, a response action is necessary

to protect the public health or welfare from actual or threatened releases of hazardous substances into the environment that may present an imminent and substantial endangerment to public health or welfare.

Based on historical patterns of remedy selection for common categories of sites (such as landfills), the USEPA encourages the selection of presumptive remedies to increase the consistency in remedy selection and to streamline the investigative process. Following the RI for Site 4, it was determined that a presumptive remedy was the best course of action for the site based on the characteristics of the materials in the landfill and low concentrations of the contaminants reported in the surficial aquifer. A containment remedy incorporating a low permeability cover was considered the overall site strategy most consistent with USEPA guidance amended by the *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills* and the MDEQ policy requiring a final cover (containment) for this category of landfill. Figure 2-7 presents the Site 4 Conceptual Site Model, which identifies the waste disposal area, media of concern, and receptors under current and future land use scenarios.

The FS presented alternatives to eliminate or reduce human health risks from dioxins; 4-4'-DDT; 4,4'-DDD; Aroclor-1260; iron; manganese; lead; cis-1,2-DCE; trans-1,2-DCE; TCE; VC; dibenzo(a)anthracene; and benzo(a)anthracene through containment, monitoring, and LUCs. The preferred alternative will eliminate the potential for unacceptable risks to human health by containment and preventing exposure to the contaminated media.

2.6 PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials considered highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

Contaminated groundwater generally is not considered a source material; however, nonaqueous phase liquids in groundwater may be viewed as a source material. Dissolved concentrations of COCs in groundwater at approximately 1 to 5 percent of the solubility of a compound would suggest the presence of dense nonaqueous phase liquids (DNAPL) in the subsurface. The maximum concentrations of COCs at Site 4 were present in concentrations less than 1 percent of their respective solubility. Therefore, DNAPLs are not considered principal threat wastes at Site 4. Light nonaqueous phase liquids were not identified.

Because no significant source materials are present and there are no realistic exposures scenarios to COC-impacted soil and groundwater, it can be concluded that there is no principal threat waste at Site 4.

2.7 REMEDIAL ACTION OBJECTIVES

The Remedial Action Objectives (RAOs) for Site 4 were developed during the FS process and are as follows:

- RAO 1: Prevent direct contact with landfill contents and eliminate unacceptable human exposure to soil with contaminant concentrations greater than MDEQ TRGs.
- RAO 2: Minimize infiltration and potential contaminant leaching of PAHs and dioxins/furans to groundwater.
- RAO 3: Prevent human exposure to contaminated groundwater and monitor groundwater quality beyond the site boundary.
- RAO 4: Prevent direct exposure routes for human and ecological receptors to COCs in surface water and sediment.

Worksheet

Baseline Site Conceptual Exposure Model (SCEM)

Site Name: **Site 4, Golf Course Landfill**
Site Location: **NCBC Gulfport, Mississippi**

