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FINAL RECORD OF DECISION FOR SITE 84 OPERABLE UNIT 19 (OU 19) MCB CAMP LEJEUNE NC

01/21/2009

RHEA ENGINEERS & CONSULTANTS

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FINAL
RECORD OF DECISION

SITE 84, OPERABLE UNIT NO. 19
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

Prepared for
Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic Division

Contract No. N40085-07-D-1905

January 21, 2009

Prepared by
Rhēa Engineers & Consultants, Inc.

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ABBREVIATIONS AND ACRONYMN LIST

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CFR	Code of Federal Regulations
CSF	Carcinogenic Slope Factors
CSM	Conceptual Site Model
DoD	Department of Defense
ERA	Ecological Risk Assessment
FFA	Federal Facilities Agreement
FS	Feasibility Study
HEARST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
LUCs	Land Use Controls
MCB	Marine Corps Base
mg/kg-day	milligrams per kilogram per day
msl	Mean Sea Level

Navy	United States Department of the Navy
NCDENR	North Carolina Department of Environment and Natural Resources
NCEA	National Center for Environmental Assessment
NCGS	North Carolina General Statutes
NCP	National Contingency Plan
NPL	National Priorities List
NTCRA	Non Time Critical Removal Action
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated Biphenyl
PPE	Personal protective equipment
ppm	Parts per million
PRAP	Proposed Remedial Action Plan
PRG	Preliminary Remediation Goal
RA	Risk Assessment
RAA	Remedial Action Alternative
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RD	Remedial Design
RfD	Reference Dose
Rhēa	Rhēa Engineers & Consultants, Inc.
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SMP	Site Management Plan
TBCs	To Be Considered
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Site 84, Operable Unit (OU) 19
Marine Corps Base (MCB) Camp Lejeune
Jacksonville, North Carolina
EPA ID#: NC6170022580

Site 84 is located just south of Highway 24, one mile west of the MCB Camp Lejeune main gate entrance. The site extends to the south and east to encompass a small former man-made lagoon and the former Building 45 area.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for Site 84, OU 19, at MCB Camp Lejeune in Jacksonville, North Carolina, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This document was prepared in accordance with United Stated Environmental Protection Agency (USEPA) guidance for decision documents. This decision is based on the Administrative Record file for this site, which is located at the Onslow County Public Library, 58 Doris Avenue East, Jacksonville, North Carolina 28540.

The United States Department of the Navy (Navy) is the lead agency and is responsible for site cleanups at MCB Camp Lejeune. The remedy set forth in this Record of Decision (ROD) has been selected by the Navy and MCB Camp Lejeune, jointly with the USEPA, and with the concurrence of the North Carolina Department of Environment and Natural Resources (NCDENR). A copy of the NCDENR concurrence letter dated September 2, 2008 is included as **Appendix A**. NCDENR has also indicated concurrence by signature in Section 1.7, Authorizing Signatures.

1.3 ASSESSMENT OF THE SITE

Following three Non-Time-Critical Removal Actions (NTCRAs), Polychlorinated Biphenyls (PCBs) in surface and subsurface soils are at concentrations that pose a potential threat to human health. The response action selected in this ROD is necessary to protect public health or welfare from actual or threatened releases of pollutants or

contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

1.4 DESCRIPTION OF THE SELECTED REMEDY

Site 84 is the sole site in OU 19 and is one of several Installation Restoration Program (IRP) sites that are part of the comprehensive environmental investigation and cleanup currently being performed at MCB Camp Lejeune under the CERCLA program pursuant to the Federal Facilities Agreement (FFA) for MCB Camp Lejeune dated March 1, 1991. This ROD addresses soil contamination at OU 19 Site 84. The status of all of the IRP sites at MCB Camp Lejeune can be found in the current version of the Site Management Plan (SMP), which is located in the Administrative Record file.

The Selected Remedy for Site 84 includes accepting the previous PCB Removal Actions and Land Use Controls (LUCs) that will limit exposure to PCB contaminated soils. The three previous NTCRAs removed approximately 1,199 tons of PCB waste soil, 16,460 tons of PCB contaminated soil and included the installation of a soil cover over PCB contaminated soil that remained in place. The Selected Remedy was determined based on the evaluation of site conditions, site related risks, applicable or relevant and appropriate requirements (ARARs), and Remedial Action Objectives (RAOs). Because this remedy will result in contaminated soil remaining on site, LUCs will be instituted to prevent unacceptable land uses and prevent intrusive activities to effectively eliminate the exposure pathways, and reduce risk to acceptable levels.

The LUCs will be implemented and maintained until the concentration of hazardous substances (i.e., PCBs) in the soil are at levels that allow for unrestricted use and unlimited exposure. The Navy and MCB Camp Lejeune are responsible for implementing, maintaining, reporting on, and enforcing the LUCs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property agreement, or through other means, the Navy and MCB Camp Lejeune shall retain ultimate responsibility for the remedy integrity. The performance objectives of the LUCs at Site 84 are to:

- Prohibit the development and use of the site for residential housing, elementary and secondary schools, child care facilities, and recreational areas within the LUC boundaries of the site;
- Prohibit intrusive activities within the areas with PCB contamination greater than 10 ppm in subsurface soils, i.e., greater than two-foot depth; and
- Maintain the integrity of the 24-inch vegetative soil cover to limit exposure to subsurface soils with PCB contamination greater than 10 ppm.

The areas of Site 84 to be affected by LUCs (i.e., LUC boundaries) are identified in **Figure 1-1**. The following generally describes the LUCs which will be implemented at Site 84 in order to achieve the LUC performance objectives detailed above:

1. Incorporating land use prohibitions into the MCB Camp Lejeune Base Master Plan;
2. Recording a Notice of Contaminated Site filed in Onslow County real property records per North Carolina General Statues (NCGS) 143B-279.9 and 143B-279.10;
3. Monitoring and maintenance of the Site 84 soil cover and fence; and
4. Deed and/or lease restrictions in the event of transfer for any portion of Site 84.

The Navy shall prepare, in accordance with USEPA guidance, and submit to the USEPA and NCDENR, a Remedial Design (RD) containing LUC implementation and maintenance actions, including periodic inspections, within 90 days of the ROD signature, for review and approval. The Navy shall also submit the document memorializing remedial action completion within 120 days following completion of the remedial action for Site 84. The Navy will be and MCB Camp Lejeune are responsible for implementing, maintaining, inspecting, reporting on, and enforcing the LUCs described in this ROD in accordance with the ROD and the approved RD.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate (i.e., ARARs) to the remedial action, is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. A major component of the Selected Remedy for Site 84 is the three NTCRAs implemented prior to finalization of this ROD. The regulatory requirements for the work conducted as removal actions are identified herein as ARARs. Consequently, most of the Action-specific ARARs have been complied with by the Navy while implementing the removal actions.

The remedy in this OU does not satisfy the statutory preference for treatment as a principal element of the remedy. However, the NTCRAs conducted to date have mitigated the ecological risk at the site, and the risk remaining for human receptors has been reduced to surface soil risk for future adult and child residents and subsurface soil risk for future construction workers. With the LUCs in place, human receptors will be prevented from accessing Site 84 for unwarranted use and intrusive activities will be prevented in locations where soil PCB concentrations exceed 10 ppm.

This 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 40CFR 300.430(f)(4)(ii), a statutory review will be conducted within five 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 because LUCs have failed, additional remedial actions would be evaluated by the FFA parties, and the Navy may be required to undertake additional remedial action.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record on file for MCB Camp Lejeune Site 84.

- Contaminant of concern (COC) and their respective concentrations (Section 2.5.3);
- Baseline risk represented by the COCs (Section 2.7.1.4);
- Cleanup levels established for COCs and the basis for these levels (Section 2.8);
- How source materials constituting principal threats are addressed (Section 2.11);
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Section 2.6);
- Potential land use that will be available at the site as a result of the Selected Remedy (Section 2.12.2);
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.12.3); and
- Key factors that led to selecting the remedy, i.e., a description of how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision (Section 2.12.1).

1.7 AUTHORIZING SIGNATURES

18 Dec 08
Date

R. P. Flatau, Jr.
Colonel, U.S. Marine Corps
Commanding Officer
Marine Corps Base, Camp Lejeune

1/21/09
Date

Franklin E. Hill, Director
Superfund Division
U.S. Environmental Protection Agency Region 4

With concurrence from:

1-14-09
Date

Dexter R. Matthews, Director
Division of Waste Management
North Carolina Department of Environment and Natural Resources

2.0 DECISION SUMMARY

This ROD describes the Navy and USEPA's selected remedial action for Site 84 OU 19 at MCB Camp Lejeune in Jacksonville, North Carolina (EPA ID#: NC6170022580). The Navy is the lead agency and is responsible for site cleanups conducted pursuant to the FFA. Site 84 is the sole site in OU 19, which is one of 22 OUs at MCB Camp Lejeune.

The Public Meeting for Site 84 was held on April 29, 2008. The Preferred Alternative, as detailed in the Proposed Remedial Action Plan (PRAP), was presented at the meeting. This Decision Summary provides an overview of Site 84 characteristics and describes the process by which the Selected Remedy was chosen and the rationale for its selection. Community acceptance of the alternatives is discussed in Section 3.0 of this ROD. NCDENR concurs with the Selected Remedy. A copy of the NCDENR concurrence letter dated September 2, 2008 is included as **Appendix A**. NCDENR has also indicated concurrence with the Selected Remedy by signing this ROD.

2.1 SITE NAME, LOCATION, AND BACKGROUND

MCB Camp Lejeune is located on 236 square miles of land in Onslow County, North Carolina, adjacent to the southern side of the City of Jacksonville. Jacksonville is the largest city near MCB Camp Lejeune, and it contains approximately half of the county's total population. The areas adjacent to MCB Camp Lejeune are generally rural. MCB Camp Lejeune is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction. MCB Camp Lejeune is bordered by the Atlantic Ocean to the east, U.S. Route 17 to the west and State Route 24 to the north.

Site 84, Operable Unit 19, is located within the northeast portion of MCB Camp Lejeune, one mile west of the main gate entrance, and is accessed from NC Route 24 (See **Figure 2-1**). The site is fenced to prevent vehicular and trespasser access. Vehicular access to the site is gained from the Base on the south side of the site or through the chain link fence along the highway. The northeast edge of the study area runs along a newly-constructed pedestrian/bicycle trail, and the northwest edge is bordered by Northeast Creek. Toward the creek, the site is mostly wooded or covered by thick vegetation or grass. Wetland areas are present adjacent to the creek. An access road runs through the site and terminates at Northeast Creek. A map showing the various site features is presented as **Figure 2-2.** Currently, the site is not used, and vehicular access is restricted.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site 84 extends to the south and east to encompass a small, former man-made lagoon and the former Building 45 area. Site 84's former Building 45, constructed by the U.S. Navy soon after purchasing the property in 1941, was leased to Tidewater Electric, who operated the building through 1965. Former employees recalled that site activities included PCB transformer maintenance, recycling, and on-site disposal of spent transformer casings. In approximately 1965, Camp Lejeune converted Building 45 to a maintenance facility for large machinery, and it was used for that purpose until the early 1990s.

A 12-inch diameter steel reinforced concrete pipe from Building 45 discharged into the southeastern end of the lagoon. Reportedly the pipe was connected to the former oil/water separator located outside of Building 45. However, it is believed that prior to the installation of the oil/water separator, the pipe was connected directly to the building floor drains.

Investigations at Site 84 have been conducted since 1992, and initially focused on underground storage tanks (USTs) associated with Building 45. These investigations focused on total petroleum hydrocarbon (TPH) contamination. Note that TPH contamination at Site 84 is being addressed by the underground storage tank (UST) Remedial Program.

Later investigations expanded to address other contaminants. Site documentation is available to the public in the Administrative Record for MCB Camp Lejeune. The following subsections provide summaries of the investigations and removal actions conducted at Site 84 from 1995 through 2008, outside of the UST Remedial Program.

2.2.1 Relative Risk Ranking System Data Collection Investigation (1995) and Pre-Remedial Investigation (RI) Screening Study (1998)

The Relative Risk Ranking and Pre-RI Screening Studies were conducted after the discovery of transformers in the lagoon. Surface soil analyses indicated PCB contamination in the area of the lagoon and toward Building 45. The highest concentrations of PCBs (i.e., Aroclor 1260) in the surface soil were detected approximately midway between the lagoon and Building 45. Groundwater samples were collected from specific existing wells at Site 84. Analyses for PCBs indicated no PCBs above detection limits. Surface water samples collected from the lagoon where transformers were discovered and removed were not contaminated with PCBs. Sediment samples collected from the lagoon were contaminated with PCBs above screening standards.

2.2.2 Abandoned Portions of Building 45 Removed (1999)

In 1999, the aboveground portion of Building 45 was removed.

2.2.3 Final Remedial Investigation OU 19 Site 84 (2002)

A Remedial Investigation (RI) was concluded in 2002 (Baker, 2002). During the RI investigation, borings were drilled and surface and subsurface soil samples were taken and analyzed. In addition, monitoring wells installed across the site were sampled and analyzed. Conclusions of the RI, with the exception of petroleum-related issues, which are now being addressed by the UST Remedial Program, included the following:

- Soils at Site 84 have been impacted by PCBs due to past site operations. PCB contamination is widespread at low concentrations (1 ppm to 10 ppm); however, there are three "hot spots" of PCB contamination, including the lagoon area, the midfield area [near the former aboveground storage tank (AST) – see Figure 1-2 from the Final Feasibility Study (FS) (Baker and CH2MHill, 2002)], and the Building 45 area;

- Soils at Site 84 also have been impacted due to past site operations by pesticides and polycyclic aromatic hydrocarbons (PAHs). These contaminants are primarily distributed around Building 45;

- A NTCRA involving the demolition of the foundation of former Building 45 and excavation of soils in the immediate area of the foundation is planned. The removal action addresses one of the three "hot spots" for soil at Site 84 and should significantly reduce site risks. Further, the removal action work plan contains provisions for PCB confirmatory sampling to ensure that soil remediation goals for high occupancy residential land use, i.e., 1 part per million (ppm), are met in the area of the NTCRA. Although the removal action is focused on removing the remaining portions of Building 45 and impacted soil in that area, all other areas of the site must be addressed;

- Groundwater sampling completed as part of the RI identified pesticides heptachlor epoxide and gamma-chlordane as exceeding screening criteria in a limited number of samples;

- Northeast Creek does not appear to be impacted by past site operations. Contaminants were not detected in surface water or sediment samples from the creek; and

- Lagoon sediments have been impacted due to past site operations by PCBs. The presence of these contaminants is most likely related to the drainpipe that runs from the former Building 45 to the lagoon, which was apparently used to discharge waste material from the building. In addition, the presence of PCBs may be related to the reported disposal of transformers in the lagoon. The lagoon surface water was not contaminated with PCBs.

2.2.4 Final Feasibility Study (2002) and Proposed Remedial Action Plan (2002)

A Feasibility Study (FS) (Baker and CH2MHill, 2002) was conducted that evaluated different alternatives for remediation of the site. The FS Preferred Alternative for soil and lagoon sediment, recommended in the 2002 PRAP, was Remedial Action Alternative (RAA) 4: Excavation and Landfill Disposal (Low Occupancy Land Use) with LUCs. The 2002 PRAP was presented to the public for review and comment. RAA 4 included excavation of soils and lagoon sediments that contain contaminant concentrations in excess of remediation goals for low-occupancy land use, including a soil remediation goal of 10 ppm for PCBs based on USEPA Superfund guidance for industrial land use at the more protective end of the 10 to 25 parts per million (ppm) range suggested in the USEPA guidance and USEPA Region 9 Residential Preliminary Remediation Goals (PRGs) for other contaminants.

As part of the action, samples would be analyzed for PCBs, PAHs, and pesticides. Excavated soils would be separated into Toxic Substances Control Act (TSCA)-regulated and non-TSCA-regulated soils. TSCA-regulated soils (PCBs greater than 50 ppm) would be handled separately and would be transported to a TSCA-permitted chemical waste landfill meeting the requirements of 40 CFR 761.75 for proper off-site disposal. The remaining non-TSCA-regulated excavated soils would be transported to a proper landfill for disposal.

Following completion of these 2002 documents, and after soliciting public comment, the Navy decided not to implement the Preferred Alternative from the PRAP due to a dispute between the Department of Defense (DoD) and the USEPA over post ROD authority and LUCs documentation.

Consequently, an Action Memorandum was developed (MCB Camp Lejeune, 2002) that proposed removal actions at Site 84. The Navy implemented three NTCRAs between 2002 and 2006 which focused on addressing PCB contaminated sediment and soil which essentially was the preferred alternative except for the LUC component of the remedy. A summary of the removal actions are listed below.

2.2.4.1 Phase I NTCRA (2002)

The Phase I NTCRA, as discussed above, which removed the Building 45 foundation and adjacent contaminated soils – PCB, PAH, and pesticide contaminated - was completed in October 2002. These excavation areas were backfilled with clean soil. In addition, approximately 20 transformers containing PCB transformer oil were removed from the lagoon.

2.2.4.2 Phase II NTCRA (2004)

Removal of the lagoon sediments and other contaminated soil, backfilling of the lagoon and other excavation areas with clean fill, and partial removal of the pipe from former Building 45 were completed in 2004 as part of a Phase II NTCRA. During the Phase II NTCRA, additional PCB contamination concerns were raised in the northwest wooded area. These concerns were investigated, past sampling and analysis results were reviewed, and it was concluded that the concerns are unsupported.

A railroad right-of-way borders Site 84 to the north, parallel to NC Highway 24. As the railroad is no longer used, the Base has transferred a portion of the railroad right-of-way to the City of Jacksonville for a pedestrian/bicycle trail. Fencing is necessary to prevent recreational trespassers from accessing the site. Partial fencing was completed in 2004 during the Phase II NTCRA.

Confirmation testing performed during the Phase II NTCRA identified several site areas with soil PCB concentrations greater than or equal to the site cleanup level for low occupancy industrial land use of 10 ppm. Also, during the Phase II removal action, a steel pipe was found in the northwestern area of the site, but pipe sediment testing was performed. Additional investigations and a Phase III NTCRA were required.

2.2.4.3 Supplemental Investigations (2005)

Two underground pipes originating from the general area of former Building 45 were located by geophysical methods and exposed during the supplemental investigations. The southernmost pipeline corresponded to the location of the concrete-encased steel pipe that was partially excavated during the Phase II NTCRA, i.e., a pipe that discharged

to the former lagoon from former Building 45. PCB concentrations in sediment samples taken from the pipe were less than 10 ppm, and the pipe could remain in place. PCB concentrations in sediment samples taken from the northernmost pipe were also less than 10 ppm, and this pipe could remain in place also.

The continuing COC in the site groundwater was pesticides. The 2002 Final FS suggested a monitoring program to verify that pesticides are still present in the groundwater prior to any remedial action. Based on the results of groundwater sampling and analysis conducted in 2005, no pesticide compounds exceeded the most recent North Carolina 2L Standards (NCDENR, 2000), and no action is required for groundwater. Note that no PCBs had been detected in previous groundwater sampling/analysis events.

As a result of the test pit program, PCB contamination greater than 10 ppm was identified in surface (i.e., 0 to 2 feet in depth) and subsurface (i.e., > 2 feet in depth) soil south and west of the Phase I and Phase II NTCRAs. It was determined that the areas of highest surface soil contamination would be excavated, where possible, and disposed of off site, and the areas would be backfilled with a minimum of two feet of clean soil cover and revegetated.

During the utility location task, numerous buried, active electric, and communication lines were identified along the area of the gravel access road south and west of the Phase I and Phase II NTCRAs. Some samples taken in this area contained PCB concentrations greater than 50 ppm; however, because of the large number of critical communication lines and electric lines, it would not be feasible to excavate this area. Instead, two feet minimum of clean soil would have to be placed over the area.

2.2.4.4 Phase III NTCRA (2006)

The Phase III NTCRA was conducted south and west of the Phase I and Phase II NTCRA areas. Where possible, surface soils impacted with PCBs at concentrations greater than or equal to 50 ppm were excavated and disposed of off site. In areas where mass excavation was not feasible due to numerous buried, active utility and communication lines or PCB concentrations were less than 50 ppm at the surface, a minimum of two feet of clean soil cover was placed above the existing surface. In addition, as part of this removal action, the existing four-foot high fence along the northeastern border of the site was extended to Northeast Creek, and the entire site was revegetated.

2.2.4.5 Conclusion of NTCRAs

At the conclusion of the three NTCRAs, PCB surface soil contamination had been removed to a depth of one foot or more and backfilled or covered with clean fill. The

PCB contaminated sediment from the lagoon had been removed and the lagoon backfilled with clean fill. All PCB contaminated soil was disposed of off site in approved landfills. PAH and pesticide contamination had been found around the Building 45 foundation during the RI. Both PAH and pesticide contamination were removed and disposed of during the Phase I NTCRA. In addition, disposal soil samples from the Phase II NTCRA were analyzed for PAHs and pesticides, and all results were reported as non-detect. TPH contamination at the site is being addressed by the underground storage tank (UST) Remedial Program. And, as discussed above, groundwater pesticide contamination was determined to no longer be a concern.