Completed By: **Y. Martínez**
Revision Date: **11/1/2007**

☐ Complete ○ Potentially Complete ☐ Draft ■ Final

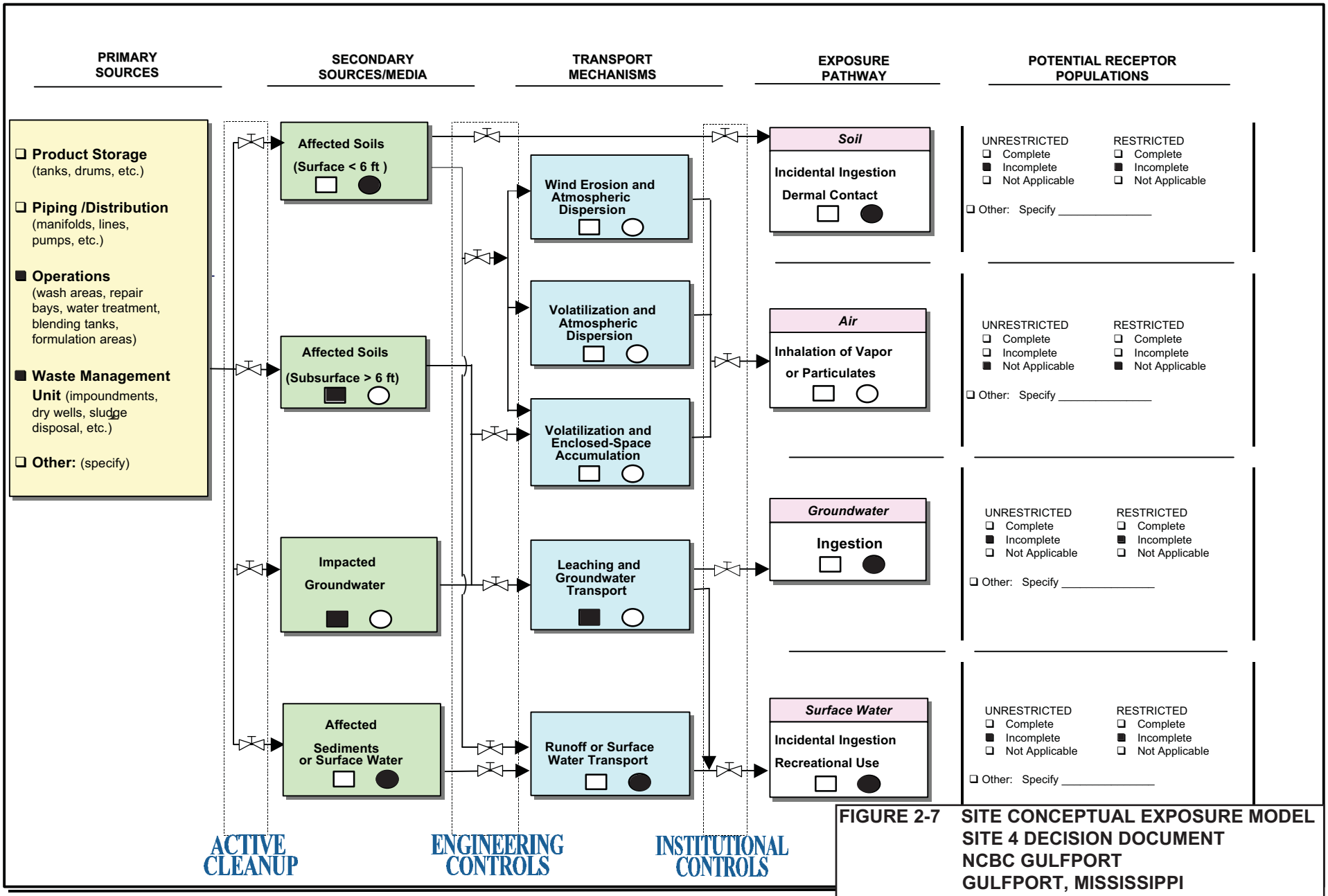

FIGURE 2-7 SITE CONCEPTUAL EXPOSURE MODEL SITE 4 DECISION DOCUMENT NCBC GULFPORT GULFPORT, MISSISSIPPI

2.8 DESCRIPTION AND COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

2.8.1 Description of Remedial Alternatives

Remedial alternatives to address media impacts at Site 4 were developed and are detailed in the FS. Two potential remedial action alternatives were developed and evaluated in the FS. These two potential remedial action alternatives are based upon the RAOs, site conditions, waste characteristics, volume of contaminated media, and the presumptive remedy of containment for Site 4. These potential remedial action alternatives are as follows:

- Alternative 1 – No Action.
- Alternative 2 – Comprehensive Action (waste containment, surface water and sediment control, groundwater monitoring, landfill gas management, and LUCs).

2.8.2 Comparative Analysis of Remedial Alternatives

Following the landfill presumptive remedy approach, two alternatives (Alternative 1 – No Action, and Alternative 2 – Comprehensive Action) were developed in the FS to address the RAOs. The alternatives were evaluated with respect to the nine criteria as described in CERCLA. The comparative analysis of alternatives as presented in the FS is summarized in Table 2-5.

2.9 SELECTED REMEDY

2.9.1 Rationale for Selected Remedy

The Selected Remedy for Site 4 is the presumptive remedy for military landfills (waste containment with long-term monitoring and LUCs) and will allow for continued recreational use of the property. The remedy will meet the RAOs by preventing direct contact with contaminated soil, groundwater, and buried wastes and by implementing LUCs to restrict access, limit future site uses to non-residential activities, and prohibit excavation/disturbance of soil and the landfill cap.

The principal factors in the selection of this remedy included the following:

- Implementation will reduce current unacceptable risk to receptors in a relatively short period (estimated 1 year for construction).
- The remedy is consistent with the reasonably anticipated future recreational use of the site.

2.9.2 Description of Selected Remedy

The selected remedy (Alternative 2), as shown on Figure 2-8, is a combination of various remedial technologies and controls as further described below:

- The landfill will be contained by a low-permeability cap system (with a maximum vertical of hydraulic conductivity of 1 x 10^{-5} centimeters/second), and the ditch will be lined with riprap to complete the containment system.
- A landfill gas management system will be installed and gas probes will be located outside the limits of the low permeability cover system to detect methane gas that may be migrating from the landfill.
- The existing ground surface will be graded and sloped as needed to promote runoff.

TABLE 2-5: SUMMARY OF COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES		
Criterion	**Alternative 1: No Action**	**Alternative 2: Comprehensive Action**
Overall Protection of Human Health and the Environment	The No Action alternative provides a baseline against other alternatives. This alternative would involve no treatment, engineering measures, or institutional actions. If implemented, this action would not be protective of human health or the environment.	Capping of the landfill and removal of contaminated sediment would eliminate potential exposure to COCs. Capping of the landfill would prevent migration of contaminants via erosion and prevent percolation of rain from leaching contaminants from landfill material to groundwater. LUCs would prevent exposure to contaminants in soil and groundwater.
Compliance with ARARs	The No Action alternative does not comply with federal and state ARARs that require cleanup of contaminated sites.	Would comply with chemical- and action-specific ARARs. There are no location-specific ARARS for Site 4.
Long-term Effectiveness and Permanence	This alternative would not be effective in the long term.	This alternative is expected to be effective in the long term in protecting human health and the environment by precluding unacceptable human exposures and contaminant migration. Permanence would be assured through routine site inspections, maintenance, and monitoring of the landfill cap.
Reduction of Toxicity, Mobility, or Volume through Treatment	This alternative would not reduce the toxicity, mobility, or volume of contaminated media through treatment.	This alternative would not reduce the toxicity, mobility, or volume of contaminated media through treatment.
Short-term Effectiveness	This alternative would not entail any remedial activities that would impact the community, workers, or the environment.	Risks to workers would be limited to those normally associated with construction, groundwater, and landfill gas monitoring activities. These risks would be mitigated through the development and implementation of a project-specific health and safety plan.
Implementability	This alternative could be readily implemented because it would not involve remediation activities.	The technology needed for this alternative would be readily available, easily implemented, and reliable.
Cost	There would be no cost for this alternative.	Capital Cost: $1,938,000 Present Worth of O&M Cost: $467,000 NPW: $2,405,000

ARAR = Applicable or relevant and appropriate requirement
TBC = To be considered

- A landfill gas management system will be included for controlling landfill gas.
- Sediment (i.e., fine-grained organic muck) that has accumulated in the drainage channel will be excavated down to the firmer fine-grained sand. The sediment will be placed within the limits of the landfill beneath the final cover system.
- LUCs will be implemented to prevent residential development, excavation, or disturbance of surface and subsurface soil, or groundwater use. A LUC Memorandum of Agreement to be executed between the Navy and the MDEQ will be developed along with a site specific LUC Implementation Plan (LUCIP). Specifics regarding the LUCIP will be prepared in the remedial design phase; however, for the costing estimate in the FS, signage, and annual inspections were assumed.
- After the remedy is implemented, the site will be available for recreational uses.

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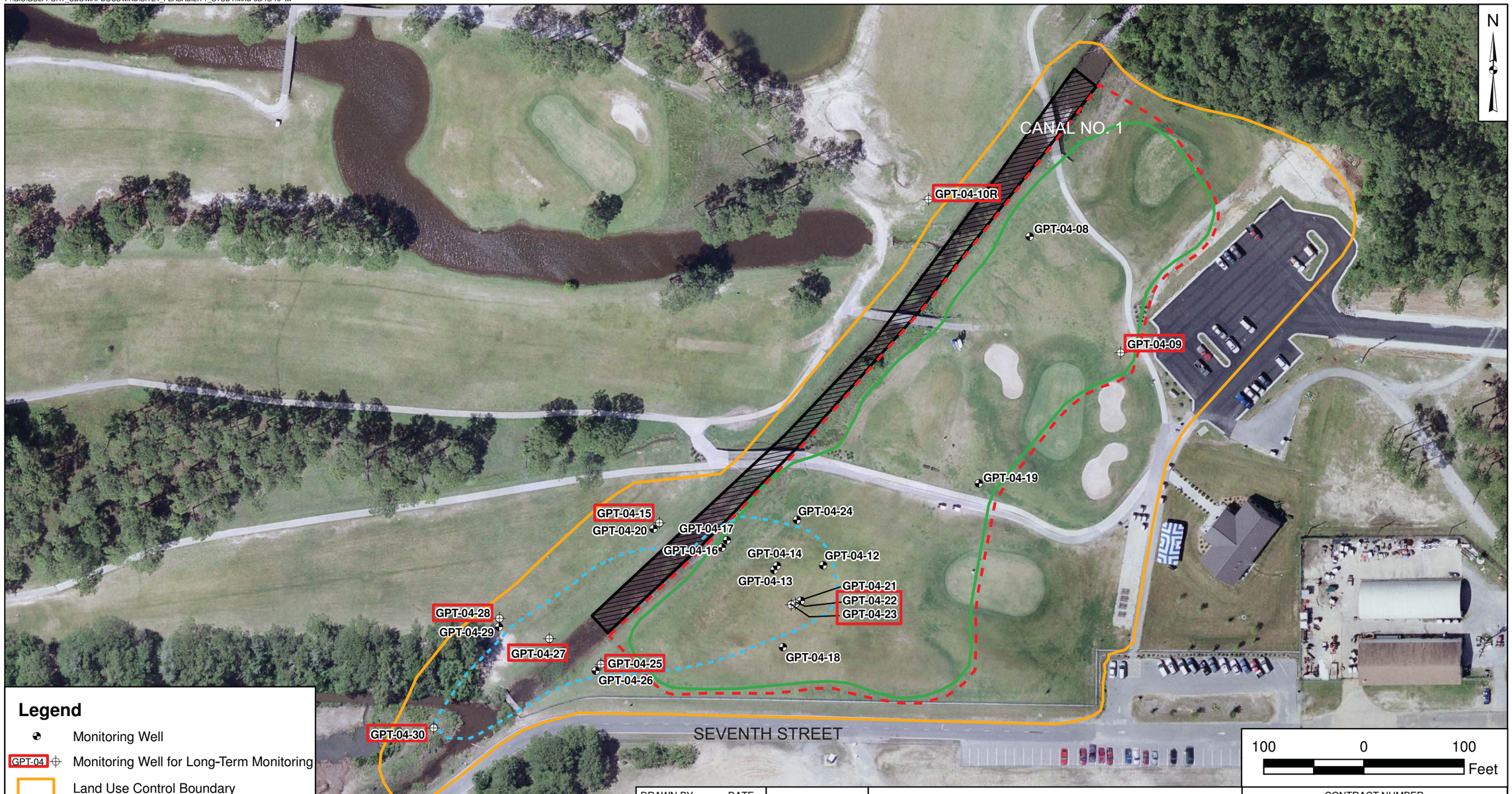

DRAWN BY / DATE	T. WHEATON 11/06/09
CHECKED BY / DATE	Y. MARTINEZ 03/15/10
COST/SCHEDULE-AREA	
SCALE	AS NOTED

NAVFAC

REMEDIAL ACTION
SITE 4 DECISION DOCUMENT
NCBC GULFPORT
GULFPORT, MISSISSIPPI

CONTRACT NUMBER	CTO 0068
APPROVED BY / DATE	— / —
APPROVED BY / DATE	— / —
FIGURE NO.	FIGURE 5 -1
REV	0

- Groundwater will be monitored semiannually for VOCs, semivolatile organic compounds, pesticides, and metals. The results will be evaluated and compared with maximum contaminant levels (MCLs). Once the MCLs are achieved for four consecutive periods in a well, the well will be removed from the sampling program, except for the sentinel wells identifying the downgradient "clean" locations. The sentinel wells will be monitored for the life of the program to ensure contaminant migration is not occurring. Changes will be made to the program to maintain an optimized sampling protocol. The Navy will ensure that the MDEQ is notified of the changes prior to implementing them. The five-year review process will be an integral component of the monitoring program.

2.9.3 Expected Outcomes of Selected Remedy

Current land uses are expected to continue at Site 4, and there are no other planned land uses in the near future or for development of lands adjacent to Site 4. Exposure will be controlled through LUCs, which will be developed to allow for recreational uses of the site and prevent residential development, excavation, or disturbance of surface and subsurface soil, and groundwater use. Any changes to current land use controls must be coordinated with MDEQ and reflected in an updated LUCIP.

2.9.4 Statutory Determinations

Remedial actions undertaken at NPL sites must meet the statutory requirements of Section 121 of CERCLA. The following discussion summarizes the statutory requirements that are met by the Selected Remedy.

- **Protection of Human Health and the Environment –** The Selected Remedy is needed to prevent estimated risks associated with hypothetical future residential exposure and to minimize current and future ecological exposure to contaminated soil. Containment of soil and buried waste will achieve the RAOs, and LUCs will be implemented to ensure protectiveness. Because there is unacceptable future risk to human health, due to the contaminated groundwater at this site that in the future may be considered a potential drinking water source, a remedial action is required to restrict use of the groundwater through LUCs. Although there is no risk based on current land use, the Selected Remedy will protect human health and the environment by reducing site risks through removal of contaminated sediment, lining the ditch with riprap and containing the landfill with a low-permeability cap system.