2.2.4.6 Baseline Risk Assessment

A Baseline Human Health Risk Assessment (HHRA) was conducted as part of the RI for both the pre-NTCRA Phase I scenario and the post-NTCRA Phase I scenario. With the three NTCRAs being completed and contamination remaining only in site soils, the Baseline HHRA is summarized for the applicable contaminants for the post-NTCRA Phase I scenario as follows:

- Total site Incremental Lifetime Cancer Risk (ILCR) values calculated in the Baseline HHRA indicate potentially unacceptable carcinogenic risk for future adult and child residents and the future industrial/commercial site worker and construction worker. The Baseline HHRA concluded that ingestion of and dermal contact with PCB Aroclor-1260 in the surface soil, i.e., zero to two feet in depth, was the primary contributor to unacceptable carcinogenic risks. Soil evaluated after the NTCRA Phase I event did not contribute significantly to unacceptable noncarcinogenic adverse health effects for the receptors. With the completion of the three NTCRAs, the risk to the industrial/commercial workers at the site has been eliminated in the surface soil. However, risk still remains in some subsurface soils on site for the construction workers and in surface soils for future adult and child residents. Therefore, LUCs that prevent intrusive activities and unacceptable land uses must be applied at the site to prevent unacceptable exposure.

2.2.4.7 Ecological Risk Assessment

An Ecological Risk Assessment (ERA) was conducted as part of the RI. The ecological risk characterization was based on the post-NTCRA Phase I scenario for surface soils, i.e., defined as the top 12 inches of soil. Note that subsurface soils are not considered a

complete exposure pathway for terrestrial receptors because the mass of most root systems is within the surface soil, most soil heterotropic activity is within the surface organic layer, and soil invertebrates occur on the surface or within the oxidized root zone. With the NTCRAs being completed and contamination remaining only in site soils, the baseline ERA is summarized for the applicable contaminants for the post-NTCRA Phase I scenario as follows:

- For the ERA, the surface soil exposure pathway was evaluated by comparing contaminant concentrations in the surface soil to the USEPA Region 4 Recommended Soil Screening Values. Following the NTCRA Phase I event, PCB Aroclor-1260 was the greatest risk driver in surface soils [i.e., those with refined Hazard Quotients (HQs) exceeding 10.0]. However, following the three NTCRAs, the HQ would not exceed 1.0 because the PCB contamination in the top 12 inches of soil is in all cases significantly less than the USEPA Region 4 Recommended Surface Screening Value of 20 ppm for all PCBs. Therefore, the ecological risk has been mitigated.

2.2.5 Final Feasibility Study Amendment (2008)

A Final FS Amendment for Site 84 (Rhēa, 2008) presents remedial alternatives for a final remedial action for Site 84 that takes into account the earlier removal actions and is based upon present site conditions and PCB concentrations. From this study, the new Preferred Alternative chosen for Site 84 and discussed in the April 2008 PRAP is RAA-4 – PCB Removal Actions with LUCs.

2.2.6 Enforcement Activities

MCB Camp Lejeune was placed on USEPA's National Priorities List (NPL) effective November 4, 1989 (54 Federal Register 41015, October 4, 1989). As a result of the NPL listing and pursuant to CERCLA, the USEPA Region 4, NCDENR, the Navy, and the Marine Corps entered into a FFA for MCB Camp Lejeune in 1991. The primary purpose of the FFA is to ensure that the environmental impacts associated with past and present activities at the Base are thoroughly investigated and remediated. The Navy is responsible for ensuring that appropriate CERCLA response alternatives are developed and implemented as necessary to protect public health, welfare, and the environment. No enforcement activities have been recorded at Site 84.

2.3 COMMUNITY PARTICIPATION

The Navy, MCB Camp Lejeune, USEPA, and the NCDENR provide information regarding the cleanup of MCB Camp Lejeune to the public through the community relations program which includes a Restoration Advisory Board (RAB), public meetings, the Administrative Record file for the site, and announcements published in local newspapers. RAB meetings continue to be held to provide an information exchange among community members, the Navy, MCB Camp Lejeune, USEPA, and NCDENR. These meetings are open to the public and are held quarterly.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from April 29 through May 27, 2008, for the PRAP (April 2008) for Site 84. A public meeting to present the PRAP was held on April 29, 2008, at the Coastal Carolina Community College in Jacksonville, North Carolina. Public notice of the meeting and availability of documents was placed in *The Jacksonville Daily News* newspaper on April 21, 2008.

The Administrative Record file, Community Relations Plan, Installation Restoration Program fact sheets, and final technical reports concerning Site 84 can be accessed by the public at home through the Internet at http://www.bakerenv.com/camplejeune_irp or at the following location where the Internet is available:

Onslow County Public Library
58 Doris Avenue East
Jacksonville, North Carolina 28540
(910) 455-7350

2.4 SCOPE AND ROLE OF RESPONSE ACTION

MCB Camp Lejeune was placed on USEPA's NPL in November 1989. OU 19 Site 84 is one of several IRP sites addressed under CERCLA at MCB Camp Lejeune. The response action for Site 84 does not include or affect any other sites at the facility. Information on the status of all the IRP sites at MCB Camp Lejeune can be found in the current version of the SMP, which is located in the Administrative Record file.

The overall strategy for cleanup of Site 84 soil is to eliminate current exposure pathways that may pose unacceptable human health risks. These pathways have mostly been eliminated by excavation and off-site disposal of PCB contaminated soil or by placing clean surface soil cover and, in some cases, separation liners over areas of contamination. The three removal actions that have been completed at Site 84 are entirely consistent with

the agency's overall strategy for site cleanup.

Along with the removal actions, LUCs will be implemented to prevent intrusive activities and unacceptable land uses, to effectively eliminate the exposure pathways, and reduce risk to an acceptable level. LUCs will be implemented and maintained within the boundaries of Site 84 until the concentrations have been reduced to levels that allow for unlimited exposure and unrestricted use.

This ROD is the final action for OU 19 Site 84. The remedy documented in this ROD will achieve the RAO (described later in **Section 2.8**) and allow low occupancy industrial uses of the site.

2.5 SITE CHARACTERISTICS

Site 84, Operable Unit 19, approximately 4.5 acres in area, is located within the northeast portion of MCB Camp Lejeune, one mile west of the main gate entrance, and is accessed from NC Route 24. Site 84 extends to the south and east to encompass a small, former man-made lagoon and the former Building 45 area. The site is fenced to prevent vehicular and trespasser access. Vehicular access to the site is gained from the Base on the south side of the site or through the chain link fence along the highway. The northeast edge of the study area runs along a newly-constructed pedestrian/bicycle trail, and the northwest edge is bordered by Northeast Creek. Toward the creek, the site is mostly wooded or covered by thick vegetation or grass. Wetland areas are present adjacent to the creek. An access road runs through the site and terminates at Northeast Creek.

The ground surface of Site 84 is initially gently sloping from west (i.e., Northeast Creek) to east. The ground surface is relatively steeper east of the gravel access road. Elevations at the site range from approximately less than 5 feet to 25 feet above mean sea level (msl). With the exception of the gravel access road, the majority of the surface is grass covered or wooded.

2.5.1 Conceptual Site Model

The source of PCB soil contamination at Site 84 was likely due to spills or leaks from transformers containing PCBs, leaking from the transport pipe connecting former Building 45 to the former lagoon, and/or use of PCB-contaminated oil for dust control during site operations. The conceptual site model (CSM) for human health exposure pathways (**Figure 2-3**) shows sources, primary release mechanisms, secondary sources, secondary release mechanisms, exposure routes, and potential human receptors for Site

84 following the three NTCRAs, i.e., the present site conditions. For human health, potential receptors, including future residents and future construction workers, may contact residual levels of PCB contamination in surface or subsurface soil through inhalation, ingestion, or dermal absorption. For the present site conditions, no CSM is required for ecological exposure pathways because the ecological risk at the site has been mitigated as a result of the NTCRAs completed, as discussed above.

2.5.2 Sampling Strategy

Surface and subsurface soil, sediment, surface water, and groundwater samples were collected and analyzed to characterize the nature and extent of contamination and potential risk to human health and the environment as part of the RI for Site 84. Summaries of samples collected for the RI are provided in **Tables 2-1, 2-2, 2-3, 2-4,** and **2-5** for soil, groundwater, surface water, sediment, and quality control/quality assurance, respectively. These samples were collected from April 1998 through August 2001.

During the Phase I NTCRA, PCB contaminated soil was removed to 1 ppm, and therefore, no residual contamination was left in that area of the site. The goal for PCB contaminated soil cleanup for the Phase II NTCRA was 10 ppm. That action was not completely successful. **Figure 2-4** illustrates the confirmation sampling conducted following the Phase II NTCRA. As can be seen from this Figure, contamination above 10 ppm was left in the northwestern and southeastern areas of the site. Note that interior sidewall samples taken as the excavation progressed are not considered in the analysis of remaining PCB soil contamination.

Prior to the Phase III NTCRA, additional investigation was conducted to further characterize PCB contaminated soil at the site. **Figure 2-5** identifies surface soil samples taken in future backfill areas in the northwestern area of the site in 2005. **Figure 2-6** includes 2005 surface sample locations in future backfill areas in the southeastern area of the site. The 2005 sample analysis results for the future backfill areas are included on **Tables 2-6** and **2-7**.

Immediately following the third and final NTCRA, confirmatory soil samples were collected to document the PCB contaminant levels left in place in both excavation and backfill areas at Site 84. Summaries of samples collected following the Phase III NTCRA are provided in **Table 2-8**. The confirmatory sample locations and analysis results are included on **Figures 2-7** and **2-8**.

2.5.3 Nature of Contamination

PCBs are the contaminant of concern at Site 84. A significant quantity of PCB contaminated soil and lagoon sediment has been removed from the site; yet, residual contamination remains in both the surface and subsurface soils. No PCB contamination has been detected in surface water or groundwater.

In 2002, the Phase I NTCRA was conducted in which the foundation of Building 45 and surrounding PCB contaminated soil were removed. During this NTCRA, 4,860 tons of PCB-contaminated soil (i.e., <50 ppm) was excavated and disposed of at the Sampson County Landfill, a local permitted facility in Rosewood, North Carolina. In addition, 143 tons of TSCA PCB waste soil (Toxic Substances Control Act – TSCA) soil (i.e., >50 ppm) was excavated and disposed of at the Wayne Disposal, Inc. facility, a TSCA landfill in Belleville, Michigan. PCB contaminated soil was removed to a concentration of 1 ppm. The minimum depth of excavation in the Phase I NTCRA area was four feet. After excavation was completed, the area was backfilled with off-site clean soil.

In 2004, a Phase II NTCRA was completed that attempted to address the remaining contamination on site. The excavation volume included 11,600 tons of PCB-contaminated soil and sediment and 360 tons of TSCA PCB waste soil. The PCB-contaminated soil and sediment was disposed of at the Sampson County Landfill, and the TSCA PCB waste soil was disposed of at the Clean Harbors Lone Mountain Landfill, a TSCA landfill in Waynoka, Oklahoma. Confirmation testing performed after excavation verified that the soil in the base of the excavation from zero to two feet was below the remediation goal of 10 ppm for industrial low-occupancy land use. However, confirmation sampling also identified several Phase II NTCRA excavation sidewall areas with soil PCB concentrations greater than or equal to 10 ppm. The sample results appeared to indicate a significant southwestern extension of PCB contamination. Following excavation, the area was backfilled with off-site clean soil.

From June through August 2006, a Phase III NTCRA was conducted at Site 84, south and west of the Phase I and Phase II NTCRA areas. Where possible, surface soils impacted with PCBs at concentrations greater than or equal to 50 ppm were excavated and disposed of off site at the Wayne Disposal, Inc. facility, a TSCA landfill in Belleville, Michigan. The area of soil removal was 5,800 square feet, and 696 tons of TSCA PCB waste soil was disposed of at the Belleville, Michigan facility. The excavated areas were backfilled with a minimum of two feet of clean soil cover supplied by the MCB Camp Lejeune French Creek borrow area. In areas where mass excavation was not feasible due to numerous buried, active utility and communication lines or PCB concentrations were less than 50 ppm at the surface, a minimum of two feet of clean soil cover was placed

above the existing surface. Soil cover in the Phase III NTCRA area is 18,300 square feet. Prior to backfilling, the existing in-place soil was sampled and analyzed for PCBs.

After the three NTCRAs were completed, some PCB contamination greater than 10 ppm was left in place below a depth of two feet in the northwestern area of the Phase II NTCRA and in the Phase III NTCRA area, i.e., beneath the vegetated soil cover, and some PCB contamination greater than 1 ppm but less than 10 ppm was left in place from zero to two feet in depth across the site.

Dividing the Phase II NTCRA site area into approximate 0.5 acre increments reveals that over approximately 4 acres of the site, the average PCB concentration remaining in the soil ranges from 0.8 ppm to 4 ppm. Only six of 33 confirmation samples were above 10 ppm PCB in the far western area of Phase II, and none of the post excavation samples exceeded 50 ppm in this area.

In the Phase III NTCRA area, however, the average PCB concentration beneath a two foot depth over 0.5 acre is 55 ppm. Contamination exceeds 50 ppm in the local area of the utility corridor because excavation could not be performed due to the impracticality of digging into an area lined with numerous power lines, gas lines, and fiber optic lines. However, with the geotextile liner under the roadway base material acting as a separation fabric, PCB concentrations under the road from 0.1 ppm to 1700 ppm can be removed from the calculation because they are essentially capped. Under this scenario, the average PCB concentration in the Phase III NTCRA area falls to 37 ppm.

2.5.4 Potential Future Surface and Subsurface Routes of Exposure and Receptors

PCB contaminated soil at a concentration greater than 1 ppm in surface soils could potentially affect future adult and child residents. The LUCs for Site 84 will prohibit the development and use of the site for residential housing, elementary and secondary schools, child care facilities, and recreational areas within the LUC boundaries of the site (see **Figure 1-1**).

PCB contaminated soil at a concentration greater than 10 ppm in subsurface soils (i.e., greater than two-foot depth) could affect future construction workers at the site. The exposure routes include inhalation, ingestion, and dermal contact. Therefore, intrusive activities will be prohibited in the areas identified on **Figure 1-1**, unless specifically approved by both NCDENR and USEPA. If future work is required in these prohibited areas, the workers will need to be properly trained, briefed regarding the site risks, and shall don appropriate personnel protective equipment (PPE) prior to working in these areas. In addition, the excavated soil may not be placed back into the excavation area but must be disposed of at a TSCA Landfill if the concentrations exceed 50 ppm or in a lined

landfill if the concentrations are above 1 ppm. Until removal actions reduce concentrations to levels that allow for unlimited exposure to construction workers (i.e., less than 10 ppm PCBs), LUCs will prevent unacceptable human exposure to PCBs.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Currently, Site 84 is vacant, and no structures are present on the site. N.C. Highway 24 and a residential development are located northeast of the site, and a TPH treatment building and system is located southeast of the site. The MCB Camp Lejeune main gate is also located southeast of the site, and electric substations are located south of the site. The planned future site use is as a low occupancy industrial area.

A low occupancy land use area is defined in the TSCA regulations as a land use where an unprotected individual would not be present for more than an average of 6.7 hours/week, or 335 hours/year. Examples of low occupancy land areas include unoccupied areas outside of a building or storage area in a warehouse at an industrial facility (40 Code of Federal Regulations [CFR] 761.3).

2.7 SUMMARY OF SITE RISKS

A Baseline HHRA and ERA were conducted to evaluate the potential human health and/or environmental risks associated with the presence of potentially site-related constituents in various media at Site 84. These RAs were performed for the pre-NTCRA scenario and the post-NTCRA scenario. They provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed. A detailed discussion of potential risks is provided in the RI. After the completion of the three NTCRAs, PCBs in surface and subsurface soils pose the only potential unacceptable risk to human health. The ecological risks for the site have been mitigated. The response action selected in this ROD is necessary to protect public health or welfare from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

2.7.1 Human Health Risk Summary

The Baseline HHRA was performed for the pre-NTCRA scenario and the post-NTCRA scenario. The secondary source of potential human health risk for the post-NTCRA is surface or subsurface soil contamination attributed to the presence of PCBs. A detailed discussion of risks identified at Site 84 can be found in the RI Report.

2.7.1.1 Contaminants of Concern

Based on the results of the RI, the three NTCRAs, and the Baseline HHRA, PCBs are the COC for Site 84. The baseline RA indicates that PCB contaminated surface soil remaining after the NTCRA Phase I does contribute to potentially unacceptable carcinogenic risk for future adult and child residents, and PCB contaminated subsurface soil remaining after the NTCRA Phase I does contribute to potentially unacceptable carcinogenic risk for the future construction worker.

Detailed information for the selection of Contaminants of Potential Concern (COPCs) for all media at Site 84 is provided in Section 6.2 of the RI. The range of detected concentrations (minimum and maximum) and the frequency of detection for each COPC in each medium investigated are provided on **Tables 2-9, 2-10, 2-11, 2-12,** and **2-13**.

Exposure point concentrations were determined based on USEPA guidance. An individual moving randomly across Site 84 is assumed to have an equal probability of potential exposure to environmental media such as soil and sediment. Therefore, for these media, the exposure point concentration for a constituent in the intake equation can be reasonably estimated as the arithmetic average concentration of site sampling data. However, uncertainty is inherent in the estimation of the true average constituent concentration at the site.

USEPA Region 4 risk assessment guidance makes an exception to the use of the Upper Confidence Limit (UCL) as the exposure point concentration for groundwater. Groundwater exposure point concentrations should be the arithmetic average of the wells in the highly concentrated area of the plume. However, individual contaminant distribution is scattered at Site 84, with no apparent plume. Therefore, to maintain a conservative approach in this Baseline HHRA, the maximum detected concentrations of the COPCs retained in shallow groundwater were used as the exposure concentrations.

Maximum detected concentrations of the COPCs retained in the surface water were used as the exposure concentrations because of the mobile nature of the medium and the low number of samples in the data set.

Statistical data summary tables for COPCs in each medium sampled (i.e. surface soil, subsurface soil, groundwater, surface water, and sediment) are found in the Statistical Summaries presented in **Appendix B**. These tables provide the arithmetic mean, the standard deviation, and the upper 95 percent confidence limit value for both normally and lognormally distributed data (as determined by Shapiro-Wilkes and d'Agostino distribution tests).

2.7.1.2 Exposure Assessment

The exposure assessment estimates the magnitude of actual and/or potential human exposure, the frequency and duration of those exposures, and the pathways (i.e., inhalation, ingestion, and dermal contact) by which people are potentially exposed. The elements of the exposure assessment for Site 84 following the three NTCRAs are identified in the CSM (**Figure 2-3**). To determine whether human exposure could occur at Site 84, an exposure assessment, which identifies potential exposure pathways and receptors, was conducted. The following four elements were considered to determine whether a complete exposure pathway was present:

- A source and potential mechanism of chemical release;
- An environmental retention or transport medium;
- A point of potential human contact with the contaminated medium; and
- A human exposure route (e.g., ingestion) at the contact point

An estimate of risk was developed for Site 84, evaluating exposure to surface soil for future adult and child residents and subsurface soil for future construction workers. Additional exposure scenarios/pathways were considered but were not significant for Site 84 following the NTCRAs. A detailed discussion of the exposure assessment for all scenarios considered is provided in Section 6.3 of the RI.

2.7.1.3 Toxicity Assessment

The toxicity assessment provides a numerical estimate of the relationship between the extent of exposure and possible severity of adverse effects, and consists of two steps: hazard identification and dose-response assessment. Toxicity data used in the Baseline HHRA are USEPA published toxicity values (non-carcinogenic reference doses [RfDs] and carcinogenic slope factors [CSFs]) in the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEARST) databases. If data were not available from either of these sources, USEPA's National Center for Environmental Assessment (NCEA) data were used. Toxicity data used in risk evaluations for all of the COPCs for the site are provided in **Table 2-14**. A detailed discussion of the toxicity assessment is provided in Section 6.4 of the RI.

2.7.1.4 Risk Characterization

The risk characterization combines the selected COPCs, the exposure assessment, and the toxicity assessment to produce a quantitative estimate of current and future potential

human health risks associated with Site 84. A detailed presentation of Site 84 risk characterization for all of the COPCs is provided in Section 6.5 of the RI.
For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated using the following equation:

Risk = CDI x CSF

where:

Risk = a unitless probability (e.g., 2 x 10-5) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years, expressed in milligrams per kilogram per day (mg/kg-day)
CSF = carcinogenic slope factor, expressed in (mg/kg-day)-1

These risks are probabilities that usually are expressed in scientific notation (e.g., 1x10-6). An excess lifetime cancer risk of 1x10-6 indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. USEPA's generally acceptable risk range for site-related exposures is 10-4 to 10-6.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (i.e., lifetime) with a RfD derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a HQ. An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all COPCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

CDI = Chronic daily intake
RfD = Reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

Focusing on the post-NTCRA risk characterization for future adult and child residents and the future construction worker, following are risk estimates for exposure to the two secondary sources, i.e., surface soils and subsurface soils, determined to be significant.

Surface Soils

Potentially unacceptable total site risk estimates included an ILCR value of 6.2 x 10-4 and a HI value of 16 derived for future adult residents, and an ILCR value of 6.4 x 10-4 and a HI value of 36 derived for future child residents.

Ingestion of the PCB Aroclor-1260 in the surface soil was the main contributor (greater than 80 percent) to the elevated surface soil ILCR of 1.8 x 10-4 for the adult resident and 3.7 x 10-4 for the child resident.

Therefore, based on the exposure scenario including soil after the NTCRAs, potentially unacceptable risks for future adult and child residents may be associated with surface soil investigated at Site 84.