- **Compliance with ARAR –** Remedial Actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site or obtain a waiver. ARARs include only federal and state environmental or facility citing laws/regulations and do not include occupational safety or worker protection requirements. The Navy and MDEQ have identified the ARARs for the selected remedy. The Selected Remedy will meet all identified chemical- and action-specific ARARs (see Table 2-6). There are no location-specific ARARS for Site 4.

- **Cost-Effectiveness –** The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. The following definition was used to determine cost effectiveness, "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness (NCP §300.430(f)(1)(ii)(D)". This analysis was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria. The costs are proportional to overall effectiveness by achieving long-term effectiveness and permanence within a reasonable timeframe.

TABLE 2-6. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED CRITERIA

NAME AND REGULATORY CITATION	DESCRIPTION	CONSIDERATION IN THE REMEDIAL ACTION PROCESS	TYPE
FEDERAL			
USEPA Region 3 RBC Table	Provides risk-based concentrations for screening of soil.	TBC. These guidelines aid in the screening of chemicals in soil.	Chemical-specific
USEPA Region 4 Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment	Provides risk-based concentrations for screening contaminated media for ecological receptors.	TBC. These levels serve as guidelines for the Ecological Risk Assessment.	Chemical-specific
National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)	Standards promulgated under the Clean Air Act for significant sources of hazardous air pollutants.	Relevant and appropriate. Remedial action (e.g., soil excavation) may result in release of hazardous air pollutants.	Action-specific
RCRA Treatment, Storage, and Disposal of Hazardous Waste (40 CFR 262-266)	Regulates the treatment, storage, and disposal of hazardous waste.	Relevant and appropriate. Hazardous waste generated by site remediation must meet RCRA generator and treatment, storage, or disposal requirements.	Action-specific
STATE			
MDEQ TRGs (Mississippi Code Section 49-35-21)	Default screening levels. Human Health risk-based cleanup goals for soil and groundwater.	Applicable. These regulations apply to all remedial actions in the State of Mississippi.	Chemical-specific
MDEQ Risk Evaluation Procedures for Voluntary Cleanup and Redevelopment	Risk-based procedures and rationale for site evaluation and remediation.	TBC. These regulations apply to all Voluntary Cleanup and Brownfield actions in the State of Mississippi.	Action-specific
MDEQ Office of Pollution Control Hazardous Waste Management Regulations	Adopts by reference specific sections of the federal Hazardous Waste regulations.	Relevant and Appropriate. These regulations may apply if material is removed from the base.	Action-specific
Mississippi Commission on Environmental Quality Regulation SW-2, 2005. Non-hazardous Solid Waste Management Regulations and Criteria, April, 2005.	Landfill closure regulations	Relevant and Appropriate. These regulations apply because the current soil cover does not meet the permeability requirements for landfill closures.	Action-specific

CFR = Code of Federal Regulations
RBC = Risk-Based Concentration
RCRA = Resource Conservation and Recovery Act

- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable –** The Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at Site 4. Because long-term effectiveness and permanence are achieved in the shortest timeframe with the Selected Remedy, the Navy and MDEQ determined that the Selected Remedy provides the best balance of tradeoffs in terms of the balancing criteria while also considering the statutory preference for treatment as a principal element and considering state and community acceptance.

- **Preference for Treatment as a Principal Element** – Treatment is not used as a principal element in the Selected Remedy this is because alternate approaches (i.e., capping the landfill, removal of contaminated sediments and LUC with monitoring) are better suited to control the potential exposure at Site 4.

Five-Year Reviews – The Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure. Therefore in accordance with CERCLA Section 121(c) and the NCP at 40 Code of Federal Regulations 300.430 (f)(4)(ii), a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. If the remedy is determined not to be protective of human health and the environment, then additional remedial actions would be evaluated by the Navy and MDEQ and the Navy may be required to undertake additional remedial action.

2.10 COMMUNITY PARTICIPATION

The Navy performs public participation activities in accordance with CERCLA and the NCP throughout the site cleanup process at NCBC Gulfport. The Navy has a comprehensive community relations program for NCBC Gulfport, and community relations activities are conducted in accordance with the NCBC Gulfport Community Involvement Plan. These activities include regular technical and Restoration Advisory Board (RAB) meetings with local officials and the establishment of an Information Repository at the local library for dissemination of information to the community.

The Navy organized a RAB in October 1994 to review and discuss NCBC Gulfport environmental issues with local community officials and concerned citizens. The RAB consists of representatives of the Navy, MDEQ, and members of the community. The RAB has met frequently since its inception and now meets quarterly. Site 4 investigation activities, results, and associated remedial decisions have been discussed at RAB meetings. The NCBC Gulfport Information Repository is located at the temporary Gulfport Public Library, 47 Maples Drive # 1, Gulfport, Mississippi. Documents and other relevant information relied on in the remedy selection process are available for public review at the Information Repository, which includes a copy of the Administrative Record. For access to the Administrative Record or additional information about the Installation Restoration (IR) Program at NCBC Gulfport, contact Gordon Crane, Restoration Manager, Naval Construction Battalion Center, 2401 Upper Nixon Avenue, Gulfport, MS, 39501, (228) 871-7171.

On December 15, 2009, a public meeting was held at the West Side Community Center in Gulfport, and a public comment period was provided from December 15 through January 15, 2010. The meeting included a presentation of the Proposed Plan that summarized the findings and the preferred alternative to address unacceptable risks at Site 4. A detailed summary of the public meeting for the Site 4 Proposed Plan is included in Appendix B of this document.

No comments were received during the public meeting or comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

3.0 Responsiveness Summary

3.1 Stakeholder Comments and Lead Agency Responses

The participants in the Public Meeting held on December 15, 2009, included representatives of the Navy, and NCBC Gulfport. Questions received during the public meeting were general inquiries and are described in the public meeting minutes in the Administrative Record. There were no comments received at the public meeting requiring amendment to the Proposed Plan and no additional written comments, concerns, or questions were received from community members during the public comment period.

3.2 Technical and Legal Issues

No technical or legal issues associated with the Site 4 DD were identified.

APPENDIX A

COST ESTIMATES

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI
Site 4
Alternative 2: Landfill Cap, Sediment Removal, Canal Lining, LUCs, Groundwater Monitoring, and Landfill Gas Management
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$1,937,278		$1,937,278	1.000	$1,937,278
1		$94,281	$94,281	0.935	$88,153
2		$48,873	$48,873	0.873	$42,666
3		$48,873	$48,873	0.816	$39,880
4		$26,169	$26,169	0.763	$19,967
5		$44,869	$44,869	0.713	$31,992
6		$26,169	$26,169	0.666	$17,429
7		$26,169	$26,169	0.623	$16,303
8		$26,169	$26,169	0.582	$15,230
9		$26,169	$26,169	0.544	$14,236
10		$44,869	$44,869	0.508	$22,793
11		$26,169	$26,169	0.475	$12,430
12		$26,169	$26,169	0.444	$11,619
13		$26,169	$26,169	0.415	$10,860
14		$26,169	$26,169	0.388	$10,154
15		$44,869	$44,869	0.362	$16,243
16		$26,169	$26,169	0.339	$8,871
17		$26,169	$26,169	0.317	$8,296
18		$26,169	$26,169	0.296	$7,746
19		$26,169	$26,169	0.277	$7,249
20		$44,869	$44,869	0.258	$11,576
21		$26,169	$26,169	0.242	$6,333
22		$26,169	$26,169	0.226	$5,914
23		$26,169	$26,169	0.211	$5,522
24		$26,169	$26,169	0.197	$5,155
25		$44,869	$44,869	0.184	$8,256
26		$26,169	$26,169	0.172	$4,501
27		$26,169	$26,169	0.161	$4,213
28		$26,169	$26,169	0.15	$3,925
29		$26,169	$26,169	0.141	$3,690
30		$44,869	$44,869	0.131	$5,878
			TOTAL PRESENT WORTH		**$2,404,358**

NAVAL CONSTRUCTION BATTALION CENTER
GULFPORT, MISSISSIPPI
Site 4
Alternative 2: Landfill Cap, Sediment Removal, Canal Lining, LUCs, Groundwater Monitoring, and Landfill Gas Managemen
Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Material	Labor	Equipment	Extended Cost Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Construction/Work Plans	300	hr			$35.00		$0	$0	$10,500	$0	$10,500
2 MOBILIZATION, DEMOBILIZATION AND FIELD SUPPORT											
2.1 Office Trailer	6	mo				$375.00	$0	$0	$0	$2,250	$2,250
2.2 Field Office Support	6	mo		$150.00			$0	$900	$0	$0	$900
2.3 Storage Trailer (2)	12	mo				$101.00	$0	$0	$0	$1,212	$1,212
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	$1,500.00				$1,500	$0	$0	$0	$1,500
2.5 Site Utilities	6	mo	$150.00				$900	$0	$0	$0	$900
2.6 Underground Utility Clearances	1	ls	$9,000.00				$9,000	$0	$0	$0	$9,000
2.7 Construction Survey Support	40	day	$935.00				$37,400	$0	$0	$0	$37,400
2.8 Equipment Mobilization/Demobilization	8	ea			$158.00	$384.00	$0	$0	$1,264	$3,072	$4,336
2.9 Site Superintendent	120	day			$355.00		$0	$0	$42,600	$0	$42,600
2.10 Site Health & Safety and QA/QC	120	day			$325.00		$0	$0	$39,000	$0	$39,000
3 DECONTAMINATION											
3.1 Decontamination Services	2	mo		$1,100.00	$2,025.00	$1,400.00	$0	$2,200	$4,050	$2,800	$9,050
3.2 Equipment Decon Pad	1	ls		$3,500.00	$3,000.00	$425.00	$0	$3,500	$3,000	$425	$6,925
3.3 Decon Water	2,000	gal		$0.20			$0	$400	$0	$0	$400
3.4 Decon Water Storage Tank, 6,000 gallon	2	mo				$704.00	$0	$0	$0	$1,408	$1,408
3.5 Clean Water Storage Tank, 4,000 gallon	2	mo				$633.00	$0	$0	$0	$1,266	$1,266
3.6 Disposal of Decon Waste (liquid & solid)	2	mo	$950.00				$1,900	$0	$0	$0	$1,900
4 SITE PREPARATION, EXCAVATION, AND COVER											
4.1 Grading Soil	2,000	cy		$12.00			$0	$24,000	$0	$0	$24,000
4.2 Dozer, 140 hp	10	day			$318.40	$611.40	$0	$0	$3,184	$6,114	$9,298
4.3 Excavator, 2 cy	10	day			$318.40	$994.60	$0	$0	$3,184	$9,946	$13,130
4.4 Compactor, 125 h.p. (2 each)	20	day			$318.40	$565.60	$0	$0	$6,368	$11,312	$17,680
4.5 Site Labor, (3 laborers)	10	day			$690.00		$0	$0	$6,900	$0	$6,900
4.6 Gas Vent Pipes, 6" dia. header PE	700	lf		$2.60			$0	$1,820	$0	$0	$1,820
4.7 Trench for Pipe	2	day				$51.00	$0	$0	$0	$102	$102
4.80 Site Labor, (3 laborers)	2	day			$690.00		$0	$0	$1,380	$0	$1,380
5 SITE RESTORATION											
5.1 Infiltration and Gas Vent Layers, sand	10,800	cy		$24.00			$0	$259,200	$0	$0	$259,200
5.2 Dozer, 140 hp (2 each)	60	day			$318.40	$611.40	$0	$0	$19,104	$36,684	$55,788
5.3 Compactor, 125 h.p. (2 each)	60	day			$318.40	$565.60	$0	$0	$19,104	$33,936	$53,040
5.4 Site Labor, (3 laborers)	30	day			$690.00		$0	$0	$20,700	$0	$20,700
5.5 Geotextile,	16,200	sy		$1.05	$0.18		$0	$17,010	$2,916	$0	$19,926
5.6 Topsoil (loam)	2,700	cy		$24.93			$0	$67,311	$0	$0	$67,311
5.7 Dozer, 140 hp (2 each)	40	day			$318.40	$611.40	$0	$0	$12,736	$24,456	$37,192
5.8 Site Labor, (3 laborers)	20	day			$690.00		$0	$0	$13,800	$0	$13,800
5.9 Sod, Bent Grass	145	msf	$675.00				$97,875	$0	$0	$0	$97,875
5.10 Seeding Disturbed Areas	36	msf	$71.00				$2,556	$0	$0	$0	$2,556
5.11 Irrigation System, 60' dia. coverage	27	ea	$200.00				$5,400	$0	$0	$0	$5,400
5.12 Ditch Dredging, Gradall	10	day			$318.40	$905.80	$0	$0	$3,184	$9,058	$12,242
5.13 Site Labor, (3 laborers)	10	day			$690.00		$0	$0	$6,900	$0	$6,900
5.14 Characterization/Offsite Disposal Soil Testing	6	ea	$543.00	$10.00			$3,258	$60	$0	$0	$3,318
5.15 Ditch Lining, riprap	300	sy		$19.00	$36.00	$14.90	$0	$5,700	$10,800	$4,470	$20,970
6 MONITORING WELLS											
6.1 Driller Mob/Demob (Abandonment)	1	ls	$500.00				$500	$0	$0	$0	$500
6.2 Well Abandonment	350	feet	$10.00				$3,500	$0	$0	$0	$3,500
6.3 Removal/Disposal of Casings	14	each	$100.00				$1,400	$0	$0	$0	$1,400
6.4 Driller Mob/Demob (Install Replacement Wells)	1	ls	$500.00				$500	$0	$0	$0	$500
6.5 Well Installation (MWs and LF Gas Wells)	190	feet	$80.00				$15,200	$0	$0	$0	$15,200
6.6 Protective Casing	13	each	$250.00				$3,250	$0	$0	$0	$3,250
6.7 IDW Disposal (Non-hazardous)	13	drum	$185.00				$2,405	$0	$0	$0	$2,405