Subsurface Soils

For the future construction worker, potentially unacceptable total site risk estimates for Site 84 included an ILCR value of 7.0 x 10-4 and a HI value of 12. Potential exposure to subsurface soil comprised these elevated risk and hazard values. Ingestion of and dermal contact with Aroclor-1260 in the subsurface soil contributed primarily to the ILCR 8.0 x 10-4. Therefore, based on the exposure scenario including soil after the NTCRA, potentially unacceptable risks for future construction workers may be associated with subsurface soil investigated at Site 84.

Uncertainty

The risk measures used in risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are developed. Thus, it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective. A detailed discussion of the uncertainties associated with the risk assessment is included in the RI.

2.7.2 Ecological Risk Summary

For the present site conditions following the three NTCRAs, complete ecological exposure pathways no longer exist. Therefore, there is no longer an ecological risk at Site 84.

2.8 REMEDIAL ACTION OBJECTIVE AND REMEDIATION GOAL

Remedial action objectives are medium-specific or site-specific goals established for protecting human health and the environment. At Site 84, the environmental media to be addressed is PCB contaminated soil. Future land use for the site has been determined to be low occupancy industrial, such as warehouse or equipment storage. The RAO for Site 84 is:

- Remove contaminated surface and subsurface soils that contain PCBs in excess of the selected remediation goal (i.e., cleanup level) and prevent exposure to remaining PCB contaminated soil consistent with the requirements for a low occupancy industrial area.

A low occupancy land use area is defined as a land use where an unprotected individual would not be present for more than an average of 6.7 hours/week, or 335 hours/year. Examples of low occupancy land areas include unoccupied areas outside of a building or storage area in a warehouse at an industrial facility (40 CFR 761.3).

PCBs in soil are the only COC at Site 84. The remediation goal for Site 84 is:

- PCBs 10 ppm

The selected soil remediation goal for PCBs is based on USEPA Superfund guidance for industrial land use (USEPA, 1990). The 10 ppm PCB cleanup goal is at the more protective end of the 10 to 25 ppm range suggested in the USEPA guidance for sites with industrial use (i.e., low occupancy area) exposure scenarios.

2.9 DESCRIPTION OF ALTERNATIVES

Remedial alternatives to address PCB contamination in soil at Site 84 were developed and are detailed in the Feasibility Study (FS) Amendment. The alternatives evaluated are:

- Alternative RAA 1 – No Action;
- Alternative RAA 2 - Excavation to 1 ppm PCBs;
- Alternative RAA 3 - 1 ppm PCB Soil Cover with LUCs; and
- Alternative RAA 4 - PCB Removal Actions with LUCs.

A description of remedy components is provided in **Table 2-15** and includes a bulleted list of the components of each alternative and the cost of these components. Costs for land use control monitoring and maintenance are also included in **Table 2-15**. Note that the cost of the three completed NTCRAs - approximately $3.5 million - should be added to the cost provided in **Table 2-15** for each of the four alternatives.

2.9.1 Alternative RAA 1 – No Action

Alternative RAA 1 is required by CERCLA to be evaluated as a baseline to compare against all other alternatives. Under the No Action RAA, no physical remedial actions will be performed to reduce the toxicity, mobility, or volume of contaminants identified in soil at Site 84 at the present time. In addition, low occupancy land use would be permitted, but no LUCs will be implemented at the site to mitigate the risk to the industrial users. Vehicular access and trespasser access is currently restricted by existing fencing along the highway. Although this RAA does not involve physical remediation, some degree of remediation of the soil contamination is expected to occur over time via natural attenuation processes such as biodegradation. However, the soil contaminants at Site 84, i.e., PCBs, are known for their environmental persistence; therefore, possible natural attenuation processes would require an indefinite period of time. Under the No Action RAA, however, no means are provided to monitor or confirm the natural remediation process. Because hazardous substances will remain at Site 84 under this RAA, the NCP [40 CFR 300.430(f)(4)] requires the lead agency to review the effectiveness of this alternative at least once every five years.

2.9.2 Alternative RAA 2 – Excavation to 1 ppm PCBs

RAA 2 is recommended for high occupancy future land uses such as housing or schools. Note that high occupancy land use is defined as a land use where an unprotected individual may be present for more than an average of 6.7 hours/week or 335 hours/year. This RAA includes excavation of soils that contain contaminant concentrations in excess

of remediation goals for high occupancy land use, i.e., 1 ppm, based on USEPA and TSCA cleanup goals for PCBs for high occupancy areas without additional controls.

With no LUCs, all soil exceeding cleanup criteria would be excavated and disposed of off site. The total volume for contaminated soil excavation is approximately 20,000 tons of PCB contaminated soil with disposal in a solid waste landfill and approximately 5,500 tons of TSCA PCB waste soil disposed of in a TSCA approved landfill. Prior to excavation, the existing communication lines and electric lines through the planned excavation area would be rerouted.

Confirmatory sampling will take place to ensure that all contaminants exceeding PCB remediation goals have been excavated. Excavated soils would be separated into TSCA-regulated and non-TSCA-regulated soils. TSCA-regulated soils (PCBs greater than 50 ppm) will be handled separately and would be transported to a TSCA-permitted chemical waste landfill meeting the requirements of 40 CFR 761 for proper off-site disposal. The remaining (non-TSCA-regulated) excavated soils will be transported to a solid waste landfill for proper disposal.

Following the excavation operation, the site would be restored by placing clean backfill (assumed to be approximately one foot of existing clean cover over NTCRA areas and from the on-Base borrow area) to bring the site back to original grade. All disturbed areas would be revegetated with native grasses and plant species to control erosion. Access roads or other infrastructure that are disturbed or destroyed in the excavation process would be restored to pre-excavation conditions. No LUCs would be necessary.

2.9.3 Alternative RAA 3 – 1 ppm PCB Soil Cover with LUCs

RAA 3 is recommended for high occupancy future land uses such as housing or schools. This RAA will include installation of a soil cover over PCB contaminated soils that exceed remediation goals for high occupancy land use. A two-foot thick clean backfill soil cover (assumed from the on-Base borrow area) will be placed. Approximately 4.5 acres would receive soil cover. All disturbed areas would be revegetated with native grasses and plant species to control erosion. Access roads or other infrastructure that are disturbed or destroyed in the backfilling process would be restored to pre-backfilling conditions.

A soil cover will control erosion and migration of contaminated soil. The cover will be contoured so as to control erosion and sedimentation, and will be compacted and vegetated with native grasses and plant species. It is assumed that clean backfill can be obtained from an on-Base borrow source. The soil cover and site fencing will be

inspected on an annual basis and after major storm events to ensure that integrity is maintained. Cover restoration and fence repairs will be performed, as needed, based upon inspection results. For costing purposes, it is assumed that inspections will be conducted annually.

Because contaminated soil that poses a potential human health risk will remain at the site, LUCs will be required for this alternative to mitigate the risk for residential users. LUCs will include restrictions on intrusive activities at the site deeper than two feet (e.g., excavation, installation of wells, or construction) other than for monitoring or future remediation purposes [where PCB concentrations at a depth of two feet exceed 1 ppm.] recording a Notice per North Carolina General Statutes (NCGS) 143B-279.9 and .10, and deed and/or lease restrictions in the event that the property is transferred. Also, because hazardous substances will remain at Site 84 under this RAA, the NCP [40 CFR 300.430(f)(4)] requires the lead agency to review the effectiveness of this alternative at least once every five years.

2.9.4 Alternative RAA 4 – PCB Removal Actions with LUCs

RAA 4 is an option for low occupancy industrial land uses such as a warehouse or equipment storage facility. This RAA is Site 84 in its present condition following the three NTCRAs, where both excavation and backfilling to grade, along with soil cover placement, have been performed across the site. Total cost for the three NTCRAs was approximately $3.5 million. No further soil excavation or soil cover placement would be conducted as part of this alternative.

The installed soil cover on the Phase I and Phase II NTCRA areas varies from one foot to four feet in thickness. This soil cover will control erosion and migration of contaminated soil. The cover is contoured so as to control erosion and sedimentation, and was compacted and vegetated with native grasses and plant species. For this alternative, the existing soil cover and site fencing will be inspected on an annual basis and after major storm events to ensure that integrity is maintained. Cover restoration and fence repairs will be performed, as needed, based upon inspection results. For costing purposes, it is assumed that inspections will be conducted annually.

Because contaminated soil that poses a potential human health risk will remain at the site, LUCs will be required for this alternative to mitigate the potential risk for industrial users. See **Figure 2-9**. LUCs will include restrictions on intrusive activities on the site that are documented in the Base Master Plan, maintenance of perimeter fence, recording a Notice per NCGS 143B-279.9 and .10, and deed and/or lease restrictions in the event that the property is transferred. Also, because hazardous substances will remain at Site

84 under this RAA, the NCP [40 CFR 300.430(f)(4)] requires the lead agency to review the effectiveness of this alternative at least once every five years.

2.9.5 Common Elements and Distinguishing Features

The No Action alternative does not protect human health and the environment but is presented as a baseline for comparison purposes. With the exception of the no action alternative, the common elements of the remedial alternatives include compliance with ARARs and implementability. RAA 2 is distinguished from RAA 3 and RAA 4 in its expected timeframe to reach cleanup of the site. All contamination remaining at the site above 1 ppm PCBs will be removed and disposed of as part of RAA 2 so the timeframe is relatively short in comparison to RAA 3 and RAA 4. Because of the significant effort required to achieve RAA 2, the cost of this alternative is close to double the $3.5 million cost already spent in performing the three NTCRAs.

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

Each remedial alternative for Site 84 was evaluated against the nine criteria listed below. Alternative RAA 1 (No Action) does not achieve the RAO and is not considered further in this ROD. A comparison of alternatives is presented in **Table 2-16**. The Site 84 FS Amendment provides a more detailed comparative analysis of alternatives.

- Protection of Human Health and the Environment—Addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

- Compliance with ARARs—Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA §121(d)(4).

- Long-Term Effectiveness and Permanence—Refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain on

site following remediation and the adequacy and reliability of controls.

- Reduction of Toxicity, Mobility, or Volume Through Treatment—Refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

- Short-Term Effectiveness—Addresses the period of time needed to implement the remedy and any adverse impacts to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

- Implementability—Addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

- Cost—Refers to the estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of -30 to +50 percent.

- State Acceptance—Considers whether the state or commonwealth agrees with the analyses and recommendations.

- Community Acceptance—Considers whether the local community agrees with the analyses and preferred alternative.

2.10.1 Threshold Criteria

2.10.1.1 Protection of Human Health and the Environment

Each alternative will protect human health and the environment for the desired future land use. RAA 2 is most protective of human health and the environment because soil exceeding the chemical-specific TBC cleanup goals is removed from the site. For RAA 3 and RAA 4, protection of human health and the environment will be achieved with implementation and proper maintenance of LUCs.

2.10.1.2 Compliance with ARARs

All of the RAAs meet the applicable chemical-specific TBC requirements and action-specific ARARs along with remediation goals for the desired future land use. See **Table 2-17** and **Table 2-18** for details of the chemical-specific TBC requirements and action-specific ARARs for Site 84, respectively.

2.10.2 Primary Balancing Criteria

2.10.2.1 Long-Term Effectiveness and Permanence

RAA 2 is most effective of the remaining alternatives because contaminated soil above 1 ppm PCBs will be completely removed from the site. Both RAA 3 and RAA 4 will be effective in the long term if the soil cover is properly maintained into the future.

2.10.2.2 Reduction in Toxicity, Mobility, or Volume

None of the three remaining alternatives will reduce toxicity, mobility, or volume of contaminants through treatment. RAA 2 includes disposal of PCB contaminated soil in approved landfills. RAA 3 and RAA 4 that include future and existing soil covers, respectively, will reduce contact with contaminated soil by human receptors, so the potential for toxicity will be reduced.

2.10.2.3 Short Term Effectiveness

For RAA 2 and RAA 3 to be effective in the short term, worker and environmental protection plans will need to be in place. Because of the significant amount of excavation required for RAA 2, there is a possibility of increased risk for workers and community members. RAA 3 will be physically effective in protecting human health and the environment in a shorter time frame than RAA 2. There are no short-term risks associated with RAA 4 that may impact human health or the environment. It is estimated that the alternative construction/remediation efforts can be implemented in one year or less.

2.10.2.4 Implementability

All of the remaining alternatives have an easy level of difficulty to implement, and similar work to RAA 2, RAA 3, and RAA 4 has been completed successfully at Site 84 or at other CERCLA sites on Camp Lejeune.

2.10.2.5 Cost

At $6,400,000, RAA 2 has a low cost efficiency because it permits high occupancy land use but at a cost that is nearly double the cost of NTCRAs completed to date at Site 84. RAA 4 is the most cost-efficient alternative because, at a very reasonable cost, it permits low occupancy land use of Site 84, the MCB Camp Lejeune planned land use. RAA 3 is moderately cost efficient because it permits high occupancy land use, with restrictions on intrusive activities, at a moderate cost.

2.10.3 Modifying Criteria

2.10.3.1 State Acceptance

State acceptance as a criterion is a statutory requirement that requires state involvement. For all MCB Camp Lejeune projects, including this project, state involvement is achieved by including state officials in a Partnering Team that meets routinely throughout the entire remedial process. Comments from state officials are invited and addressed throughout the development of the RI, FS, the PRAP, and the ROD, as appropriate. NCDENR, as the designated state support agency in North Carolina, has reviewed this ROD and has given concurrence on the Selected Remedy.

2.10.3.2 Community Acceptance

The public meeting was held on April 29, 2008 to present the PRAP and answer community questions regarding the proposed plan at Site 84. There were no concerns raised at the meeting, and the questions were general inquiries for information purposes only. No significant comments were received from the public. Detailed information on the public meeting is provided in the Responsiveness Summary of this ROD.

2.11 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site whenever practicable. The "principal threat" concept is applied to the characterization of "source material" at a Superfund site. Principal threat wastes are those source materials considered to be 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.

The three NTCRAs used landfill disposal to address the principal threats posed by the PCB contamination at Site 84. Following the three NTCRAs, PCB contaminated soil and PCB waste soil, i.e., soil contaminated with greater than 50 ppm PCBs, remain at the site

under a minimum two-foot thick soil cover. Note that PCBs are not very mobile, and have never been detected in the site groundwater. Treatment is not a practical alternative for relatively large volumes of PCB contaminated soil and PCB waste soil, because of the significant cost of incineration. In addition, a possible byproduct of the incineration process could be dioxin, which is a highly toxic carcinogen.

Three of the four RAAs – RAA 1, RAA 3, and RAA 4 - would leave the existing PCB contaminated soil and PCB waste in place under a soil cover, and one RAA – RAA 2 - would excavate and dispose of the PCB contaminated soil and PCB waste soil in approved landfills. To quantify the concentrations of PCB remaining on site, the Phase II NTCRA site area has been divided into approximate 0.5 acre increments. Over approximately four acres of the site, the average PCB concentration remaining in the soil ranges from 0.8 ppm to 4 ppm. Only six of 33 confirmation samples were above 10 ppm PCB in the far western area of Phase II, and none of the post excavation samples exceeded 50 ppm in this area.

In the Phase III NTCRA area, however, the average PCB concentration beneath a two-foot soil cover over 0.5 acre is 55 ppm. Contamination exceeds 50 ppm in the local area of the utility corridor because excavation could not be performed due to the impracticality of digging into an area lined with numerous power lines, gas lines, and fiber optic lines. However, with the geotextile liner under the roadway base material acting as a separation fabric, PCB concentrations under the road from 0.1 ppm to 1700 ppm can be removed from the calculation because they are essentially capped. Under this scenario, the average PCB concentration in the Phase III NTCRA area falls to 37 ppm.

With PCBs at Site 84 being highly immobile, the average PCB concentrations falling below the highly toxic level of 50 ppm, and with the LUCs being required for all viable alternatives where PCB contaminated soil and PCB waste soil are to remain in place, the PCB-contaminated soil source remaining at Site 84 after the NTCRAs should not constitute a principal threat.

2.12 SELECTED REMEDY

Alternative RAA 4, PCB Removal Actions with LUCs, is the Selected Remedy to address PCB soil contamination at Site 84.

2.12.1 Summary of Rationale for the Selected Remedy

For Alternative RAA 4, protection of human health and the environment will be achieved with implementation and proper maintenance of LUCs. And RAA 4 meets the applicable chemical-specific TBC and action-specific ARARs along with remediation goals for the anticipated future industrial land use. If the soil cover is properly maintained into the future, RAA 4 will be effective in the long term. RAA 4 that includes an existing soil cover and a separation fabric under the roadway above high PCB contamination that could not be excavated, will reduce contact with contaminated soil by human receptors, so the potential for toxicity will be reduced.

There are no short-term risks associated with RAA 4 that may impact human health or the environment. Implementability of RAA 4 would be easy going forward because the actions (i.e., three NTCRAs) have already been implemented. And, RAA 4 is the most cost-efficient alternative because, at a very reasonable cost, it permits the planned low occupancy industrial land use of Site 84.

The Selected Remedy is the best choice among the alternatives because:

- The three earlier NTCRAs removed a large volume of PCB contaminated soil and PCB waste soil and covered the remaining PCB contaminated soil and PCB waste soil with a soil cover,

- LUCs will be instituted to prevent unacceptable land uses and intrusive activities to effectively eliminate the exposure pathways and reduce risk to an acceptable level;

- MCB Camp Lejeune's plan for low occupancy industrial land use is met with the Selected Remedy; and

- The Selected Remedy is cost effective, will meet the RAO, as well as comply with ARARs and TBC.

Based on information currently available, the Navy, MCB Camp Lejeune, and the USEPA, in conjunction with NCDENR, believe the Selected Remedy provides the best balance of tradeoffs for the site and is protective of human health and complies with all ARARs.

2.12.2 Description of the Selected Remedy

The Selected Remedy for Site 84, PCB Removal Actions with LUCs, includes the application of LUCs to Site 84 following the PCB removal actions conducted in three phases of NTCRAs in 2002, 2004, and 2006 (Rhēa, 2007). The three earlier NTCRAs removed PCB contaminated soil and PCB waste soil and implemented a soil cover over PCB contaminated soil remaining in place. Removal actions at Site 84, OU 19, included the following:

- 1999 – Abandoned Portions of Building 45 Removed;
- 2002 – Phase I NTCRA – Removal of Building 45 Foundation and Surrounding Contaminated Soil;
- 2004 – Phase II NTCRA – Removal of PCB Contaminated and Commingled PCB/Total Petroleum Hydrocarbons (TPH) Contaminated Soil and Sediment; Removal of Concrete-Encased Steel Pipe that originated in the former Building 45 and discharged into the former Lagoon; and removal and backfilling of the Lagoon; and
- 2006 – Phase III NTCRA – Removal of PCB Contaminated Soil and PCB Waste Soil to a depth of two feet and Soil Cover of PCB Contaminated Soil and PCB Waste Soil remaining in place at a depth greater than two feet beneath the final surface at a concentration greater than 10 ppm.

In 1999, the aboveground portion of Building 45 was removed. In 2002, the Phase I NTCRA was conducted in which the foundation of Building 45 and surrounding PCB contaminated soil were removed. During this NTCRA, 4,860 tons of PCB-contaminated soil (i.e., <50 ppm) was excavated and disposed of at the Sampson County Landfill, a local permitted facility in Rosewood, North Carolina. In addition, 143 tons of TSCA PCB waste soil (Toxic Substances Control Act – TSCA) (i.e., >50 ppm) was excavated and disposed of at the Wayne Disposal, Inc. facility, a TSCA landfill in Belleville, Michigan. PCB contaminated soil was removed to a concentration of 1 ppm. The minimum depth of excavation in the Phase I NTCRA area was four feet. After excavation was completed, the area was backfilled with off-site clean soil.

In 2004, a Phase II NTCRA was completed that attempted to address the remaining contamination on site. The excavation volume included 11,600 tons of PCB-contaminated soil and sediment and 360 tons of TSCA PCB waste soil. The PCB-contaminated soil and sediment was disposed of at the Sampson County Landfill, and the

TSCA PCB waste soil was disposed of at the Clean Harbors Lone Mountain Landfill, a TSCA landfill in Waynoka, Oklahoma. Confirmation testing performed after excavation verified that the soil in the base of the excavation from zero to two feet was below the remediation goal of 10 ppm for industrial low-occupancy land use. However, confirmation sampling also identified several Phase II NTCRA excavation sidewall areas with soil PCB concentrations greater than or equal to 10 ppm. The sample results appeared to indicate a significant southwestern extension of PCB contamination. Following excavation, the area was backfilled with off-site clean soil.

From June through August 2006, a Phase III NTCRA was conducted at Site 84, south and west of the Phase I and Phase II NTCRA areas. Where possible, surface soils impacted with PCBs at concentrations greater than or equal to 50 ppm were excavated and disposed of off site at the Wayne Disposal, Inc. facility, a TSCA landfill in Belleville, Michigan. The area of soil removal was 5,800 square feet, and 696 tons of TSCA PCB waste soil was disposed of at the Belleville, Michigan facility. The excavated areas were backfilled with a minimum of two feet of clean soil cover supplied by the MCB Camp Lejeune French Creek borrow area. In areas where mass excavation was not feasible due to numerous buried, active utility and communication lines or PCB concentrations were less than 50 ppm at the surface, a minimum of two feet of clean soil cover was placed above the existing surface. The area of soil cover in the Phase III NTCRA area is 18,300 square feet. Prior to backfilling, the existing in-place soil was sampled and analyzed for PCBs. In addition, as part of this removal action, the existing four-foot high fence along the northeastern border of the site was extended to Northeast Creek, and the entire site was revegetated. The three NTCRA phases were completed at a cost of approximately 3.5 million dollars.