NAVAL CONSTRUCTION BATTALION CENTER
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Capital Cost

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
7 POST CONSTRUCTION COST											
7.1 Contractor Completion Report	150	hr			$35.00		$0	$0	$5,250	$0	$5,250
7.2 Remedial Action Closeout Report	200	hr			$35.00		$0	$0	$7,000	$0	$7,000
7.3 Prepare LUC Document	150	hr			$35.00		$0	$0	$5,250	$0	$5,250
7.4 LUC Survey Support	2	day	$935.00				$1,870	$0	$0	$0	$1,870
Subtotal							$188,414	$382,101	$248,174	$148,511	$967,200
Local Area Adjustments							100.0%	100.9%	86.3%	86.3%	
Subtotal							$188,414	$385,540	$214,174	$128,165	$916,293
Overhead on Labor Cost @ 30%									$64,252		$64,252
G & A on Labor Cost @ 10%									$21,417		$21,417
G & A on Material Cost @ 10%								$38,554			$38,554
G & A on Equipment Cost @ 10%										$12,816	$12,816
G & A on Subcontract Cost @ 10%							$18,841				$18,841
Tax on Materials and Equipment Cost @ 7%								$26,988		$8,972	$35,959
Total Direct Cost							$207,255	$451,082	$299,844	$149,953	$1,108,134
Indirects on Total Direct Cost @ 25%											$276,558
Profit on Total Direct Cost @ 10%											$110,813
Subtotal											$1,495,506
Health & Safety Monitoring @ 2%											$29,910
Total Field Cost											$1,525,416
Contingency on Total Field Costs @ 20%											$305,083
Engineering on Total Field Cost @ 7%											$106,779
TOTAL CAPITAL COST											**$1,937,278**

NAVAL CONSTRUCTION BATTALION CENTER
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Site 4
Alternative 2: Landfill Cap, Sediment Removal, Canal Lining, LUCs, Groundwater Monitoring, and Landfill Gas Management
Annual Cost

Item	Item Cost year 1	Item Cost years 2 to 3	Item Cost years 4 to 30	Item Cost every 5 years	Notes
Site Inspection & Repor	$3,150	$3,150	$3,150		Visit to inspect site once a year for LUC RD
Sampling	$28,960	$14,480	$7,240		Labor and supplies to collect samples from wells using a crew of two.
Analysis/Water	$47,600	$23,800	$11,900		Analyze groundwater samples from 8 wells for CVOCs, dioxins/furans, & metals in years 1 through 30. Collect samples 4 times a year in year 1, 2 times a year in years 2 and 3, and once a year for years 4 through 30.
Report	$6,000	$3,000	$1,500		Document sampling & results
Five Year Review				$17,000	
Subtotal	$85,710	$44,430	$23,790	$17,000	
Contingency @ 10%	$8,571	$4,443	$2,379	$1,700	
TOTAL	$94,281	$48,873	$26,169	$18,700	

CLIENT: **NCBC GULFPORT**		JOB NUMBER: 112GN1813PW0 110 100
SUBJECT: Site 4 FS		
BASED ON:		DRAWING NUMBER:
BY: TJR Date: 9/26/07	CHECKED BY: Date:	APPROVED BY: DATE:

SOIL REMEDIAL ALTERNATIVES

Alternative 2: Comprehensive Action: Landfill Cap, Sediment Removal, Canal Lining, LUCs, Groundwater Monitoring, and Landfill Gas Management

Annual Cost

Cover Inspection & Report (1 person)

Car, 3 days	$300	
Hours	$2,600	(40 hours * $65/hr for field & report)
Misc	$250	
	$3,150	

Cover Maintenance

Assume golf course will maintain cover.

Sampling

Labor & Materials, per round (2 wells per day: 10 wells)
Assume 5 days to sample with 2 people, local

2 people @ $60.00 per hour for 10 hours per day for 5 days =	$6,000
car for 5 days =	$500
report @ $65.00 per hour for 6 hours =	$390
Misc supplies, copying, etc. =	$350
	$7,240

Analytical, per round for 30 years
Collect water samples from wells and analyze for CVOCs, dioxins/furans, & metals

type	cost each	number	total
CVOCs	$75	10	$750
dioxins/furans	$650	10	$6,500
metals	$125	10	$1,250
			$8,500
		40% QA/QC & Data Validation	$3,400
			$11,900

Sampling report assume $1,500 per round $1,500

APPENDIX B

SITE 4 PROPOSED PLAN PUBLIC MEETING SUMMARY

Public Meeting Summary
December 15, 2009
Site 4 – Proposed Plan
Golf Course Landfill
Naval Construction Battalion Center Gulfport
Gulfport, Mississippi

Bob Fisher opened the meeting at 5:30 pm:

The intention of this meeting is to present our Proposed Plan for Site 4, the Golf Course Landfill. We are interested in any comments or concerns that you may have about the plan. We encourage you to present any questions or comments in writing so that we can respond to them as part of our final decision-making process.

With that, I would like to introduce Bill Olson, our Tetra Tech Navy Contractor. Bill Olson is a geologist, has been working on the site for several years.

[Bill Olson] The materials available at the meeting are the proposed plan, which describes what the Navy thinks is the best way to approach the site, a fact sheet that briefly describes the site and the proposed plan, and a handout of the slides that I'll be showing. Because we're a small group tonight, I encourage you to feel free to ask questions during the presentation.

The proposed plan summarizes the investigations that we've done, presents the remedies that have been evaluated, explains the recommendation of the Preferred Alternative for cleaning up Site 4, and provides a period for public comment.

Public Comment Period

The public comment period for this plan starts tomorrow and will be open for 30 days. Comments on the plan will be accepted in writing during the public comment period. Copies of the Proposed Plan are available at this meeting and at the Information Repository in the temporary location of the Gulfport Library located off of Pass Road. Also, other Site 4 documents, such as the Remedial Investigation Report and the Feasibility Study, are available at the Information repository.

[Gordon Crane]: I will also be placing copies of the Proposed Plan in the in the Long Beach and Pass Christian libraries.

[Bill Olson]: This is a map of the Seabee Base showing the site located on the west end of the base. Site 4 is approximately 4 acres. It operated as a landfill from 1966 to 1972. Some of the things that were brought there included refuse, solid waste (including debris following Hurricane Camille), and liquid wastes were disposed of at Site 4. Wastes were typically placed in trenches and burned. After waste disposal ended, 4 to 6 feet of fill was placed over the landfill.
The site is currently part of the Pine Bayou Golf Course. This photo of the site shows the well maintained grass with a few land traps. The site is mostly flat with some golf course features, until it drops off into Canal No. 1. This photo shows a Canal No. 1. That's Jason on the bridge collecting a sample and measuring the depth of the canal. This photo show the slope of the land as it dips into the canal.

A little bit of history of the Site 4 investigations. Site 4 was identified in the 1987 as part of the base wide Initial Assessment Study and confirmed as a site in the Confirmation Study, also completed in 1987. The base wide Surface Water/Sediment Delineation Study completed in 1995 showed some possible contamination coming from the groundwater beneath the landfill, so an Interim Remedial Action was completed in 1997 which involved treating the groundwater using carbon filtration. That study was followed with a Groundwater Monitoring Study in 1998, a Remedial Investigation in 2004, and a Groundwater Treatability Study in 2006. So as you can see, this site has been thoroughly investigated over this time.

The investigation that summarized all previous investigations and led to this proposed plan included a geophysical survey, surface soil sampling, subsurface soil sampling, surface water and sediment sampling, groundwater sampling, and shallow aquifer evaluation. This photo shows Bob Fisher using geophysical equipment. This photo shows the rig that was used to collect samples. This photo shows the rig used to inject bacteria into the groundwater as part of our treatability study.

Through the remedial investigation we determined that most of the buried material was in the southwest part of the site. We also found a contaminant plume of dry cleaning solvents and degreasers that exceeded Mississippi Department of Environmental Quality standards.

The chemicals that we found can be summarized as follows: in soil we found Polynuclear Aromatic Hydrocarbons (PAHs); in sediment we found PAHs, dioxins, insecticides, polychlorinated biphenyls (PCBs), and lead; in groundwater we found chlorinated volatile organic compounds (CVOCs), dioxins, iron and manganese; and in surface water we found dioxins and lead.

Once we found out what contaminants were there, we conducted a risk assessment. The human health risk assessment determined that occupational workers and hypothetical future residents would have unacceptable cancer risk due to due to CVOCs and dioxins in soil. Also, hypothetical future residents would have unacceptable non-cancer risks due to CVOCs in groundwater. The ecological risk assessment showed no risk to ecological due to a lack of natural habitat at the site.

The Site 4 Feasibility Study was the next step in the process. The Feasibility Study evaluated cleanup alternatives for site. The first step in the Feasibility Study is to determine the objectives of the remedy. These Remedial Action Objectives included preventing direct exposure to landfill contents to eliminate human health risk; minimizing infiltration of rainwater to keep the contaminants beneath the site from dissolving and moving into the groundwater; preventing human contact with the groundwater; preventing human and ecological receptors from coming into contact with the surface water and sediment; and preventing erosion and transportation of contaminants into Canal 1.

The USEPA has developed standardized approaches for cleanups for common types of environmental sites. Presumptive remedies allow for consistency in remedy selection and reduce the cost and time for evaluation. Municipal landfills are one of the common types of sites. Site 4 has characteristics consistent with municipal landfills and therefore the presumptive remedy approach has been applied. Also, it has been shown that site risks are low, except for hot spots, wastes are generally household, commercial or industrial solid wastes, hazardous wastes, if any, are present in lesser quantities, and no military-specific wastes are present. The goal of the presumptive remedy is to break the link between the contaminants and the people.

The components of this presumptive remedy are:

- A cover to minimize rainfall passing through the landfill;
- A cover to prevent contact with buried waste and to prevent exposure and movement by wind and water;
- A system to manage gases generated in the landfill.

These landfills generate methane and other gases if covered, so you need to figure out how to deal with the gases.

Part of the benefit of using the presumptive remedy approach is to reduce the number of alternatives to be evaluated during the Feasibility Study. We evaluated two alternatives. Alternative 1, No Action, don't do anything to change site conditions; and, Alternative 2, Comprehensive Action including waste containment and isolation, surface water and sediment controls, groundwater monitoring, landfill gas management, and land use controls.

Alternative 1, No Action, is not the alternative of choice. This alternative is always used as a baseline for comparison. It assumes that no changes would be made to the existing conditions at the site. The Navy uses this alternative to justify expenditures to clean up the site.