Following the completion of three NTCRAs, all known surface soil PCB contamination concentrations do not exceed 10 ppm PCBs. The site is cleared for industrial land use, but not residential land use, because of surface soil (i.e., less than two feet in depth) concentrations in excess of 1 ppm PCBs. RAA 4 proposes the use of LUCs to permit industrial or low occupancy land use at Site 84 and to prevent unacceptable land uses and intrusive activities in areas with subsurface soil (i.e., greater than two foot depth) concentrations are still greater than 10 ppm PCBs.

The LUCs will be implemented and maintained until the concentration of hazardous substances (i.e., PCBs) in the soil are at such levels that allow for unrestricted use and unlimited exposure. The Navy and MCB Camp Lejeune are responsible for implementing, maintaining, reporting on, and enforcing the LUCs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property agreement, or through other means, the Navy and MCB Camp Lejeune shall retain

ultimate responsibility for the remedy integrity. The Navy and MCB Camp Lejeune or any subsequent owners shall not modify, delete, or terminate any LUC without USEPA and NCDENR concurrence.

The performance objectives of the LUCs at Site 84 are to:

- Prohibit the development and use of the site for residential housing, elementary and secondary schools, child care facilities, and recreational areas within the LUC boundaries of the site;
- Prohibit intrusive activities within the areas with PCB contamination greater than 10 ppm in subsurface soils, i.e., greater than two-foot depth; and
- Maintain the integrity of the 24 inch vegetative soil cover to limit exposure to subsurface soils with PCB contamination greater than 10 ppm.

The area of Site 84 to be covered by LUCs (i.e., LUC boundaries) are identified in **Figure 1-1.** The following generally describes the LUCs which will be implemented at Site 84 in order to achieve the LUC performance objectives detailed above:

1. Incorporating land use prohibitions into the MCB Camp Lejeune Base Master Plan;
2. Recording a Notice of Contaminated Site filed in Onslow County real property records per North Carolina General Statues (NCGS) 143B 279.9 and 143B-279.10;
3. Monitoring and maintenance of the Site 84 soil cover and fence; and
4. Deed and/or lease restrictions in the event of transfer for any portion of Site 84.

The Navy shall prepare, in accordance with USEPA guidance, and submit to the USEPA and NCDENR, a Remedial Design (RD) containing LUC implementation and maintenance actions, including periodic inspections, within 90 days of the ROD signature, for review and approval. The Navy shall also submit the document memorializing remedial action completion within 120 days following completion of the remedial action for Site 84. The Navy will be and MCB Camp Lejeune are responsible for implementing, maintaining, inspecting, reporting on, and enforcing the LUCs described in this ROD in accordance with the ROD and the approved RD.

PCB contaminated soil at a concentration greater than 10 ppm in subsurface soils (i.e., greater than two-foot depth) could affect future construction workers at the site. The exposure routes include inhalation, ingestion, and dermal contact. Therefore, intrusive activities will be prohibited in the areas identified on **Figure 1-1**, unless specifically

approved by both NCDENR and USEPA. If future work is required in these prohibited areas, the workers will need to be properly trained, briefed regarding the site risks, and shall don appropriate PPE prior to working in these areas. In addition, the excavated soil may not be placed back into the excavation area but must be disposed of at a TSCA Landfill if the concentrations exceed 50 ppm or in a lined landfill if the concentrations are above 1 ppm.

2.12.3 Summary of the Estimated Remedy Costs

The estimated costs for Alternative RAA 4, PCB Removal Actions with LUCs, are summarized in **Table 2-15** and detailed in **Table 2-19**. The information in this cost estimate is based on the best available information regarding the anticipated scope of the Selected Remedy. Changes in the cost estimate may occur as a result of new information. Major changes will be documented in the form of a memorandum in the Administrative Record file. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 percent to -30 percent of the actual costs. A complete cost summary for each remedial alternative is provided in the Final FS Amendment (Rhēa, 2008).

2.12.4 Expected Outcomes of the Selected Remedy

Future land use plans by MCB Camp Lejeune for Site 84 are low occupancy industrial such as unoccupied areas outside of a building or storage area in a warehouse at an industrial facility. When Alternative RAA 4 is implemented, exposure for construction workers will be controlled through LUCs until PCB concentrations are reduced to acceptable levels for unlimited exposure and unrestricted use. Once the utility corridor lease agreements are scheduled for renewal, the utility companies (i.e., ones with utilities within the PCB Area of Concern [AOC]) will be notified of the contaminated area and given the option to either properly excavate and dispose of PCB contaminated soil and PCB waste soil (see **Section 2.12.2**) or relocate their utilities outside of the PCB AOC.

2.13 STATUTORY DETERMINATIONS

Remedial actions undertaken at NPL sites must meet the statutory requirements of Section 121 of CERCLA and thereby achieve adequate protection of human health and the environment, comply with ARARs of both federal and state laws and regulations, be cost-effective, and use, to the maximum extent practicable, permanent solutions and alternative treatment or resource recovery technologies. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, and/or mobility of hazardous waste as the principal element. The

following discussion summarizes the statutory requirements that are met by the Selected Remedy.

2.13.1 Protection of Human Health and the Environment

For the Selected Remedy RAA 4, low occupancy industrial land use would be permitted at Site 84. The contamination levels now present at Site 84 are acceptable for industrial use but not residential use. Therefore, by establishing the LUCs proposed in RAA 4, human health risks associated with unwarranted residential use and the potential for exposing industrial users to PCB concentrations greater than 10 ppm PCBs through intrusive activities are mitigated. The goal of reducing potential human health risks is appropriately achieved for those granted access to Site 84.

2.13.2 Compliance with ARARs and To Be Considered (TBC) Criteria

CERCLA Section 121(d), specifies in part, that 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 [see also 40 Code of Federal Regulations (CFR) 300.430(f)(1)(ii)(B)]. ARARs include only federal and state environmental or facility siting laws/regulations and do not include occupational safety or worker protection requirements. In addition, per 40 CFR 300.405(g)(3), other advisories, criteria, or guidance may be considered in determining remedies (so-called To-Be-Considered [TBC] guidance category.

In accordance with 40 CFR 300.400(g), the Navy, NCDENR, and USEPA have identified the specific ARARs and TBCs for the selected remedy. The selected remedy complies with all ARARs related to implementing the selected action. **Tables 2-17** and **2-18** list the Chemical-specific and Action-specific ARARs, as well as the TBCs which were considered in the implementation of the selected remedy. As noted above, a major component of the selected remedy for Site 84 (three NTCRAs) were implemented prior to finalization of this ROD. The regulatory requirements for the work conducted as removal actions are identified herein as ARARs. Consequently, most of the Action-specific ARARs have been complied with by the Navy while implementing the removal actions.

2.13.3 Cost Effectiveness

The Selected Remedy, Alternative RAA 4, is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used, “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. Overall effectiveness was compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to represent a reasonable value for the money to be spent, taking into account the MCB Camp Lejeune plan for reuse of the site.

The estimated net present worth cost for RAA 4 is $50,804. RAA 4 is cost-effective because it permits low occupancy land use for Site 84, as planned, at a low cost.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The Navy, MCB Camp Lejeune, USEPA, and the State of North Carolina determined that the Selected Remedy, Alternative RAA 4, represents the maximum extent to which permanent solutions can be used in a practicable manner at Site 84. Over $3.5 million was spent in removing and disposed of PCB contaminated soil and PCB waste soil from Site 84. Because of the remaining site risks, LUCs will be implemented to prevent residential development on the site and to control intrusive activities for future construction workers.

2.13.5 Preference for Treatment as a Principal Element or Explanation of Why Not Satisfied

As discussed above in **Section 2.11,** the Selected Remedy RAA 4, does not include treatment as a principal element. Treatment is not a practical alternative for relatively large volumes of PCB contaminated soil and PCB waste soil because of the significant cost of incineration. In addition, a possible byproduct of the incineration process could be dioxin, which is a highly toxic carcinogen. The three NTCRAs used landfill disposal to address the principal threats posed by the PCB contamination at Site 84. Following the three NTCRAs, PCB contaminated soil and PCB waste soil, i.e., soil contaminated with greater than 50 ppm PCBs, remain at the site under a minimum two-foot thick soil cover and LUCs will be implemented to control remaining site risks.

2.13.6 Five-Year Review Requirements

This 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 CFR300.430(f)(4)(ii) a statutory review will be conducted by the Navy within five 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 because LUCs have failed, additional remedial actions would be evaluated by the FFA parties and the Navy may be required to undertake additional remedial action.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The PRAP for Site 84 was released for public comment on April 29, 2008. The PRAP identified Alternative RAA 4, PCB Removal Actions with LUCs, as the Preferred Alternative for soil remediation. The Navy reviewed the comments made during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the PRAP, were necessary or appropriate.

3.0 RESPONSIVENESS SUMMARY

In accordance with Section 113 and 117 of CERCLA, the Navy provided a public comment period April 29 through May 27, 2008, for the proposed remedial action described in the FS and PRAP for Site 84. A public meeting to present the PRAP was held at the Coastal Carolina Community College, located in Jacksonville, North Carolina, on April 29, 2008. Public notice of the meeting and availability of documents was placed in *The Jacksonville Daily News* newspaper on April 21, 2008.

The participants in the Public Meeting held on April 29, 2008, included representatives of the Navy, MCB Camp Lejeune, USEPA, and NCDENR. Five community members attended the meeting. Questions received during the public meeting were general inquiries and are described in the PRAP Public Meeting minutes included as **Appendix C**. There were no significant comments received at the public meeting requiring amendment to the PRAP, and no additional written comments, concerns, or questions were received from community members during the public comment period.

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TABLES

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
DIRECT PUSH SAMPLES									
IR84-DP01-00	7/17/01	0-1'			< 1.0				
IR84-DP01-02	7/17/01	3-5'							
IR84-DP02-00	7/17/01	0-1'			< 1.0				
IR84-DP02-03	7/17/01	5-7'							
IR84-DP03-00	7/17/01	0-1'			1.0 - 10.0				
IR84-DP03-02	7/17/01	3-5'							
IR84-DP04-00	7/17/01	0-1'			< 1.0				
IR84-DP04-04	7/17/01	7-9'							
IR84-DP04-05	7/17/01	9-11'							
IR84-DP05-00	7/17/01	0-1'			< 1.0				
IR84-DP05-04	7/17/01	7-9'							
IR84-DP05-05	7/17/01	9-11'							
IR84-DP06-00	7/17/01	0-1'	1611	IR84-DP06-00	< 1.0	X			
IR84-DP07-00	7/17/01	0-1'			< 1.0				
IR84-DP08-00	7/17/01	0-1'							
IR84-DP08-05	7/17/01	9-11'							
IR84-DP09-00	7/18/01	0-1'			1.0 - 10.0				
IR84-DP09-03	7/18/01	5-7'							
IR84-DP09-04	7/18/01	7-9'							
IR84-DP10-00	7/18/01	0-1'			1.0 - 10.0				
IR84-DP10-02	7/18/01	3-5'							
IR84-DP10-05	7/18/01	9-11'							
IR84-DP11-00	7/18/01	0-1'			< 1.0				
IR84-DP11-02	7/18/01	3-5'							
IR84-DP12-00	7/18/01	0-1'			10.0 - 50.0				
IR84-DP12-02	7/18/01	3-5'							
IR84-DP13-00	7/18/01	0-1'			1.0 - 10.0				
IR84-DP13-03	7/18/01	5-7'							
IR84-DP14-00	7/18/01	0-1'			< 1.0				
IR84-DP14-02	7/18/01	3-5'							
IR84-DP14-03	7/18/01	5-7'							
IR84-DP15-00	7/18/01	0-1'			< 1.0				
IR84-DP15-02	7/18/01	3-5'							
IR84-DP15-03a	7/18/01	5-7'	1429	IR84-DP15-03				X	

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Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
IR84-DP15-03b	7/18/01	5-7'							
IR84-DP16-00	7/18/01	0-1'			< 1.0				
IR84-DP16-04	7/18/01	7-9'							
DIRECT PUSH SAMPLES (cont.)									
IR84-DP17-00	7/19/01	0-1'			< 1.0				
IR84-DP17-02	7/19/01	3-5'							
IR84-DP18-00	7/19/01	0-1'	0752	IR84-DP18-00	10.0 - 50.0	X			
IR84-DP18-02	7/19/01	3-5'	0756	IR84-DP18-02	> 50.0	X			
IR84-DP19-00	7/19/01	0-1'			1.0 - 10.0				
IR84-DP19-01	7/19/01	1-3'							
IR84-DP20-00	7/19/01	0-1'	0831	IR84-DP20-00	< 1.0	X			
IR84-DP20-02	7/19/01	3-5'							
IR84-DP21-00	7/19/01	0-1'			1.0 - 10.0				
IR84-DP21-04	7/19/01	7-9'							
IR84-DP22-00	7/19/01	0-1'	1036	IR84-DP22-00 IR84-DP22-00-D	< 1.0	X			
IR84-DP23-00	7/19/01	0-1'			1.0 - 10.0				
IR84-DP24-00	7/19/01	0-1'			< 1.0				
IR84-DP25-00	7/19/01	0-1'			10.0 - 50.0				
IR84-DP26-00	7/19/01	0-1'			1.0 - 10.0				
IR84-DP26-01	7/19/01	1-3'							
IR84-DP26-02	7/19/01	3-5'							
IR84-DP27-00	7/19/01	0-1'	1254	IR84-DP27-00	1.0 - 10.0	X			
IR84-DP28-00	7/19/01	0-1'			10.0 - 50.0				
IR84-DP28-01	7/19/01	1-3'			< 1.0				
IR84-DP29-00	7/19/01	0-1'	1315	IR84-DP29-00	1.0 - 10.0	X			
IR84-DP29-01	7/19/01	1-3'							
IR84-DP30-00	7/19/01	0-1'			< 1.0				
IR84-DP30-03	7/19/01	5-7'							
IR84-DP31-00	7/19/01	0-1'			1.0 - 10.0				
IR84-DP32-00	7/20/01	0-1'			> 50.0				
IR84-DP33-00	7/20/01	0-1'	1000	IR84-DP33-00	1.0 - 10.0	X			
IR84-DP33-01	7/20/01	1-3'							
IR84-DP34-00	7/20/01	0-1'			< 1.0				
IR84-DP34-01	7/20/01	1-3'							

TABLE 2-1
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Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
IR84-DP35-00	7/20/01	0-1'			1.0 - 10.0				
IR84-DP35-03	7/20/01	5-7'							
IR84-DP36-00	7/20/01	0-1'	1112	IR84-DP36-00	1.0 - 10.0	X	X		
IR84-DP36-03	7/20/01	5-7'							
IR84-DP37-00	7/20/01	0-1'	1335	IR84-DP37-00	< 1.0	X			
IR84-DP37-04	7/20/01	7-9'							
DIRECT PUSH SAMPLES (cont.)									
IR84-DP37-06	7/20/01	11-13'							
IR84-DP38-00	7/20/01	0-1'			< 1.0				
IR84-DP39-00	7/20/01	0-1'			< 1.0				
IR84-DP40-00	7/20/01	0-1'			< 1.0				
IR84-DP41-00	7/20/01	0-1'	1545	IR84-DP41-00	10.0 - 50.0	X			
IR84-DP42-00	7/20/01	0-1'	1610	IR84-DP42-00 IR84-DP42-00D	1.0 - 10.0	X			
IR84-DP43-00	7/20/01	0-1'			1.0 - 10.0				
IR84-DP44-00	7/20/01	0-1'			1.0 - 10.0				
IR84-DP45-00	7/21/01	0-1'	0845	IR84-DP45-00				X	
IR84-DP45-03	7/21/01	5-7'	0850	IR84-DP45-03				X	
IR84-DP46-00	7/21/01	0-1'	0915	IR84-DP46-00				X	
IR84-DP46-02	7/21/01	3-5'	0930	IR84-DP46-02				X	
IR84-DP47-00	7/21/01	0-1'	0935	IR84-DP47-00				X	
IR84-DP47-01	7/21/01	1-3'	0940	IR84-DP47-01				X	
IR84-DP48-00	7/21/01	0-1'	0955	IR84-DP48-00				X	
IR84-DP49-00	7/21/01	0-1'	1010	IR84-DP49-00				X	
IR84-DP49-01	7/21/01	1-3'	1012	IR84-DP49-01				X	
IR84-DP50-00	7/21/01	0-1'	1028	IR84-DP50-00				X	
IR84-DP50-01	7/21/01	1-3'	1030	IR84-DP50-01				X	
IR84-DP51-00	7/21/01	0-1'	1043	IR84-DP51-00				X	
IR84-DP51-01	7/21/01	1-3'	1045	IR84-DP51-01				X	
IR84-DP52-00	7/21/01	0-1'	1055	IR84-DP52-00				X	
IR84-DP52-01	7/21/01	1-3'	1100	IR84-DP52-01				X	
IR84-DP53-00	7/21/01	0-1'	1130	IR84-DP53-00				X	
IR84-DP54-00	7/21/01	0-1'	1140	IR84-DP54-00				X	
IR84-DP55-00	7/21/01	0-1'	1150	IR84-DP55-00				X	
IR84-DP56-00	7/21/01	0-1'			1.0 - 10.0				

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
IR84-DP56-01	7/21/01	1-3'							
IR84-DP57-00	7/21/01	0-1'			< 1.0				
IR84-DP58-00	7/22/01	0-1'			1.0 - 10.0				
IR84-DP58-01	7/22/01	1-3'							
IR84-DP59-00	7/22/01	0-1'							
IR84-DP59-01	7/22/01	1-3'							
IR84-DP60-00	7/22/01	0-1'			1.0 - 10.0				
IR84-DP60-01	7/22/01	1-3'							
IR84-DP61-00	7/22/01	0-1'			1.0 - 10.0				
DIRECT PUSH SAMPLES (cont.)									
IR84-DP61-01	7/22/01	1-3'							
IR84-DP62-00	7/22/01	0-1'			1.0 - 10.0				
IR84-DP62-01	7/22/01	1-3'							
IR84-DP63-00	7/22/01	0-1'	1200	IR84-DP63-00	10.0 - 50.0	X			
IR84-DP63-01	7/22/01	1-3'	1205	IR84-DP63-01	1.0 - 10.0	X			
IR84-DP64-00	7/22/01	0-1'			> 50.0				
IR84-DP64-01	7/22/01	1-3'			1.0 - 10.0				
IR84-DP65-00	7/22/01	0-1'	1224	IR84-DP65-00	10.0 - 50.0	X			
IR84-DP65-02	7/22/01	3-5'	1228	IR84-DP65-02	1.0 - 10.0	X			
IR84-DP66-00	7/22/01	0-1'			< 1.0				
IR84-DP66-02	7/22/01	3-5'							
IR84-DP67-00	7/22/01	0-1'			10.0 - 50.0				
IR84-DP68-00	7/22/01	0-1'			< 1.0				
IR84-DP69-00	7/22/01	0-1'	1505	IR84-DP69-00 IR84-DP69-00D	< 1.0	X			
IR84-DP70-00	7/22/01	0-1'			< 1.0				
IR84-DP71-00	7/22/01	0-1'	1525	IR84-DP71-00	1.0 - 10.0	X			
IR84-DP72-00	7/23/01	0-1'			< 1.0				
IR84-DP73-00	7/23/01	0-1'			< 1.0				
IR84-DP74-00	8/2/01	0-1'	1030	IR84-DP74-00					X
IR84-DP74-04	8/2/01	7-9'	1050	IR84-DP74-04					X
IR84-DP75-00	8/2/01	0-1'	1105	IR84-DP75-00					X
IR84-DP75-05	8/2/01	9-11'	1140	IR84-DP75-05					X
IR84-DP76-00	8/2/01	0-1'	1155	IR84-DP76-00					X
IR84-DP76-04	8/2/01	7-9'	1205	IR84-DP76-04					X

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
IR84-DP77-00	8/5/01	0-1'	1750	IR84-DP77-00					X
IR84-DP77-03	8/5/01	5-7'	1755	IR84-DP77-03					X
IR84-DP78-00	8/5/01	0-1'	1720	IR84-DP78-00					X
IR84-DP78-03	8/5/01	5-7'	1735	IR84-DP78-03					X
IR84-DP79-00	8/5/01	0-1'	1650	IR84-DP79-00					X
IR84-DP79-02	8/5/01	3-5'	1705	IR84-DP79-02 IR84-DP79-02D					X

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
DIRECT PUSH SAMPLES (cont.)									
IR84-DP80-00	8/5/01	0-1'	1630	IR84-DP80-00					X
IR84-DP80-02	8/5/01	3-5'	1640	IR84-DP80-02					X
IR84-DP81-00	8/5/01	0-1'	1455	IR84-DP81-00					X
IR84-DP81-04	8/5/01	7-9'	1515	IR84-DP81-04					X
IR84-DP82-00	8/5/01	0-1'	1530	IR84-DP82-00					X
IR84-DP82-04	8/5/01	7-9'	1545	IR84-DP82-04					X
IR84-DP83-00	8/5/01	0-1'	1600	IR84-DP83-00					X
IR84-SP83-03	8/5/01	5-7'	1610	IR84-DP83-03					X
IR84-DP84-00	8/3/01	0-1'	1015	IR84-DP84-00					X
TEST PIT SAMPLES									
IR84-TP01A	7/23/01		1145	IR84-TP01A		X			
IR84-TP01B	7/23/01		1145	IR84-TP01B		X			
IR84-TP02A	7/23/01		1145	IR84-TP02A		X			
IR84-TP02B	7/23/01		1145	IR84-TP02B		X			
IR84-TP03A	7/23/01		1200	IR84-TP03A		X			
IR84-TP03B	7/23/01		1200	IR84-TP03B		X			
MONITORING WELL BORINGS									
IR84-MW15-00	7/31/01	0-1'	0730	IR84-MW15-00					X
IR84-MW15-04	7/31/01	7-9'	0810	IR84-MW15-04					X
IR84-MW16-00	7/31/01	0-1'	0930	IR84-MW16-00		X			
IR84-MW16-07	7/31/01	13-15'	1000	IR84-MW16-07		X			
IR84-MW17-00	7/31/01	0-1'	1325	IR84-MW17-00					X
IR84-MW17-07	7/31/01	13-15'	1435	IR84-MW17-07					X
IR84-MW18-00	8/1/01	0-1'	0710	IR84-MW18-00		X			
IR84-MW18-04	8/1/01	7-9'	0736	IR84-MW18-04		X			
IR84-MW19-00	8/1/01	0-1'	0938	IR84-MW19-00		X			
IR84-MW19-06	8/1/01	11-13'	1010	IR84-MW19-06		X			
IR84-MW20-00	8/1/01	0-1'	1300	IR84-MW20-00 IR84 MW20-00D					X
IR84-MW21-04	8/2/01	7-9'	0815	IR84-MW21-04					X
IR84-MW22-02	8/3/01	3-5'	1200	IR84-MW22-02					X
IR84-MW23-01	8/3/01	1-3'	0925	IR84-MW23-01					X

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
SOIL BORINGS									
IR84-SB01-02	8/2/01	3-5'	1450	IR84-SB01-02					X
IR84-SB02-02	8/2/01	3-5'	1435	IR84-SB02-02					X
IR84-SB03-02	8/2/01	3-5'	1230	IR84-SB03-02					X
IR84-SB04-02	8/2/01	3-5'	1500	IR84-SB04-02					X
IR84-SB05-01	8/3/01	1-3'	1240	IR84-SB05-01					X
IR84-SB06-01	8/2/01	1-3'	1525	IR84-SB06-01 IR84-SB06-01D					X
IR84-SB07-01	8/2/01	1-3'	1545	IR84-SB07-01					X
IR84-SB08-01	8/2/01	1-3'	1555	IR84-SB08-01					X
1998 SOIL BORINGS									
IR84-SB02-00	4/16/98	0-6"		IR84-SB02-00		X			
IR84-SB02-01	4/16/98	6-12"		IR84-SB02-01		X			
IR84-SB04-00	4/16/98	0-6"		IR84-SB04-00		X			
IR84-SB04-01	4/16/98	6-12"		IR84-SB04-01		X			
IR84-SB08-00	4/16/98	0-6"		IR84-SB08-00		X			
IR84-SB08-01	4/16/98	6-12"		IR84-SB08-01		X			
IR84-SB10-00	4/16/98	0-6"		IR84-SB10-00		X			
IR84-SB10-01	4/16/98	6-12"		IR84-SB10-01		X			
IR84-SB15-00	4/16/98	0-6"		IR84-SB15-00		X			
IR84-SB15-01	4/16/98	6-12"		IR84-SB15-01		X			
IR84-SB21-00	4/16/98	0-6"		IR84-SB21-00		X			
IR84-SB21-01	4/16/98	6-12"		IR84-SB21-01		X			
IR84-SB23-00	4/16/98	0-6"		IR84-SB23-00		X			
IR84-SB23-01	4/16/98	6-12"		IR84-SB23-01		X			
IR84-SB25-00	4/16/98	0-6"		IR84-SB25-00		X			
IR84-SB25-01	4/16/98	6-12"		IR84-SB25-01		X			
IR84-SB26-00	4/23/98	0-6"		IR84-SB26-00		X			
IR84-SB26-01	4/23/98	6-12"		IR84-SB26-01		X			
IR84-SB27-00	4/23/98	0-6"		IR84-SB27-00		X			
IR84-SB27-01	4/23/98	6-12"		IR84-SB27-01		X			
IR84-SB28-00	4/23/98	0-6"		IR84-SB28-00		X			
IR84-SB28-01	4/23/98	6-12"		IR84-SB28-01		X			
IR84-SB29-00	4/23/98	0-6"		IR84-SB29-00		X			
IR84-SB29-01	4/23/98	6-12"		IR84-SB29-01		X			

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals
IR84-SB30-00	4/23/98	0-6"		IR84-SB30-00		X			
IR84-SB30-01	4/23/98	6-12"		IR84-SB30-01		X			
IR84-SB31-00	4/23/98	0-6"		IR84-SB31-00		X			
1995 SOIL BORINGS									
IR84-SB31-01	4/23/98	6-12"		IR84-SB31-01		X			
84-SB01A	10/26/95	0-6"		84-SB01A		X			
84-SB01B	10/26/95	6-12"		84-SB01B		X			
84-SB02A	10/26/95	0-6"		84-SB02A		X			
84-SB02B	10/26/95	6-12"		84-SB02B		X			
84-SB03A	10/26/95	0-6"		84-SB03A		X			
84-SB03B	10/26/95	6-12"		84-SB03B		X			
84-SB04A	10/26/95	0-6"		84-SB04A		X			
84-SB04B	10/26/95	6-12"		84-SB04B		X			
84-SB05A	10/26/95	0-6"		84-SB05A		X			
84-SB05B	10/26/95	6-12"		84-SB05B		X			
84-SB06A	10/26/95	0-6"		84-SB06A		X			
84-SB06B	10/26/95	6-12"		84-SB06B		X			
84-SB07A	10/26/95	0-6"		84-SB07A		X			
84-SB07B	10/26/95	6-12"		84-SB07B		X			
84-SB08A	10/26/95	0-6"		84-SB08A		X			
84-SB08B	10/26/95	6-12"		84-SB08B		X			
84-SB09A	10/26/95	0-6"		84-SB09A		X			
84-SB09B	10/26/95	6-12"		84-SB09B		X			
84-SB10A	10/26/95	0-6"		84-SB10A		X			
84-SB10B	10/26/95	6-12"		84-SB10B		X			

NOTES:
ID = Identification
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated biphenyl
GRO = Gasoline Range Organics
DRO = Diesel Range Organics

TABLE 2-1
SOIL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

					Field Analysis	Laboratory Analysis			
Sample ID	Date	Depth (bgs)	Time (hours)	Laboratory Sample ID	Ensys™PCB (ppm)	PCBs	Grain size, Total Organic Carbon	TCL VOC, SVOC, Pesticides, PCBs, GRO, DRO, TAL Metals, Cyanide	TCL VOCs, SVOCs, Pesticides, Herbicides, PCBs, VPH, EPH, TAL Metals

VPH = Volatile Petroleum Hydrocarbon
EPH = Extractable Petroleum Hydrocarbon

TABLE 2-2
GROUNDWATER SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

				Laboratory Analysis		
Sample ID	Date	Time (hours)	Laboratory Sample ID	PCBs	TCL VOCs	TCL VOC, SVOC, Pesticides, PCBs, Herbicides, TAL Metal, VPH, EPH
2001 GROUNDWATER SAMPLES						
IR84-MW07-01C	8/6/01	1200	IR84-MW07-01C			X
IR84-MW08-01C	8/6/01	1140	IR84-MW08-01C			X
IR94-MW09-01C	8/5/01	1145	IR94-MW09-01C			X
IR84-MW10-01C	8/5/01	1135	IR84-MW10-01C			X
IR84-MW16-01C	8/4/01	0935	IR84-MW16-01C			X
IR84-MW17-01C	8/6/01	0925	IR84-MW17-01C			X
IR84-MW18-01C	8/4/01	1115	IR84-MW18-01C			X
IR84-MW19-01C	8/4/01	1310	IR84-MW19-01C			X
IR84-MW20-01C	8/5/01	1915	IR84-MW20-01C IR84-MW20-01CD			X
IR84-MW21-01C	8/5/01	1000	IR84-MW21-01C			X
IR84-MW22-01C	8/5/01	1410	IR84-MW22-01C			X
IR84-MW23-01C	8/6/01	1445	IR84-MW23-01C			X
1998 GROUNDWATER SAMPLES						
AST781-GW03-98B	4/23/98	--	AST781-GW03-98B		X	
AST781-GW04-98B	4/23/98	--	AST781-GW04-98B		X	
ASI781-GW07-98B	4/22/98	--	ASI781-GW07-98B		X	
AST781-GW08-98B	4/22/98	--	AST781-GW08-98B		X	
AST781-GW11-98B	4/23/98	--	AST781-GW11-98B		X	
AST781-GW12-98B	4/23/98	--	AST781-GW12-98B		X	
1995 GROUNDWATER SAMPLES						
84-GW01-01	11/7/95	--	84-GW01-01	X		
84-GW07-01	11/7/95	--	84-GW07-01	X		
84-GW13-01	11/26/95	--	84-GW13-01	X		

NOTES:
ID = Identification
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated biphenyl
GRO = Gasoline Range Organics
DRO = Diesel Range Organics
VPH = Volatile Petroleum Hydrocarbon
EPH = Extractable Petroleum Hydrocarbon

TABLE 2-3
SURFACE WATER SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

				Laboratory Analysis	
Sample ID	Date	Time (hours)	Laboratory Sample ID	PCBs	TCL VOCs, SVOCs
1998 SURFACE WATER SAMPLES					
IR84-SW01-98B	4/19/98		IR84-SW01-98B	X	
IR84-SW02-98B	4/19/98		IR84-SW02-98B	X	
IR84-SW03-98B	4/19/98		IR84-SW03-98B	X	
IR84-SW04-98B	4/19/98		IR84-SW04-98B	X	
IR84-SW05-98B	4/19/98		IR84-SW05-98B	X	
IR84-SW06-98B	4/19/98		IR84-SW06-98B	X	
IR84-SW07-98B	4/23/98		IR84-SW07-98B		X
1995 SURFACE WATER SAMPLES					
84-SW01-01	10/26/95		84-SW01-01	X	
84-SW02-01	10/26/95		84-SW02-01	X	
84-SW03-01			inaccessible		
84-SW04-01	10/26/95		84-SW04-01	X	
84-SW05-01	10/26/95		84-SW05-01	X	
84-SW06-01	10/26/95		84-SW06-01	X	
84-SW07-01	10/26/95		84-SW07-01	X	
84-SW08-01	10/26/95		84-SW08-01	X	

NOTES:
ID = Identification
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated biphenyl

TABLE 2-4
SEDIMENT SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

				Laboratory Analysis		
Sample ID	Date	Depth	Laboratory Sample ID	Diesel Range Organics, pH, percent moisture	TCL VOC, SVOC, pH, percent moisture	PCBs
1998 SEDIMENT SAMPLES						
IR84-SD01-98B	4/19/98	0-6" bgs	IR84-SD01-98B IR84-SD01-98BD	X		X
IR84-SD05-98B	4/19/98	0-6"	IR84-SD05-98B	X		X
IR84-SD06-98B	4/19/98	0-6"	IR84-SC06-98B	X		X
IR84-SD07-98B	4/23/98	0-6"	IR84-SD07-98B		X	
1995 SEDIMENT SAMPLES						
84-SD01-01	10/26/95	0-6"	84-SD01-01			X
84-SD02-01	10/26/95	0-6"	84-SD02-01			X
84-SD03-01			inaccessible			
84-SD04-01	10/26/95	0-6"	84-SD04-01			X
84-SD05-01	10/26/95	0-6"	84-SD05-01			X
84-SD06-01	10/26/95	0-6"	84-SD06-01			X
84-SD07-01	10/26/95	0-6"	84-SD07-01			X
84-SD08-01	10/26/95	0-6"	84-SD08-01			X

NOTES:
ID = Identification
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated biphenyl

TABLE 2-5
QUALITY ASSURANCE QUALITY CONTROL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

				Laboratory Analysis					
Sample ID	Date	Time (hours)	Laboratory Sample ID	PCBs	TCL VOC	TCL VOC, SVOC, PCBs, pesticides, herbicides, metals	TCL VOC, SVOC, PCBs, pesticides, GRO, DRO, CN, metals	TCL VOCs, SVOCs, pesticides, herbicides, PCBs, VPH, EPH, TAL metals	Comments
MATRIX SPIKE/ MATRIX SPIKE DUPLICATE SAMPLES									
IR84-DP41-00	7/20/01	1545	IR84-DP41-00MS IR84-DP41-00MSD	X					
IR84-DP71-00	7/22/01	1525	IR84-DP71-00MS IR84-DP71-00MSD	X					
IR84-SB05-01	8/3/01	1240	IR84-SB05-01MS IR84-SB05-01MSD					X	
IR84-MW07-01C	8/6/01	1200	IR84-MW01-01CMS IR84-MW07-01CMSD					X	
FIELD BLANKS									
IR84-FB01	7/17/01	0830	IR84-FB01	extract and hold					DI water
IR84-FB02	7/17/01	0843	IR84-FB02	extract and hold					Drillers' water
IR84-FB03	7/21/01	0745	IR84-FB03			X			DI water
IR84-FB04	7/21/01	0730	IR84-FB04			X			Drillers' water
IR84-FB05	8/1/01	1400	IR84-FB05					X	
IR84-FB06	8/3/01	1500	IR84-FB06					X	
EQUIPMENT RINSATES									
IR84-ER01	7/17/01	0836	IR84-ER01	extract and hold					split spoon rinsate
IR84-ER02	7/18/01	0720	IR84-ER02	X					acetate sleeve rinsate
IR84-ER03	7/19/01	0705	IR84-ER03	X					metal spoon rinsate
IR84-ER04	7/20/01	0910	IR84-ER04	extract and hold					split spoon rinsate
IR84-ER05	7/21/01	0730	IR84-ER05			X			split spoon rinsate
IR84-ER06	7/22/01	1000	IR84-ER06	X					
IR84-ER07	7/23/01	0715	IR84-ER07	X					
IR84-ER08	7/31/01	1655	IR84-ER08					X	
IR84-ER09	8/1/01	1530	IR84-ER09					X	
IR84-ER10	8/2/01	1630	IR84-ER10					X	
IR84-ER11	8/3/01	1430	IR84-ER11					X	
IR84-ER12	8/6/01	1630	IR84-ER12					X	
IR84-ER13	8/7/01	1630	IR84-ER13					X	

TABLE 2-5
QUALITY ASSURANCE QUALITY CONTROL SAMPLE SUMMARY
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
REMEDIAL INVESTIGATION, CTO-0219
MCB CAMP LEJEUNE, NORTH CAROLINA

				Laboratory Analysis					
Sample ID	Date	Time (hours)	Laboratory Sample ID	PCBs	TCL VOC	TCL VOC, SVOC, PCBs, pesticides, herbicides, metals	TCL VOC, SVOC, PCBs, pesticides, GRO, DRO, CN, metals	TCL VOCs, SVOCs, pesticides, herbicides, PCBs, VPH, EPH, TAL metals	Comments
TRIP BLANKS									
IR84-TB01	7/21/01	--	TRIP BLANK		X				"Trip Blanks" on CoC
IR84-TB02	7/17/01	0800	IR84-TB02		X				CoC said 7/16/01 (error)
IR84-TB03	7/31/01	1700	IR84-TB03		X				
IR84-TB04	8/1/01	--	IR84-TB04		X				
IR84-TB05	8/2/01	--	IR84-TB05		X				
IR84-TB06	8/3/01	--	IR84-TB06		X				
IR84-TB07	8/6/01	--	IR84-TB07		X				
IR84-TB08	8/7/01	--	IT84-TB08		X				
TBIR84-TB03	7/31/01	--	TBIR84-TB03		X				

NOTES:
ID = Identification
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
PCB = Polychlorinated biphenyl
GRO = Gasoline Range Organics
DRO = Diesel Range Organics
VPH = Volatile Petroleum Hydrocarbon
EPH = Extractable Petroleum Hydrocarbon

TABLE 2-6
Soil and Sediment PCB Sampling Results - October 2005
Site 84 Operable Unit 19
MCB Camp Lejeune, North Carolina

Sample	PCB (mg/kg)	Sample	PCB (mg/kg)
SD-CONC-PIPE1	3.3	TP-08-1.0	0.66
SD-CONC-PIPE1-DUP	4.2	TP-08-2.0	3.6
SD-STEEL-PIPE1	0.082	TP-08-3.3	0.20
TP-01-1.0	0.035 U	TP-09-1.0	9.8
TP-01-1.0-DUP	0.036 U	TP-09-2.0	6.2
TP-02-1.0	0.53	TP-09-3.15	2.0
TP-03-1.0	0.037	**TP-10-1.0**	**260**
TP-03-4.0	**48**	**TP-10-1.0-DUP**	**280**
TP-03-SW-3.5	0.10	TP-10-2.0	5.6
TP-04-1.0	0.035 U	TP-10-7.0	4.3
TP-04-2.0	0.036 U	**TP-10-SW-1.5**	**78**
TP-04-3.7	0.041 U	**TP-11-1.0**	**80**
TP-05-1.0	0.036 U	**TP-11-2.0**	**110**
TP-05-2.0	0.036 U	**TP-11-7.0**	**13**
TP-05-3.3	0.040 U	**TP-12-1.0**	**58**
TP-06-1.0	0.63	**TP-12-2.0**	**310**
TP-06-2.0	0.16	TP-12-4.7	0.18
TP-06-3.5	0.041 U		
TP-07-1.0	0.26		
TP-07-2.0	0.067		
TP-07-4.0	0.23		

Notes:
Red = PCB detected >= 10 mg/kg
U = Not detected at detection limit
PCBs were analyzed by a qualified commercial laboratory using USEPA SW 846 Method 8082

TABLE 2-7
Soil PCB Sampling Results - December 2005
Site 84 Operable Unit 19
MCB Camp Lejeune, North Carolina

Sample	PCB (mg/kg)		Sample	PCB (mg/kg)
TP-13-2.0	0.51		TP-23-2.0	**11**
TP-13-SW-R	8.1		TP-23-2.0-DUP	8.3
TP-14-2.0	**1700**		TP-23-SW-R	6.6
TP-14-SW-R	**51**		TP-24-2.0	**15**
TP-15-2.0	0.93		TP-24-SW-R	2.6
TP-15-SW-R	**87**		TP-25-2.0	0.035 U
TP-16-2.0	**24**		TP-25-SW-R	6.4
TP-16-SW-R	**38**		TP-26-2.0	8.7
TP-16-SW-R-DUP	**30**		TP-26-SW-R	9.1
TP-17-2.0	0.04		**TP-27-2.0**	**22**
TP-17-2.0-DUP	0.05		**TP-27-SW-R**	**18**
TP-17-SW-R	5.9		TP-28-2.0	0.10
TP-18-2.0	0.58		TP-28-SW-R	3.0
TP-18-SW-R	4.8		TP-29-2.0	0.71
TP-18-SW-R-DUP	4.7		TP-29-SW-R	1.3
TP-19-2.0	0.16		TP-30-2.0	0.08
TP-19-SW-R	1.6		TP-30-SW-R	0.13
TP-20-2.0	0.06		TP-31-2.0	0.22
TP-20-SW-R	4.0		TP-31-SW-R	0.73
TP-21-2.0	0.71		TP-32-2.0	0.07
TP-21-SW-R	1.2		TP-32-SW-R	0.29
TP-22-2.0	0.07		TP-33-2.0	0.09
TP-22-SW-R	2.7		TP-33-SW-R	0.16

Notes:
Red = PCB detected >= 10 mg/kg
U = Not detected at detection limit
PCBs were analyzed by a qualified commercial laboratory using USEPA SW 846 Method 8082

TABLE 2-8
Summary of Samples - Phase III NTCRA
Removal Action
Site 84 Operable Unit 19
MCB Camp Lejeune, North Carolina

Sampling Event	Designation	Sample Type	Number of Samples	Field Duplicate (10% of field samples)	MS/MSD (2 x 5% of field samples)	Equipment Blank (one per day)	Field Blank (one per sampling event)	Total per Sample Type
Pre-Removal	DT - Disposal Testing	PCB	1	1	2	1	1	6
Removal Action	IP - In Place Sampling	PCB	21	3 [1]	4	4	1	30
		DRO	7	1	2	0	0	10
		GRO	7	1	2	0	0	10
		Oil and Grease	7	1	2	0	0	10
Removal Action	SW - Sidewall Confirmation Sampling	PCB - Dexsil 2000	12	0 [2]	0	0	0	0
		PCB	6	0	0	0	0	6
Removal Action	DS - Disposal Sampling	PCB - Dexsil 2000	25	0	0	0	0	25

Notes:

[1] All QA/QC samples related to PCB contaminated soil sampling for the Removal Action are included in this table under In Place Sampling; Equipment Blanks and Field Blank for the Removal Action sampling event are also included under In Place Sampling.

[2] PCB screening with the Dexsil 2000 Soil Test System does not require laboratory QA/QC sampling and analysis.