Alternative 2, Comprehensive Action, the recommended alternative, includes a surface cover (cap) designed to meet MDEQ solid waste regulations, prevent direct exposure to waste, minimize infiltration of groundwater through buried waste, and prevent erosion and transport of contaminated media and sediment removal from Canal 1 to prevent direct exposure and install an erosion barrier on the landfill side of Canal 1 to protect the cap. Alternative 2 also includes land use controls to prevent development at the site, especially digging or groundwater use, inspections to maintain integrity of the cover and erosion barrier, and periodic sample collection from selected monitoring wells to evaluate groundwater quality and contaminant concentrations.

A detailed and comparative analysis of alternatives was completed to assess the alternatives. It was determined that Alternative 1 does not meet the Remedial Action Objectives because it does not remove the risk of human exposure at the site. On the other hand, Alternative 2 meets the Remedial Action Objectives. The Feasibility Study assessment includes evaluation of several criteria. The first criteria evaluated are called "Threshold Criteria."

Threshold criteria include an assessment of overall protectiveness of human Health and the environment. Alternative 2 would provide the highest level of protection because contaminated soil would be removed from Canal No. 1, and would be transported to an approved TSDF. Groundwater would be treated and the landfill would be properly capped, as required by MDEQ. The second threshold criteria are compliance with Applicable, Relevant, or Appropriate Regulations referred to as ARARs. Alternative 2 meet all legal requirements.

Next, the alternative is measured against the balancing criteria of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants through treatment, short-term effectiveness, and implementability.

This remedy would achieve reduction of toxicity and volume of contaminated media through containment and treatment. Also, the volume of the sediment contaminated with PAHs, dioxins/furans, and ecological contaminants would decrease significantly due to the excavation for proper grading and lining of the canal. Alternative 2 would also reduce movement of contaminants beneath the landfill by capping the site and eliminating infiltration of groundwater through the landfill. The remedy would be effective short-term because it would be implemented

quickly, and we have experience that it is implementable because we've recently successfully implemented this remedy at another site, Site 5. The last balancing criterion is cost, and we'll discuss that more in a few moments.

The last two criteria to be evaluated are called Modifying Criteria. These criteria include regulatory support and acceptance and community acceptance. The MDEQ and EPA have been involved and have approved all documents and this proposal. The last step in the process is to solicit public comments through this public comment period.

So again, the Preferred Alternative for Site 4 is Alternative 2 – Comprehensive Action. The Navy believes Alternative 2 will adequately protect human health and the environment, attain all federal and state requirements, and is cost effective, implementable, and effective.
Components of the Preferred Alternative include restructuring the site, installing an erosion barrier on the canal, installing a gas collection system, developing restrictions to protect the cover, and re-grading the site to control surface water runoff.

An engineered cap would be installed to meet infiltration control and landfill gas management requirements. Sediment would be excavated from an estimated 700 feet of Canal 1 and placed in the landfill area to be capped. An erosion barrier would be installed on the landfill side of Canal and site controls would prevent residential development or groundwater use and signs would be posted to warn against unauthorized digging. Periodic inspections would be ensure that the cover and erosion barrier are in good condition and seven monitoring wells would be periodically sampled to evaluate groundwater quality.

This diagram of the site shows where the cap will be installed trench will be installed. Sediment will be excavated from the Canal and placed on the landfill. The sides of the canal will be armored with rock and monitoring wells will be sampled to track changes in the groundwater plume.
The cost of Alternative 1 is zero. The cost of Alternative 2 is $1,938,000 in capital costs and $2,405,000 for monitoring.

Are there any questions?

[David Marshall] How long will the monitoring continue?

[Bill Olson] We would be complying with the state of Mississippi requirements of 30 years.

[Bob Fisher] The landfill sites will be monitored at some frequency based on the results that we get.

[David Marshall] Will there be any permitted use? Could this site be used for golf?

[Bill Olson] That is my understanding. It's a good use for the site.

[Phillip Shaw] What if they build an irrigation system?

[Bob Fisher] That's a good question, and something that has already come up as a question. Yes, this remedy can work with an irrigation system if done carefully. Most of the irrigation systems last 8 to 10 years then will need to be replaced. Tetra Tech will make it very clear what can and cannot be done at the site as they develop the Remedial Design. The use would be very

restricted. No training or driving of heavy equipment would be allowed. We anticipate that the site would be either a golf course or a grassy field.

[David Marshall] Typically how thick is that cap?

[Bob Fisher] The compacted clay layer about 18 inches and would be about 2.5 feet by the time you get the sod on top of it. The soil above the cap would be between three and four feet deep and there would be three to four feet of soil beneath the cap. The total thickness of soil between the waste and the surface would be approximately eight feet.

I would like to add that it's very difficult to explain a feasibility study. The process is here to make sure that we look at the best remedies, so that we don't get a big "oops" at the end. We expect a number of Proposed Plans in the next few years.

[David Marshall] Would you mind going back to that slide where you showed the thickness of the clay? How deep is that layer?

[Bill Olson} The green silt is 50 to several hundred feet thick. That layer stops the contaminants from moving any deeper.

[David Marshall] How deep were the trenches?

[Bob Fisher] The trenches were pretty much at the level of the groundwater.

[David Marshall] So the gray silt layer is below that?

[Bill Olson] Yes, the silt layer is below the trenches, which helps to contain the contamination.

[David Marshall] The groundwater plume that you found earlier, is it moving towards the southwest?

[Bill Olson] Yes, the blue line in this diagram estimates where the vinyl chloride concentrations are higher than the Mississippi drinking water standards. At one place it is more than 100 times the drinking water standard.

[Bob Fisher] Yes, and I would like to add that the gradient is so low there that it is almost flat. Another thing that I would like to mention is that we expect the natural attenuation to be working, so we expect that the concentrations of contaminants in the groundwater will be dropping.

[David Marshall] Is Site 4 the only place we've done the enhanced natural attenuation?

[Bob Fisher] Yes, we'll probably look at it for Site 3. However, we don't expect it to work as well there.

Well, that brings us to the end of our presentation. Please feel free to submit any written comments on our proposed plan, and we very much appreciate you for coming tonight.

[The meeting closed at 6:30 pm]