TABLE 2-9
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	SS Background Mean + 2 Standard Deviations (mg/kg)		Minimum Detected	Maximum Detected	Frequency of Detection
VOLATILES (ug/kg)	**(ug/kg)**	**(ug/kg)**					
2-Butanone	7,300,000	692	NE	U	4.8 J	9 J	2/26
Acetone	1,600,000	2810	NE	U	40 J	40 J	1/26
Ethylbenzene	230,000	241	NE	U	330 J	330 J	1/26
Xylenes (total)	210,000	4960	NE	U	8.7 J	120 J	2/26
SEMIVOLATILES (ug/kg)	**(ug/kg)**	**(ug/kg)**					
2-Methylnaphthalene	1,600,000 (1)	NE	NE	U	120 J	92000	3/26
Acenaphthene	3,700,000	8160	NE	U	140 J	20000 J	8/26
Anthracene	22,000,000	995000	NE	U	210 J	56000	8/26
Benzo(a)anthracene	620	358	NE	U	520	190000	8/26
Benzo(a)pyrene	62	91.1	NE	U	470	150000	7/26
Benzo(b)fluoranthene	620	NE	NE	U	540	170000	7/26
Benzo(ghi)perylene	NE	6720000	NE	U	74 J	55000	9/26
Benzo(k)fluoranthene	6,200	NE	NE	U	340 J	120000	7/26
Carbazole	24,000	NE	NE	U	130 J	38000 J	7/26
Chrysene	62,000	39800	NE	U	560	180000	8/26
Dibenz(a,h)anthracene	62	168	NE	U	70 J	17000 J	7/26
Dibenzofuran	290,000	NE	NE	U	84 J	8900 J	7/26
Dibenzothiophene	NE	NE	NE		89 NJ	760 NJ	2/2
Fluoranthene	2,300,000	276000	NE	U	1200	300000	8/26
Fluorene	2,600,000	44300	NE	U	130 J	19000 J	9/26
Hexachlorocyclopentadiene	420,000	200000	NE	U	410 J	410 J	1/26
Indeno(1,2,3-cd)pyrene	620	3260	NE	U	250 J	59000	7/26
Naphthalene	56,000	585	NE	U	140 J	7500 J	5/26
Phenanthrene	NE	59600	NE	U	910 J	180000	9/26
Pyrene	2,300,000	28600	NE	U	760	250000	8/26
bis(2-Ethylhexyl) phthalate	35,000	6670	NE	U	140 J	620	2/26

TABLE 2-9 (continued)
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	SS Background Mean + 2 Standard Deviations (mg/kg)		Minimum Detected	Maximum Detected	Frequency of Detection
PESTICIDES/PCBs (ug/kg)	**(ug/kg)**	**(ug/kg)**					
4,4'-DDD	2,400	129	NE	U	3.2 J	3000 J	7/24
4,4'-DDE	1,700	NE	NE	U	3.1	58	7/24
4,4'-DDT	1,700	1360	NE	U	1.9	190	7/24
Dieldrin	30	1.13	NE	U	3.5 J	320	8/24
Endosulfan sulfate	NE	NE	NE	U	2.1 J	54 J	6/25
Endrin	18,000 (2)	440	NE	U	6.9 J	6.9 J	1/24
Endrin aldehyde	18,000 (2)	NE	NE	U	4.5 J	74 J	8/25
Endrin ketone	18,000 (2)	NE	NE	U	1.7 J	26 J	5/25
Heptachlor	110	2.4	NE	U	1.5 J	22000	8/24
Heptachlor epoxide	53	6.67	NE	U	4.2 J	4500 J	6/24
Methoxychlor	310,000	56100	NE	U	1.9 J	98 J	7/25
PCB-1248	220	NE	NE	U	56	160000	4/95
PCB-1254	220	NE	NE	U	51000	51000	1/95
PCB-1260	220	NE	NE	U	18 J	200000	68/95
alpha-BHC	90	NE	NE	U	21	21	1/24
alpha-Chlordane	1,600 (3)	NE	NE	U	2 J	48000 J	10/24
gamma-Chlordane	1,600 (3)	NE	NE	U	3.9	58000	10/24
METALS (mg/kg)	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**				
Aluminum	76,000	NE	6,070		1270	8940	26/26
Antimony	31	5420	0.556	UJ	0.66 J	3.3 J	13/26
Arsenic	0.39	26200	0.671	U	0.33 J	9.1	24/26
Barium	5,400	848000	16.8	U	3 J	65.7	23/26
Beryllium	150	3380	0.0974	U	0.06 J	0.075 J	5/26
Cadmium	37	2720	0.0549	U	0.067 J	0.57	14/26
Calcium	NE	NE	37,271		109 J	100000 J	26/26
Chromium	30 (assumes Cr +6)	27200	7.02		1.7	20.2	26/26
Cobalt	4,700	NE	0.317	U	0.18 J	0.76 J	23/26
Copper	2,900	704000	15.8		0.35 J	146	26/26
Iron	23,000	151000	3,162		684	5000	26/26
Lead	420	270000	20.2		1.8	97.3	26/26
Magnesium	NE	NE	622		47.3 J	1480	26/26

TABLE 2-9 (continued)
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	SS Background Mean + 2 Standard Deviations (mg/kg)		Minimum Detected	Maximum Detected	Frequency of Detection
METALS (mg/kg) (Cont.)	(mg/kg)	(mg/kg)	(mg/kg)				
Manganese	1,800	65200	17.4		2.7	32.8	26/26
Mercury	23	15.4	0.0844	U	0.01 J	0.2	18/26
Nickel	1,600	56400	1.54		0.46 J	2.9 J	26/26
Potassium	NE	NE	157	U	70.2 J	258 J	17/26
Selenium	390	12200	0.463	U	0.53 J	0.61	2/26
Sodium	NE	NE	132	U	165 J	235 J	3/26
Thallium	5.2	512	0.203	U	0.6 J	0.6 J	1/26
Vanadium	550	NE	9.17		2.3 J	11.2	26/26
Zinc	23,000	1100000	30.0		1.3 J	154 J	26/26
TOTAL PETROLEUM HYDROCARBONS							
TPH (as Diesel) (mg/kg)	NE	NE	NE		7 J	470	11/11
TPH (as Gasoline) (ug/kg)	NE	NE	NE	U	880	880	1/11
CONVENTIONAL							
Percent Solids (%)	NE	NE	NE		30.3	96	47/47
Total Organic Carbon (mg/kg)	NE	NE	NE		3 BG	13 BG	2/2

NOTES:

(1) No Region IX PRG is available, value is Region 3 Residential Risk Based Concentration (RBC) based on ingestion.

(2) Total endrin consisting of endrin, endrin aldehyde, and endrin ketone.

(3) Value for chlordane

Region IX PRG = Region IX Preliminary Remediaiton Goal (www.epa.gov/region09/waste/sfund/prg updated 11/01/00)

SS Background - Surface Soil background concentrations (Background Study Report, Baker 2001)

TABLE 2-9 (continued)
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Location of Maximum Detect	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	SS Background Mean + 2 Standard Deviations Exceedance Count
VOLATILES (ug/kg)				
2-Butanone	IR84-MW20-00	0	0	NA
Acetone	84-MW15-00	0	0	NA
Ethylbenzene	IR84-DP82-00	0	1	NA
Xylenes (total)	IR84-DP82-00	0	0	NA
SEMIVOLATILES (ug/kg)				
2-Methylnaphthalene	IR84-DP84-00	0	0	NA
Acenaphthene	IR84-DP46-00	0	1	NA
Anthracene	IR84-DP46-00	0	0	NA
Benzo(a)anthracene	IR84-DP46-00	7	8	NA
Benzo(a)pyrene	IR84-DP46-00	7	7	NA
Benzo(b)fluoranthene	IR84-DP46-00	6	0	NA
Benzo(ghi)perylene	IR84-DP46-00	NA	0	NA
Benzo(k)fluoranthene	IR84-DP46-00	1	0	NA
Carbazole	IR84-DP46-00	1	0	NA
Chrysene	IR84-DP46-00	1	1	NA
Dibenz(a,h)anthracene	IR84-DP46-00	7	6	NA
Dibenzofuran	IR84-DP46-00	0	0	NA
Dibenzothiophene	IR84-DP49-00	NA		NA
Fluoranthene	IR84-DP46-00	0	1	NA
Fluorene	IR84-DP46-00	0	0	NA
Hexachlorocyclopentadiene	IR84-DP47-00	0	0	NA
Indeno(1,2,3-cd)pyrene	IR84-DP46-00	6	1	NA
Naphthalene	IR84-DP46-00	0	2	NA
Phenanthrene	IR84-DP46-00	NA	1	NA
Pyrene	IR84-DP46-00	0	1	NA
bis(2-Ethylhexyl) phthalate	IR84-MW20-00D	0	0	NA

TABLE 2-9 (continued)
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Location of Maximum Detect	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	SS Background Mean + 2 Standard Deviations Exceedance Count
PESTICIDES/PCBs (ug/kg)				
4,4'-DDD	IR84-DP47-00	1	1	NA
4,4'-DDE	IR84-DP49-00	0	0	NA
4,4'-DDT	IR84-DP49-00	0	0	NA
Dieldrin	IR84-DP49-00	3	8	NA
Endosulfan sulfate	IR84-MW20-00	NA	0	NA
Endrin	IR84-MW20-00	0	0	NA
Endrin aldehyde	IR84-MW20-00	0	0	NA
Endrin ketone	IR84-DP81-00	0	0	NA
Heptachlor	IR84-DP47-00	6	6	NA
Heptachlor epoxide	IR84-DP47-00	4	4	NA
Methoxychlor	IR84-MW20-00	0	0	NA
PCB-1248	IR84-DP47-00	2	0	NA
PCB-1254	IR84-DP53-00	1	0	NA
PCB-1260	IR84-SB27-01	55	0	NA
alpha-BHC	IR84-DP82-00	0	0	NA
alpha-Chlordane	IR84-DP47-00	4	0	NA
gamma-Chlordane	IR84-DP47-00	4	0	NA
METALS (mg/kg)				
Aluminum	IR84-MW20-00	0	0	1
Antimony	IR84-DP49-00	0	0	13
Arsenic	IR84-DP49-00	21	0	21
Barium	IR84-DP49-00	0	0	23
Beryllium	IR84-DP46-00	0	0	0
Cadmium	IR84-DP53-00	0	0	14
Calcium	IR84-DP50-00	NA	0	11
Chromium	IR84-DP49-00	0	0	6
Cobalt	IR84-DP49-00	0	0	12
Copper	IR84-DP49-00	0	0	11
Iron	IR84-MW20-00	0	0	1
Lead	IR84-DP49-00	0	0	13
Magnesium	IR84-DP49-00	NA	0	9

TABLE 2-9 (continued)
SURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

	Location of Maximum Detect	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	SS Background Mean + 2 Standard Deviations Exceedance Count
METALS (mg/kg) (Cont.)				
Manganese	IR84-DP49-00	0	0	9
Mercury	IR84-DP74-00	0	0	18
Nickel	IR84-DP49-00	0	0	12
Potassium	IR84-DP76-00	NA	0	5
Selenium	IR84-DP74-00	0	0	1
Sodium	IR84-DP50-00	NA	0	3
Thallium	IR84-DP45-00	0	0	1
Vanadium	IR84-MW20-00	0	0	2
Zinc	IR84-DP49-00	0	0	13
TOTAL PETROLEUM HYDROCARBONS				
TPH (as Diesel) (mg/kg)	IR84-DP46-00	NA	NA	NA
TPH (as Gasoline) (ug/kg)	IR84-DP46-00	NA	NA	NA
CONVENTIONAL				
Percent Solids (%)	IR84-DP36-00	NA	NA	NA
Total Organic Carbon (mg/kg)	IR84-DP27-00	NA	NA	NA

NOTES:

(1) No Region IX PRG is available, value is Region 3 R

(2) Total endrin consisting of endrin, endrin aldehyde, an

(3) Value for chlordane

Region IX PRG = Region IX Preliminary Remediaiton G

SS Background - Surface Soil background concentrations

NE = not established

NA = Not applicable

U = Not detected at method detection limit

J = Value is estimated

BG = sample was diluted due to matrix interference and blank contamination.

TABLE 2-10
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	Background Mean + 2 Standard Deviations (mg/kg)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect
VOLATILES (ug/kg)	**(ug/kg)**	**(ug/kg)**					
1,2-Dichloroethene (total)	63000	380	NE	91 J	91 J	1/24	IR84-DP82-04
2-Butanone	7300000	692	NE	3.8 J	3.8 J	1/24	IR84-MW21-04
Acetone	1600000	2810	NE	14 J	18 J	2/24	IR84-MW21-04
Benzene	670	5.62	NE	120 J	160 J	2/24	84-MW15-04
Chloroform	240	1.01	NE	0.98 J	2.3 J	3/24	IR84-SB05-01
Ethylbenzene	230000	241	NE	0.89 J	1300	5/24	IR84-DP75-05
Methylene chloride	8900	22	NE	1.3 J	1.3 J	1/24	IR84-DP78-03
Styrene	1700000	2240	NE	2.1 J	2.1 J	1/24	IR84-MW23-01
Toluene	520000	7170	NE	75 J	75 J	1/24	IR84-DP75-05
Xylenes (total)	210000	4960	NE	4.1 J	3100	4/24	IR84-DP75-05
SEMIVOLATILES (ug/kg)	**(ug/kg)**	**(ug/kg)**					
2-Methylnaphthalene	1600000	NE	NE	1000	27000	3/33	84-MW15-04
Acenaphthene	3700000	8160	NE	61 J	950 J	4/33	IR84-DP15-03
Anthracene	22000000	995000	NE	190 J	830 J	3/33	IR84-DP46-02
Benzo(a)anthracene	620	358	NE	640	3000	3/33	IR84-DP46-02
Benzo(a)pyrene	62	91.1	NE	590	2600	3/33	IR84-DP46-02
Benzo(b)fluoranthene	620	NE	NE	68 J	2800	5/33	IR84-DP46-02
Benzo(ghi)perylene	NE	6720000	NE	65 J	1200	5/33	IR84-DP46-02
Benzo(k)fluoranthene	6200	NE	NE	280 J	1700	3/33	IR84-DP46-02
Carbazole	24000	NE	NE	110 J	480 J	3/33	IR84-DP46-02
Chrysene	62000	39800	NE	57 J	3100	5/33	IR84-DP46-02
Dibenz(a,h)anthracene	62	168	NE	98 J	430 J	3/33	IR84-DP46-02
Dibenzofuran	290000	NE	NE	160 J	1300 J	3/33	IR84-DP15-03
Fluoranthene	2300000	276000	NE	74 J	4800	5/33	IR84-DP46-02
Fluorene	2600000	44300	NE	61 J	1500 J	5/33	IR84-DP15-03
Hexachlorocyclopentadiene	420000	200000	NE	94 J	94 J	1/33	IR84-DP47-01
Indeno(1,2,3-cd)pyrene	620	3260	NE	340 J	1200	3/33	IR84-DP46-02
Naphthalene	56000	585	NE	55 J	8500	4/33	84-MW15-04
Phenanthrene	NE	59600	NE	150 J	3400 J	6/33	84-MW15-04,IR84-DP15-03
Phthalic anhydride	NE	NE	NE	120 NJ	170 NJ	2/2	IR84-SB04-02
Pyrene	2300000	286000	NE	69 J	4100	5/33	IR84-DP46-02
bis(2-Chloroethoxy)methane	NE	NE	NE	54	54	1/33	IR84-DP81-04
bis(2-Ethylhexyl) phthalate	35000	6670	NE	91 J	1800	7/33	IR84-MW22-02

TABLE 2-10 (continued)
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	Background Mean + 2 Standard Deviations (mg/kg)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect
PESTICIDES/PCBs (ug/kg)	**(ug/kg)**	**(ug/kg)**					
4,4'-DDD	2400	129	NE	1.7 J	46 J	7/33	IR84-DP45-03
4,4'-DDE	1700	NE	NE	2 J	16	5/33	IR84-DP52-01
4,4'-DDT	1700	1360	NE	2.5	120 J	5/33	IR84-DP52-01
Dieldrin	30	1.13	NE	1.8	2.4	3/33	IR84-SB01-02
Endrin aldehyde	18,000 (2)	NE	NE	10 J	10 J	1/33	IR84-DP15-03
Heptachlor	110	2.4	NE	1.6 J	6900	7/33	IR84-DP47-01
PESTICIDES/PCBs (ug/kg)							
Heptachlor epoxide	53	6.67	NE	63 J	200 J	2/33	IR84-DP46-02
Methoxychlor	310000	56100	NE	2.9 J	24 J	3/33	IR84-DP15-03
PCB-1248	220	NE	NE	47000	47000	1/39	IR84-DP47-01
PCB-1254	220	NE	NE	5000	5000	1/39	IR84-DP46-02
PCB-1260	220	NE	NE	13 J	45000	11/39	IR84-DP18-02
alpha-Chlordane	1,600 (3)	NE	NE	3.3 J	14000 J	8/33	IR84-DP47-01
beta-BHC	90	NE	NE	1.7 J	1.7 J	1/33	84-MW17-07
gamma-Chlordane	1,600 (3)	NE	NE	3.3 J	18000	8/33	IR84-DP47-01
METALS (mg/kg)	**(mg/kg)**	**(mg/kg)**	**(mg/kg)**				
Aluminum	76000	NE	14,538	589	7210	33/33	IR84-DP77-03
Antimony	31	5420	0.597	0.6 J	1.3 B	8/33	IR84-DP15-03
Arsenic	0.39	26200	1.62	0.33 J	2	29/33	R84-DP15-03,IR84-DP79-02
Barium	5400	848000	23.9	0.92 J	24.3	21/33	IR84-DP49-01
Beryllium	150	3380	0.140	0.051 J	0.13 B	5/33	IR84-DP15-03
Cadmium	37	2720	0.0136	0.05 J	0.18 J	7/33	IR84-DP49-01
Calcium	NE	NE	426	71.4 J	66800 J	33/33	IR84-SB03-02
Chromium	30	27200	17.1	1.2	9.9	33/33	IR84-DP45-03
Cobalt	4700	NE	1.26	0.16 J	0.69 J	27/33	IR84-DP52-01
Copper	2900	704000	4.31	0.34 J	25.5	29/33	IR84-DP50-01
Iron	23000	151000	5,881	155	6140	33/33	IR84-DP15-03
Lead	400	270000	8.16	0.87	52.7	33/33	IR84-DP49-01

TABLE 2-10 (continued)
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil (units as indicated)	North Carolina Soil-to-Groundwater Concentration (units as indicated)	Background Mean + 2 Standard Deviations (mg/kg)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect
METALS (mg/kg) (Cont.)	(mg/kg)	(mg/kg)	(mg/kg)				
Magnesium	NE	NE	361	16.4 J	943	33/33	IR84-SB03-02
Manganese	1800	65200	8.90	0.48 J	50.5	33/33	IR84-SB03-02
Mercury	23	15.4	0.0937	0.0092 J	0.055 J	23/33	IR84-DP46-02
Nickel	1600	NE	4.29	0.42 J	3.5 J	32/33	IR84-DP50-01
Potassium	NE	NE	373	21.3 J	195 J	27/33	IR84-DP77-03
Selenium	390	12200	0.687	0.39 J	0.73	8/33	IR84-SB03-02
Sodium	NE	NE	83.3	89.7 J	89.7 J	1/33	IR84-SB03-02
Thallium	5.5	512	0.225	0.64 J	0.9 J	5/33	IR84-SB03-02
Vanadium	550	NE	19.7	1.1 J	11.4	33/33	IR84-DP79-02D
Zinc	23000	1100000	8.83	1.4 J	42.6 J	29/33	IR84-DP49-01
TOTAL PETROLEUM HYDROCARBONS							
TPH (as Diesel) (mg/kg)	NE	NE	NE	15	5500	8/8	IR84-DP15-03
TPH (as Gasoline) (ug/kg)	NE	NE	NE	220	580000	2/8	IR84-DP15-03
CONVENTIONAL							
Percent Solids (%)	NE	NE	NE	66.3	96	39/39	IR84-DP82-04

NOTES:

(1) No Region IX PRG is available, value is Region 3 Residential Risk Based Concentration (RBC) based on ingestion.
(2) Total endrin consisting of endrin, endrin aldehyde, and endrin ketone.
(3) Value for chlordane
Region IX PRG = Region 9 Preliminary Remediaiton Goal (www.epa.gov/region09/waste/sfund/prg updated 11/01/00)
B (inorganics) = value is less than contract required detection limit but greater than instrument detection limit

NE = not established
NA = Not applicable
U = Not detected at method d
J = Value is estimated
N = sample recovery not with

TABLE 2-10 (continued)
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	Background Mean + 2 Standard Deviations Exceedance Count
VOLATILES (ug/kg)			
1,2-Dichloroethene (total)	0	0	NA
2-Butanone	0	0	NA
Acetone	0	0	NA
Benzene	0	2	NA
Chloroform	0	2	NA
Ethylbenzene	0	3	NA
Methylene chloride	0	0	NA
Styrene	0	0	NA
Toluene	0	0	NA
Xylenes (total)	0	0	NA
SEMIVOLATILES (ug/kg)			
2-Methylnaphthalene	0	0	NA
Acenaphthene	0	0	NA
Anthracene	0	0	NA
Benzo(a)anthracene	3	3	NA
Benzo(a)pyrene	3	3	NA
Benzo(b)fluoranthene	3	0	NA
Benzo(ghi)perylene	0	0	NA
Benzo(k)fluoranthene	0	0	NA
Carbazole	0	0	NA
Chrysene	0	0	NA
Dibenz(a,h)anthracene	3	1	NA
Dibenzofuran	0	0	NA
Fluoranthene	0	0	NA
Fluorene	0	0	NA
Hexachlorocyclopentadiene	0	0	NA
Indeno(1,2,3-cd)pyrene	1	0	NA
Naphthalene	0	2	NA
Phenanthrene	0	0	NA
Phthalic anhydride	0	0	NA
Pyrene	0	0	NA
bis(2-Chloroethoxy)methane	0	0	NA
bis(2-Ethylhexyl) phthalate	0	0	

TABLE 2-10 (continued)
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	Background Mean + 2 Standard Deviations Exceedance Count
PESTICIDES/PCBs (ug/kg)			
4,4'-DDD	0	0	NA
4,4'-DDE	0	0	NA
4,4'-DDT	0	0	NA
Dieldrin	0	3	NA
Endrin aldehyde	0	0	NA
Heptachlor	3	4	NA
PESTICIDES/PCBs (ug/kg)			
Heptachlor epoxide	2	2	NA
Methoxychlor	0	0	NA
PCB-1248	1	0	NA
PCB-1254	1	0	NA
PCB-1260	5	0	NA
alpha-Chlordane	2	0	NA
beta-BHC	0	0	NA
gamma-Chlordane	2	0	NA
METALS (mg/kg)			
Aluminum	0	0	0
Antimony	0	0	8
Arsenic	25	0	2
Barium	0	0	3
Beryllium	0	0	0
Cadmium	0	0	7
Calcium	0	0	23
Chromium	0	0	0
Cobalt	0	0	0
Copper	0	0	9
Iron	0	0	1
Lead	0	0	9

TABLE 2-10 (continued)
SUBSURFACE SOIL DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	Region IX PRG Residential soil Exceedance Count	North Carolina Soil-to-Groundwater Concentration Exceedance Count	Background Mean + 2 Standard Deviations Exceedance Count
METALS (mg/kg) (Cont.)			
Magnesium	0	0	3
Manganese	0	0	10
Mercury	0	0	0
Nickel	0	0	2
Potassium	0	0	0
Selenium	0	0	2
Sodium	0	0	1
Thallium	0	0	5
Vanadium	0	0	0
Zinc	0	0	11
TOTAL PETROLEUM HYDROCARBO			
TPH (as Diesel) (mg/kg)	NA	NA	NA
TPH (as Gasoline) (ug/kg)	NA	NA	NA
CONVENTIONAL			
Percent Solids (%)	NA	NA	NA

NOTES:
(1) No Region IX PRG is available, value i
(2) Total endrin consisting of endrin, endrir
(3) Value for chlordane etection limit
Region IX PRG = Region 9 Preliminary Re
B (inorganics) = value is less than contract in control limits

TABLE 2-11
GROUNDWATER DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	NCWQS (2L) (units as noted)	US Primary MCL (units as noted)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect
VOLATILES (ug/L)	**(ug/L)**	**(ug/L)**				
2-Butanone	170	1,900 (1)	0.53 J	0.69 J	2/20	IR84-MW22-01C
Benzene	1	5	1.5 J	3.4 J	2/20	AST781-GW03-98B
Carbon disulfide	700 (I)	1,000 (1)	0.49 J	0.49 J	1/20	IR84-MW18-01C
Chloroform	0.19	100	16	16	2/20	AST781-GW11-98B,AST781-GW12-98B
Chloromethane	NE	NE	0.17 J	0.62 J	2/20	IR84-MW18-01C
Ethylbenzene	29	700	0.6 J	6.7 J	4/20	AST781-GW04-98B
Methyl tert-butyl ether	200	NE	0.52 J	0.52 J	1/20	IR84-MW16-01C
Methylene chloride	5	5	0.37 J	0.7 J	3/20	IR84-MW22-01C
Trichloroethene	2.8	5	0.19 J	0.19 J	1/20	IR84-MW17-01C
Xylenes (total)	530	10,000	1.8	1.8	1/20	IR84-MW17-01C
SEMIVOLATILES (ug/L)	**(ug/L)**	**(ug/L)**				
2-Methylnaphthalene	28 (I)	NE	1 J	1.1 J	2/14	IR84-MW20-01CD
Naphthalene	21	6.2 (1)	2.2 J	2.2 J	1/14	IR84-MW22-01C
PCBs (ug/L)	**(ug/L)**	**(ug/L)**				
No Exceedances						
PESTICIDES (ug/L)						
4,4'-DDD	0.14 (I)	0.28 (1)	0.028 J	0.044 J	4/14	IR84-MW18-01C
4,4'-DDE	NE	0.2 (1)	0.024 J	0.026 J	2/14	IR84-MW20-01CD
4,4'-DDT	0.1(I)	0.2 (1)	0.029 J	0.047 J	4/14	IR84-MW20-01CD
Endosulfan I	NE	220 (1)	0.023 J	0.023 J	1/14	IR84-MW18-01C
Heptachlor epoxide	0.004	0.2	0.03 J	0.03 J	1/14	IR84-MW20-01C
beta-BHC	NE	0.037 (1)	0.021 J	0.029 J	4/14	IR84-MW21-01C
gamma-Chlordane	0.027 (2)	2 (2)	0.04 J	0.04 J	1/14	IR84-MW18-01C
HERBICIDES (ug/L)	**(ug/L)**	**(ug/L)**				
Dinoseb	NE	7	0.015 J	1.5 J	4/14	IR84-MW17-01C
MCPA	NE	NE	44 J	44 J	1/14	IR84-MW18-01C
METALS (mg/L)	**(mg/L)**	**(mg/L)**				
Aluminum	NE	0.20 (s)	0.44	0.73	9/14	IR84-MW17-01C
Antimony	NE	0.006	0.0022 J	0.011 J	3/14	IR84-MW17-01C
Arsenic	0.05	0.01	0.0071 J	0.03	4/14	IR84-MW08-01C
Barium	2	2	0.0036 J	0.12 J	14/14	IR84-MW18-01C
Beryllium	NE	0.004	0.00057 J	0.0011 J	14/14	IR84-MW10-01C,IR84-MW10-01C
Cadmium	0.005	0.005	0.00056 J	0.00061 J	2/14	IR84-MW23-01C
Calcium	NE	NE	1.4 J	106	14/14	IR84-MW07-01C
Chromium	0.05 (total Cr)	0.1 (total Cr)	0.0015 J	0.0022 J	3/14	IR84-MW19-01C
Cobalt	NE	2.2 (1)	0.0022 J	0.0057 J	3/14	IR84-MW18-01C

TABLE 2-11(continued)
GROUNDWATER DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	NCWQS (2L) (units as noted)	US Primary MCL (units as noted)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect
METALS (mg/L) (Cont.)	**(mg/L)**	**(mg/L)**				
Iron	0.3	0.3	0.18	67.7	12/14	IR84-MW08-01C
Magnesium	NE	NE	0.34 J	11.3	14/14	IR84-MW18-01C
Manganese	0.05	0.05	0.004 J	0.45	14/14	IR84-MW07-01C
Mercury	0.0011	0.002	0.000072 J	0.000072 J	1/14	IR84-MW17-01C
Nickel	0.1	0.730 (1)	0.0027 J	0.011 J	2/14	IR84-MW18-01C
Potassium	NE	NE	0.86 J	11	11/14	IR84-MW21-01C
Sodium	NE	NE	2.1 J	22	14/14	IR84-MW19-01C
Thallium	NE	0.002	0.0054 J	0.0057 J	2/14	IR84-MW08-01C
Vanadium	NE	0.260 (1)	0.00084 J	0.0037 J	10/14	IR84-MW21-01C
Zinc	2.1	5 (s)	0.013 J	0.31	3/14	IR84-MW18-01C

NOTES:
NCWQS = North Carolina Water Quality Standard for groundwater protection (2L)
MCL = Maximum Contaminant Level
(1) No MCL available, value is Region 9 Tapwater standard
(2) Value is for chlordane
(I) Interim standard
(s) Secondary drinking water standard
NE = Not established
NA = Not applicable
ug/L = micrograms per liter
mg/L = micrograms per liter

TABLE 2-11(continued)
GROUNDWATER DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	NCWQS (2L) Exceedance Count	US Primary MCL Exceedance Count
VOLATILES (ug/L)		
2-Butanone	0	0
Benzene	2	0
Carbon disulfide	0	0
Chloroform	2	0
Chloromethane	NA	NA
Ethylbenzene	0	0
Methyl tert-butyl ether	0	NA
Methylene chloride	0	0
Trichloroethene	0	0
Xylenes (total)	0	0
SEMIVOLATILES (ug/L)		
2-Methylnaphthalene	0	NA
Naphthalene	0	0
PCBs (ug/L)		
No Exceedances		
PESTICIDES (ug/L)		
4,4'-DDD	0	0
4,4'-DDE	NA	0
4,4'-DDT	0	0
Endosulfan I	NA	0
Heptachlor epoxide	1	0
beta-BHC	NA	0
gamma-Chlordane	1	0
HERBICIDES (ug/L)		
Dinoseb	NA	0
MCPA	NA	NA
METALS (mg/L)		
Aluminum	NA	9
Antimony	NA	1
Arsenic	0	2
Barium	0	0
Beryllium	NA	0
Cadmium	0	0
Calcium	NA	NA
Chromium	0	0
Cobalt	NA	0

TABLE 2-11 (continued)
GROUNDWATER DATA COMPARED TO SCREENING CRITERIA
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	NCWQS (2L) Exceedance Count	US Primary MCL Exceedance Count
METALS (mg/L) (Cont.)		
Iron	11	11
Magnesium	NA	NA
Manganese	7	7
Mercury	0	0
Nickel	0	0
Potassium	NA	NA
Sodium	NA	NA
Thallium	NA	2
Vanadium	NA	0
Zinc	0	0

NOTES:
NCWQS = North Carolina Water Quality S
MCL = Maximum Contaminant Level
(1) No MCL available, value is Region 9 T
(2) Value is for chlordane
(I) Interim standard
(s) Secondary drinking water standard
NE = Not established
NA = Not applicable
ug/L = micrograms per liter
mg/L = micrograms per liter

TABLE 2-12

SURFACE WATER DATA COMPARED TO SCREENING CRITERIA - LAGOON
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	North Carolina Water Quality Standard or Fresh Surface Wate (ug/L)	USEPA Region 4 Fresh Surface Water Chronic Screening Values (ug/L)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect	North Carolina Water Quality Standards for Fresh Surface Water Exceedance Count	USEPA Region 4 Fresh Surface Water Chronic Screening Values Exceedance Count
VOLATILES (ug/L)								
Acetone	NE	NE	5.6 J	5.6 J	1/1	IR84-SW07-98B	NA	NA
Benzene	71.4	53	1.2 J	1.2 J	1/1	IR84-SW07-98B	0	0
Toluene	11*	175	2.7 J	2.7 J	1/1	IR84-SW07-98B	0	0
Xylenes (total)	NE	NE	3.5 J	3.5 J	1/1	IR84-SW07-98B	NA	NA
SEMIVOLATILES (no detections)								
PCBs (no detections)								

NOTES:
J = value is estimated
NE = Not established
NA = Not applicable
* North Carolina Water Quality Standards for Freshwater Classifications are human health standards; where human halth standards are not available, standards for aquatic life are used and are denoted by an aster
USEPA Region 4 standards are surface water chronic screening values protective of freshwater aquatic life (USEPA, 2000).

TABLE 2-13

SEDIMENT DATA COMPARED TO SCREENING CRITERIA - LAGOON
REMEDIAL INVESTIGATION, CTO-0219
OPERABLE UNIT NO. 19, SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

	NOAA Sediment Screening Value (units as indicated)	Region 4 Sediment Screening Value (units as indicated)	Minimum Detected	Maximum Detected	Frequency of Detection	Location of Maximum Detect	NOAA Sediment Screening Value Exceedance Count	Region 4 Sediment Screening Value Exceedance Count
VOLATILES (ug/kg)								
Xylenes (total)	NE	NE	910 J	910 J	1/1	IR84-SD07-98B	NA	MA
SEMIVOLATILES (ug/kg)	**(ug/kg)**	**(ug/kg)**						
2-Methylnaphthalene	70	20.2	10000	10000	1/1	IR84-SD07-98B	1	1
Naphthalene	160	34.6	2000	2000	1/1	IR84-SD07-98B	1	1
Phenanthrene	240	86.7	2500	2500	1/1	IR84-SD07-98B	1	1
bis(2-Ethylhexyl) phthalate	NE	182	2400 J	2400 J	1/1	IR84-SD07-98B	NA	1
PCBs (ug/kg)								
AROCLOR-1248	21.6 (total PCBs)	20 (total PCBs)	2800	2800	1/7	84-SD05-01	1	1
AROCLOR-1260	21.6 (total PCBs)	20 (total PCBs)	3700	40000	7/7	IR84-SD01-98B	1	1
DIESEL RANGE ORGANICS (mg/kg)	NE	NE	3500	14000	4/4	IR84-SD01-98BD	NA	NA
CONVENTIONAL								
pH (solid)	NE	NE	6.3	6.9	5/5	IR84-SD05-98B	NA	NA
Percent moisture (%)	NE	NE	19.6	59.2	5/5	IR84-SD01-98B	NA	NA

NOTES:
J = value is estimated
U = not detected at detection limit
NOAA Sediment - National Oceanic and Atmospheric Administration; Effects Range Low (ER-L) (Jones, Suter, and Hull, 1997)
Region 4 Sediment - US Environmental Protection Agency, Region 4. Memorandum: Amended Guidance on Ecological Risk Assessment at Military Bases:
Attachment 3: Ecological Screening Levels for Fresh Water (June 2000)
NE = Not established
NA = Not applicable
mg/kg = milligram per kilogram
ug/kg = microgram per kilogram

TABLE 2-14

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
SITE 84 (BUILDING 45 AREA)
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD $(mg/kg/day)^{-1}$	Inhalation RfD $(mg/kg/day)^{-1}$	Oral Absorption Factors [1]	WOE	Target Organ (Systemic Toxicity)	Critical Effect (Systemic Toxicity)
Volatiles								
Acetone	NA	NA	0.1	0.1	0.01	D	(o) Liver / Kidney	(o) Increased liver and kidney weights and nephrotoxicity
Benzene	0.055	0.027	0.003	0.00171	0.01	A	CVS	Hematotoxicity and immunotoxicity
Chloroform	0.0061	0.0805	0.01	0.000086	0.01	B2	(o) Liver	(o) Moderate/marked fatty cyst formation in the liver and elevated SGPT
Toluene	NA	NA	0.2	0.11	0.01	D	Liver / Kidney, (i) CNS /	(o) Changes in liver and kidney weights, (i) Neurological effects; Degeneration of nasal epithelium
Xylenes, total	NA	NA	2	NA	0.01	D	(o) Whole body	(o) Hyperactivity, decreased body weight and increased mortality
2-Methylnaphthalene	NA	NA	NA	NA	0.01	D	(o) Lookup	(o) Lookup
Semivolatiles								
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	0.1	D	NA	NA
Benzo(a)anthracene	0.73	0.31	NA	NA	0.13	(o) B2, (i) D	NA	NA
Benzo(a)pyrene	7.3	3.1	NA	NA	0.13	B2	NA	NA
Benzo(b)fluoranthene	0.73	0.31	NA	NA	0.13	B2	NA	NA
Benzo(k)fluoranthene	0.073	0.031	NA	NA	0.13	B2	NA	NA
Carbazole	0.02	0.02	NA	NA	0.13	(o) B2, (i) D	NA	NA
Chrysene	0.0073	0.0031	NA	NA	0.13	B2	NA	NA
Dibenz(a,h)anthracene	7.3	3.1	NA	NA	0.13	(o) B2, (i) D	NA	NA
Fluoranthene	NA	NA	0.04	0.04	0.01	D	(o) Liver / CVS	(o) Nephropathy, increased liver weights, hematological alterations, and clinical effects
Indeno(1,2,3-cd)pyrene	0.73	0.31	NA	NA	0.13	B2	NA	NA
Naphthalene	NA	NA	0.02	0.000857	0.01	(o) D, (i) C	(o) Whole Body, (i) RsS	(o) Decreased mean terminal body weight in males, (i) Nasal effects: Hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively
Pyrene	NA	NA	0.03	0.03	0.01	D	(o) Kidney	(o) Kidney effects (renal tubular pathology, decreased kidney weights)
4,4'-DDD	0.24	0.24	NA	NA	0.01	B2	NA	NA
Pesticides								
Chlordane, alpha-	0.35	0.35	0.0005	0.0002	0.04	B2	Liver	(o) Hepatic Necrosis, (i) Hepatic Effects
Chlordane, gamma-	0.35	0.35	0.0005	0.0002	0.04	B2	Liver	(o) Hepatic Necrosis, (i) Hepatic Effects
Dieldrin	16	16.1	0.00005	0.00005	0.01	B2	(o) Liver	(o) Liver lesions
Heptachlor	4.5	4.55	0.0005	0.0005	0.01	B2	(o) Liver	(o) Increase in liver weight of males
Heptachlor Epoxide	9.1	9.1	0.000013	0.000013	0.01	B2	(o) Liver	(o) Increased liver-to-body weight ratio
Aroclor-1248	2	2	NA	NA	0.14	B2	NA	NA

TABLE 2-15
DESCRIPTION OF REMEDIAL ALTERNATIVES FOR SITE 84 OU 19
MCB CAMP LEJEUNE, NORTH CAROLINA

Alternative	Components/Details	Cost (1)	
RAA 1 - No Action	Not Applicable	Capital Cost	$0
		Annual O&M	$0
		Present Worth O&M	$0
		Time Frame	>20 years
RAA 2 - Excavation to 1 ppm PCBs	Mobilization/Demobilization	Capital Cost	$6,400,370
	E&S Controls, Utility Location	Annual O&M	$0
	Site Road	Present Worth O&M	$0
	Utility Shutoff and Replacement	Time Frame	1 year
	Dozer and Operator		
	Excavation Laborer		
	Excavator and Operator		
	Transportation and Disposal <50 ppm		
	Transportation and Disposal >50 ppm		
	Confirmation Sampling & Field Analysis		
	Lab Analysis		
	Backfill Hauling		
	Backfill Spreading and Compaction		
	Seeding and Mulch		
	Site Supervision, Equipment and Expenses		
	Project Manager and Expenses		
RAA 3 - 1 ppm PCB Soil Cover with LUCs	Mobilization/Demobilization	Capital Cost	$559,221
	E&S Controls, Utility Location	Annual O&M	$2,592
	Site Road	Present Worth O&M	$50,804
	Dozer and Operator	Time Frame	>20 years
	Lab Analysis		
	Poly Sheeting		
	Soil Cover Material Hauling		
	2' Soil Cover Spreading with Compaction		
	Seeding and Mulch		
	Site Supervision, Equipment and Expenses		
	Project Manager and Expenses		
	LUCs - Yrly Grounds/Fence Maintenance		

TABLE 2-15
DESCRIPTION OF REMEDIAL ALTERNATIVES FOR SITE 84 OU 19
MCB CAMP LEJEUNE, NORTH CAROLINA

Alternative	Components/Details	Cost (1)	
RAA 4 - PCB Removal Actions with LUCs	LUCs - Yrly Grounds/Fence Maintenance	Capital Cost	$0
		Annual O&M	$2,592
		Present Worth O&M	$50,804
		Time Frame	>20 years

(1) The NTCRAs approximate cost of $3.5 million should be added to each alternative.

TABLE 2-16
RELATIVE RANKING OF REMEDIAL ALTERNATIVES
SITE 84 OU 19
MCB CAMP LEJEUNE, NORTH CAROLINA

Evaluation Criteria	Alternative RAA 1	Alternative RAA 2	Alternative RAA 3	Alternative RAA 4
Overall Protection of Human Health & Environment	○	◙	●	●
Compliance with ARARs	○	◙	◙	◙
Long-Term Effectiveness & Permanence	○	◙	●	●
Reduction of Toxicity, Mobility, or Volume Through Treatment	○	○	○	○
Short-Term Effectiveness	○	●	◙	◙
Implementability	○	◙	◙	◙
Cost	○	○	●	◙

Ranking:
◙ High
● Moderate
○ Low

Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.

Note:
Alternative RAA 1 – No Action
Alternative RAA 2 – Excavation to 1 ppm PCBs
Alternative RAA 3 – 1 ppm PCBs Soil Cover with LUCs
Alternative RAA 4 – PCB Removal Actions with LUCs

TABLE 2-17
CHEMICAL-SPECIFIC TBC
Site 84 OU 19
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Cleanup Levels		
Cleanup Levels for PCBs at Superfund Sites	Recommends PCB cleanup levels within range of 10-25 ppm for industrial sites.	CERCLA site with PCB contamination in soils greater than 1 ppm — To Be Considered (**TBC)**	USEPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination, OSWER 9355.4-01 FS (1990)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Waste Generation/Management		
Storage and Disposal of PCB waste	PCB remediation waste, including PCB sewage sludge, is regulated for cleanup and disposal in accordance with CFR 761.61.	Generation and disposal of waste containing PCBs at concentrations ≥ 50 ppm **— applicable**	40 CFR 761.50(a)
Management of PCB waste	Any person cleaning up and disposing PCBs shall do based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 CFR 761.3**— applicable**	40 CFR 761.61
	Storage		
Storage of PCB remediation waste	Waste must be placed in a pile that: •is designed and operated to control dispersal by wind, where necessary, by means other than wetting	Temporary storage of PCB remediation waste or PCB bulk product waste at cleanup site or site of generation for up to 180 days **— applicable**	40 CFR 761.65(c)(9)(i)
	• Does not generate leachate through decomposition or other reactions		40 CFR 761.65(c)(9)(ii)
	• is at a storage site with a liner designed, constructed, and installed to prevent any migration of wastes off or through the liner into adjacent subsurface soil, groundwater or surface water.		40 CFR 761.65(c)(9)(iii)(A)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Treatment/Disposal		
Disposal of decontamination PCB waste and residues	Decontamination waste and residues shall be disposed of at their existing PCB concentration unless otherwise specified.	Generation of PCB waste residues that requires disposal **— applicable**	40 CFR 761.79(g)
	Shall be disposed of in accordance with provisions for wastes from cleanup of PCB remediation waste at 40 CFR 761.61(a)(5)(v).	Non-liquid cleaning materials and PPE resulting from decontamination **— applicable**	40 CFR 761.79(g)(6)
Disposal of PCB remediation waste (self-implementing option)	May be sent off site for decontamination or disposal provided the waste is either dewatered on site or transported off site in containers meeting the requirements of DOT HMR at 49 CFR parts 171-180.	Generation of bulk PCB remediation waste (as defined in 40 CFR 761.3) for disposal **— applicable**	40 CFR 761.61(a)(5)(i)(B)
	Shall be disposed of in accordance with the provisions at 40 CFR 761.61(a)(5)(v)(A).	Bulk PCB remediation waste which has been de-watered and PCB concentration < 50 ppm — **applicable**	40 CFR 761.61(a)(5)(i)(B)(2)(ii)
	Shall be disposed of: •in a hazardous waste landfill permitted by EPA under §3004 of RCRA; or	Bulk PCB remediation waste which has been de-watered and with a PCB concentration ≥ 50 ppm — **applicable**	40 CFR 761.61(a)(5)(i)(B)(2)(iii)
	• in a hazardous waste landfill permitted by a State authorized under §3006 of RCRA; or		
	• in a PCB disposal facility approved under 40 CFR 761.60		

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Treatment/Disposal		
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials) (self- implementing option)	Shall be disposed of either: •in a facility permitted, licensed or registered by a State to manage municipal solid waste under 40 CFR 258 or non-municipal, non-hazardous waste subject to 40 CFR 257.5 thru 257.30; or	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste **— applicable**	40 CFR 761.61(a)(5)(v)(A)
	• in a RCRA Subtitle C landfill permitted by a State to accept PCB waste; or		
	• in an approved PCB disposal facility; or		
	• through decontamination under 40 CFR 761.79(b) or (c).		
Disposal of PCB waste in North Carolina Hazardous Waste Disposal Facility	PCBs of 50 ppm or greater concentration shall not be disposed of in a hazardous waste disposal facility.	Generation of PCB remediation waste ≥ 50 ppm **— relevant and appropriate**	NCGS 130A-294(h)(6)
Disposal of PCB waste in North Carolina Municipal Solid Waste Landfill (MSWLF)	PCB waste as defined in 40 CFR 761 is prohibited from disposal at a MSWLF unit.	Generation of PCB wastes as defined in 40 CFR 761 **— applicable**	15A NCAC 13B.1626(1)(b)(ii)
Disposal of PCB waste in North Carolina Construction and Demolition Landfill (CDLF)	PCB waste as defined in 40 CFR 761 is prohibited from disposal at a CDLF unit.	Generation of PCB wastes as defined in 40 CFR 761 **— applicable**	15A NCAC 13B.0542(e)(8)
	Decontamination/Cleanup		
Decontamination of movable equipment contaminated by PCBs (self-implementing option)	May decontaminate by: •swabbing surfaces that have contacted PCBs with a solvent; •a double wash/rinse as defined in 40 CFR 761.360-378; or	Movable equipment contaminated by PCBs, tools and sampling equipment **— relevant and appropriate**	40 CFR 761.79(c)(2)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Decontamination/Cleanup		
	• another applicable decontamination procedure under 40 CFR 761.79.		
Cleanup verification for self-implementing option(s)	Must collect and analyze samples to verify the cleanup and on-site disposal of bulk PCB remediation waste and porous surfaces in accordance with 40 CFR 761.280-298 (Subpart O).	Collection and analysis of samples to verify cleanup of bulk PCB remediation waste - **relevant and appropriate**	40 CFR 761.61(a)(6)(i)
	Self-implementing cleanup of PCB remediation waste is complete.	Sample analysis results in measurement of PCBs less than or equal to levels specified in 40 CFR 761.61(a) **— relevant and appropriate**	40 CFR 761.61(a)(6)(ii)(A)
	Cleanup is not complete and must either dispose of the sampled PCB remediation waste, or reclean the waste represented by the sample and reinitiate sampling and analysis in accordance with 40 CFR 761.61(a)(6)(i).	Sample analysis results in measurement of PCBs greater than or equal to levels specified in 40 CFR 761.61(a) **— relevant and appropriate**	40 CFR 761.61(a)(6)(ii)(B)
Cleanup levels for bulk PCB remediation waste left in place (self-implementing option)	May remain on site without further conditions.	Bulk PCB remediation waste remaining in a *high occupancy area* (as defined in 40 CFR 761.3) at concentrations ≤1 ppm — **relevant and appropriate**	40 CFR 761.61(a)(4)(i)(A)
	Shall be covered with a cap meeting the requirements of 40 CFR 761.61(a)(7) and 40 CFR 761.61(a)(8) [*See below*].	Bulk PCB remediation waste remaining in a *high occupancy area* (as defined in 40 CFR 761.3) at concentrations > 1 ppm and ≤ 10 ppm — **relevant and appropriate**	40 CFR 761.61(a)(4)(i)(A)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Decontamination/Cleanup		
	May remain on site without further conditions.	Bulk PCB remediation waste remaining in a *low occupancy area* (as defined in 40 CFR 761.3) at concentrations ≤ 25 ppm— **relevant and appropriate**	40 CFR 761.61(a)(4)(i)(B)(1)
	May remain on site if the site is secured by a fence and marked with a sign including the M_L mark.	Bulk PCB remediation waste remaining in a *low occupancy area* (as defined in 40 CFR 761.3) at concentrations > 25 ppm and ≤ 50 ppm — **relevant and appropriate**	40 CFR 761.61(a)(4)(i)(B)(2)
	Shall be covered with a cap meeting the requirements of 40 CFR 761.61(a)(7) and 40 CFR 761.61(a)(8) [*See below*].	Bulk PCB remediation waste remaining in a *low occupancy area* (as defined in 40 CFR 761.3) at concentrations > 50 ppm and ≤ 100 ppm — **relevant and appropriate**	40 CFR 761.61(a)(4)(i)(B)(3)
Cap requirements for Bulk PCB remediation waste left in place (self-implementing option)	Must do so in accordance with 40 CFR 264.310(a) and ensure it complies with the permeability, sieve, liquid limit and plasticity index parameters in 40 CFR 761.75(b)(1)(ii) thru (b)(1)(v).	Designing and constructing a cap for on-site disposal of PCB remediation waste — **relevant and appropriate**	40 CFR 761.61(a)(7)
	Must be of sufficient strength to maintain its effectiveness and integrity.		

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Decontamination/Cleanup		
	May not be contaminated at a level ≥1 ppm PCBs.		
	A cap of compacted soil shall have a minimum thickness of 15 cm (10 inches).		
	Institutional Controls		
Deed restrictions for caps, fences, and low occupancy areas	Must maintain the fence or cap, in perpetuity.	Use of a cap or fence at PCB remediation waste cleanup site **— relevant and appropriate**	40 CFR 761.61(a)(B)
	Within 60 days of completion of cleanup activity shall record, in accordance with State law, a notation on the deed to the property, or on some other instrument which is normally examined during a title search, that will in perpetuity notify any potential purchaser of the property:	Use of a cap or fence at low occupancy PCB remediation waste cleanup site **—relevant and appropriate**	40 CFR 761.61(a)(8)(i)(A)
	• that land has been used for PCB remediation waste disposal and is restricted to use as a low occupancy area as defined in 40 CFR 761.3.		40 CFR 761.61(a)(8)(i)(A)(1)
	• of existence of the fence or cap and the requirements to maintain the fence or cap.		40 CFR 761.61(a)(8)(i)(A)(2)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Institutional Controls		
	• the applicable cleanup levels left at the site, inside the fence, and/or under the cap.		40 CFR 761.61(a)(8)(i)(A)(3)
	May remove a fence or cap after conducting additional cleanup activities and achieving levels specified in 40 CFR 761.61(a)(4) which do not require a cap or fence and remove the notice on the deed no earlier than 30 days after achieving these levels.		40 CFR 761.61(a)(8)(ii)
Notice of Contaminated Site	Prepare and certify by professional land surveyor a survey plat, which identifies contaminated areas and entitled "NOTICE OF CONTAMINATED SITE" and includes a legal description of the site that would be sufficient as a description in an instrument of conveyance and meet the requirements of NCGS 47-30 for maps and plans.	Contaminated site subject to current or future use restrictions included in a remedial action plan as provided in G.S. 143B-279.9(a) **— TBC**	NCGS 143B-279.10(a)
	The Survey plat shall identify: • the location and dimensions of any disposal areas and areas of potential environmental concern with respect to permanently surveyed benchmarks; • the type location, and quantity of contamination known to exist on the site; and •any use restriction on the current or future use of the site.		NCGS 143B-279.10(a)(1)-(3)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Institutional		
	Notice (survey plat) shall be filed in the register of deeds office in the county which the site is located in the grantor index under the name of the owner.		NCGS 143B-279.10(b) and (c)
	The deed or other instrument of transfer shall contain in the description section, in no smaller type than used in the body of the deed or instrument, a statement that the property is a contaminated site and reference by book and page to the recordation of the Notice.	Contaminated site subject to current or future use restrictions as provided in G.S. 143B-279.9(a) that is to be sold, leased, conveyed or transferred **— TBC**	NCGS 143B-279.10(e)
	Transportation		
Transportation of PCB waste off site	Must comply with the manifesting provisions at 40 CFR 761.207 through 218.	Relinquishment of control over PCB waste by transporting, or offering for transport **— applicable**	40 CFR 761.207(a)
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and DOT HMR at 49 CFR 171-180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material **— applicable**	49 CFR 171.1(c)

TABLE 2-18
ACTION SPECIFIC ARARS and TBC
MCAS Camp Lejeune, North Carolina

Action	Requirements	Prerequisite	Citation
	Sediment and Erosion Control		
Managing storm water, surface water, and sedimentation	Persons conducting land-disturbing activity shall take all reasonable measures to protect all public and private property from damage caused by such activities. Must comply with the provisions of 04B.0106, .0107, .0108, .0113, and .0116 for an erosion and sedimentation control plan.	Conducting land-disturbing activities **—relevant and appropriate**	15A NCAC 4B.0105
	Air Quality Control		
Managing fugitive dust emissions	Implement plan outlining actions (e.g. wetting dry soils) to control dust emissions that could travel beyond the site boundary.	Conducting activities that will generate fugitive dust emissions **— relevant and appropriate**	15A NCAC 02D.0540(c) through (f)

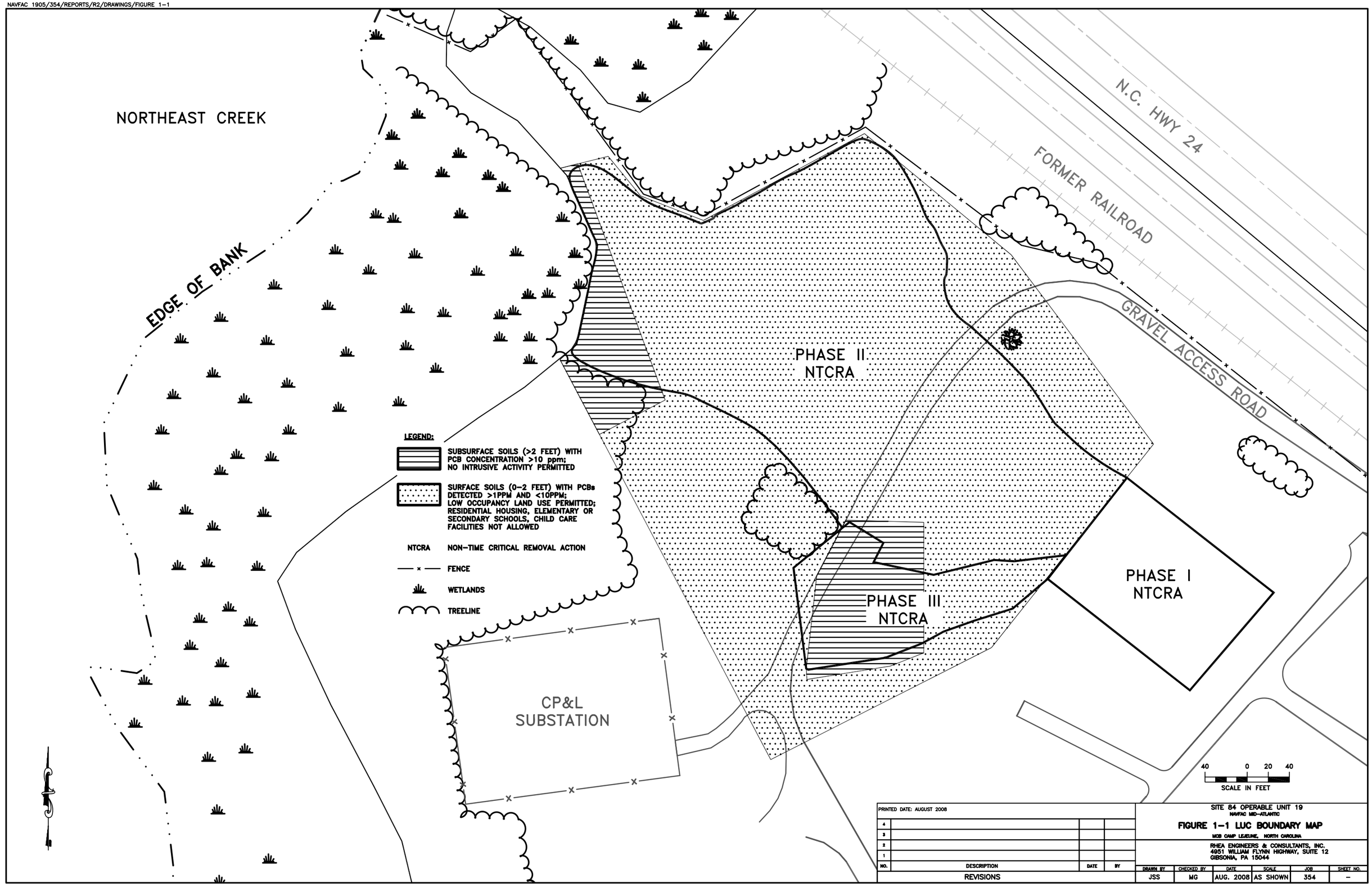
ARAR = applicable or relevant and appropriate requirement
CDLF = Construction and Demolition Landfill
CFR = *Code of Federal Regulations*
DOT = U.S. Department of Transportation
>greater than
≥ greater than or equal to
≤ less than or equal to
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
ML = Large Mark
MSWLF = Municipal Solid Waste Landfill
NCAC = North Carolina Administrative Code
NCGS = North Carolina General Statutes
PCB = polychlorinated biphenyl
PPE = personal protective equipment RCRA = Resource Conservation and Recovery Act of 1976
USEPA = United States Environmental Protection Agency

TABLE 2-19
COST ESTIMATE: RAA 4 - PCB REMOVAL ACTIONS WITH LUCs
SITE 84 OPERABLE UNIT 19
MCB CAMP LEJEUNE, NORTH CAROLINA

Cost Item	Unit	Qty	Unit Cost	Total Cost	Comments
DIRECT CAPITAL COSTS					
Capital Costs				$0	
PROFESSIONAL SERVICES					
Professional Services				$0	
ANNUAL OPERATION & MAINTENANCE					
Annual Grounds Maintenance	LS	2	$860	$1,720	Vendor quote
Est. $200/acre/event x 4.3 acres = $860.00					
Area: 4.3 acres; Events per year: 2					
Annual Fence Maintenance	LS	1	$200	$200	Engineer's Experience
Annual O&M Subtotal Cost				$1,920	
Present Cost of Annual O&M for 30 years				$37,633	
Effective Interest Rate of 3%					
Present Worth Factor: 19.6005					
SUBTOTAL PROJECT COST				*$37,633*	
Contingency 35%				$13,172	Total 35% Contingency (20% Scope and 15% Bid)
TOTAL PROJECT COST				***$50,804***	

FIGURES

NAVFAC 1905/354/REPORTS/R2/DRAWINGS/FIGURE 1-1



PRINTED DATE: AUGUST 2008

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS

SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC

FIGURE 1-1 LUC BOUNDARY MAP

MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4051 WILLIAM FLYNN HIGHWAY, SUITE 12
GIBSONIA, PA 15044

DRAWN BY	CHECKED BY	DATE	SCALE	JOB	SHEET NO.
JSS	MG	AUG. 2008	AS SHOWN	354	-

ISSUE DATE	PLOT	DRAWN BY	CHECKED BY		CAD FILE NUMBER	REVISION	DATE	DESCRIPTION
NOV. 2007	1:1	M.C.	APPR. BY	MG	273 – A1 – F1			

SITE 84 OPERABLE UNIT 19
NAVFAC MID–ATLANTIC

FIGURE 2-1 SITE LOCATION MAP

MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA
Engineers & Consultants, Inc.
4951 William Flynn Highway
Gibsonia, PA 15044

NAVFAC 1905/354/REPORTS/R2/DRAWINGS

NORTHEAST CREEK

EDGE OF BANK

WETLANDS

FENCE LINE

N.C. HWY 24

FORMER RAILROAD

GRAVEL ACCESS ROAD

PHASE II
NTCRA

PHASE III
NTCRA

PHASE I
NTCRA

CP&L
SUBSTATION

LEGEND

NTCRA NON-TIME CRITICAL REMOVAL ACTION

WETLANDS

40 0 20 40

PRINTED DATE: MAY 2007

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS

SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC

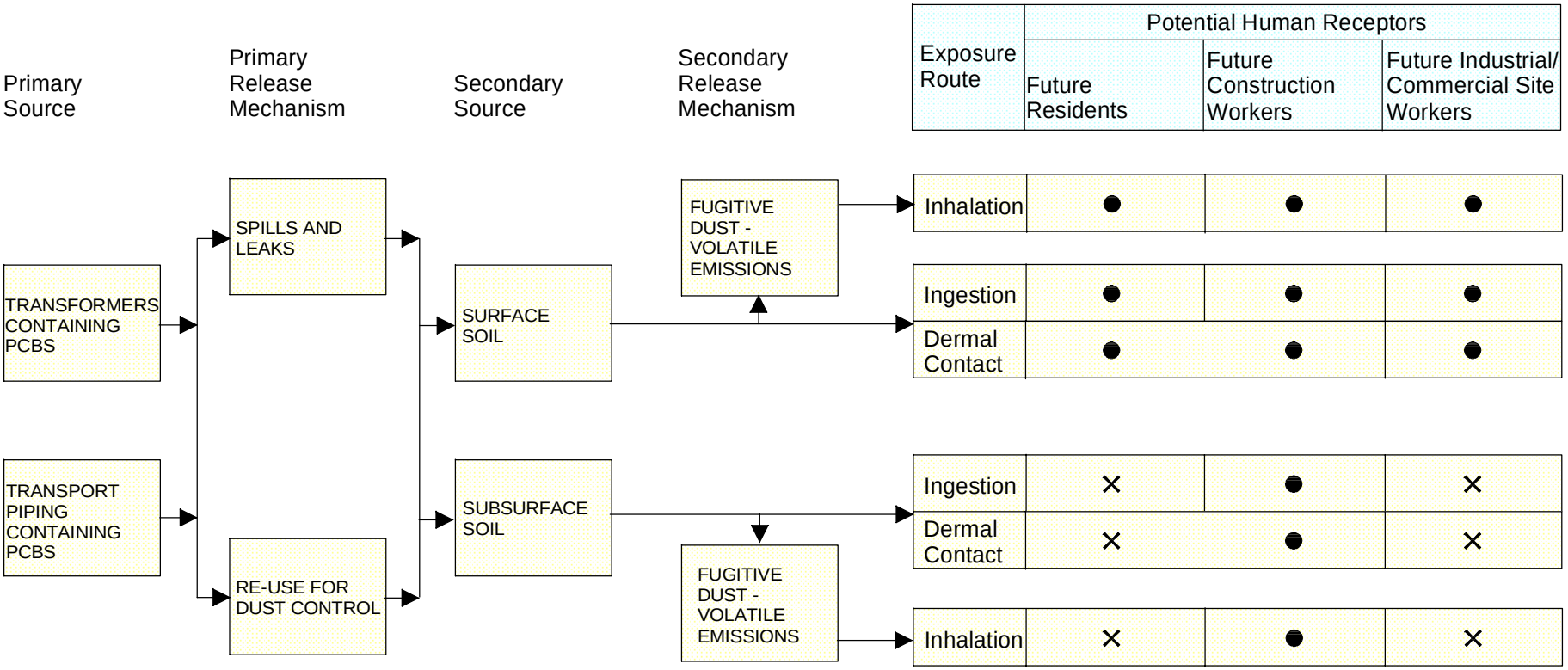
FIGURE 2-2 SITE 84 PLAN

MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4951 WILLIAM FLYNN HIGHWAY, SUITE 12
GIBSONIA, PA 15044

DRAWN BY	CHECKED BY	DATE	SCALE	JOB	SHEET NO.
MC	MG	FEB. 2008	AS SHOWN	354	2

FIGURE 2-3
CONCEPTUAL SITE MODEL
SITE 84/BUILDING 45 AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

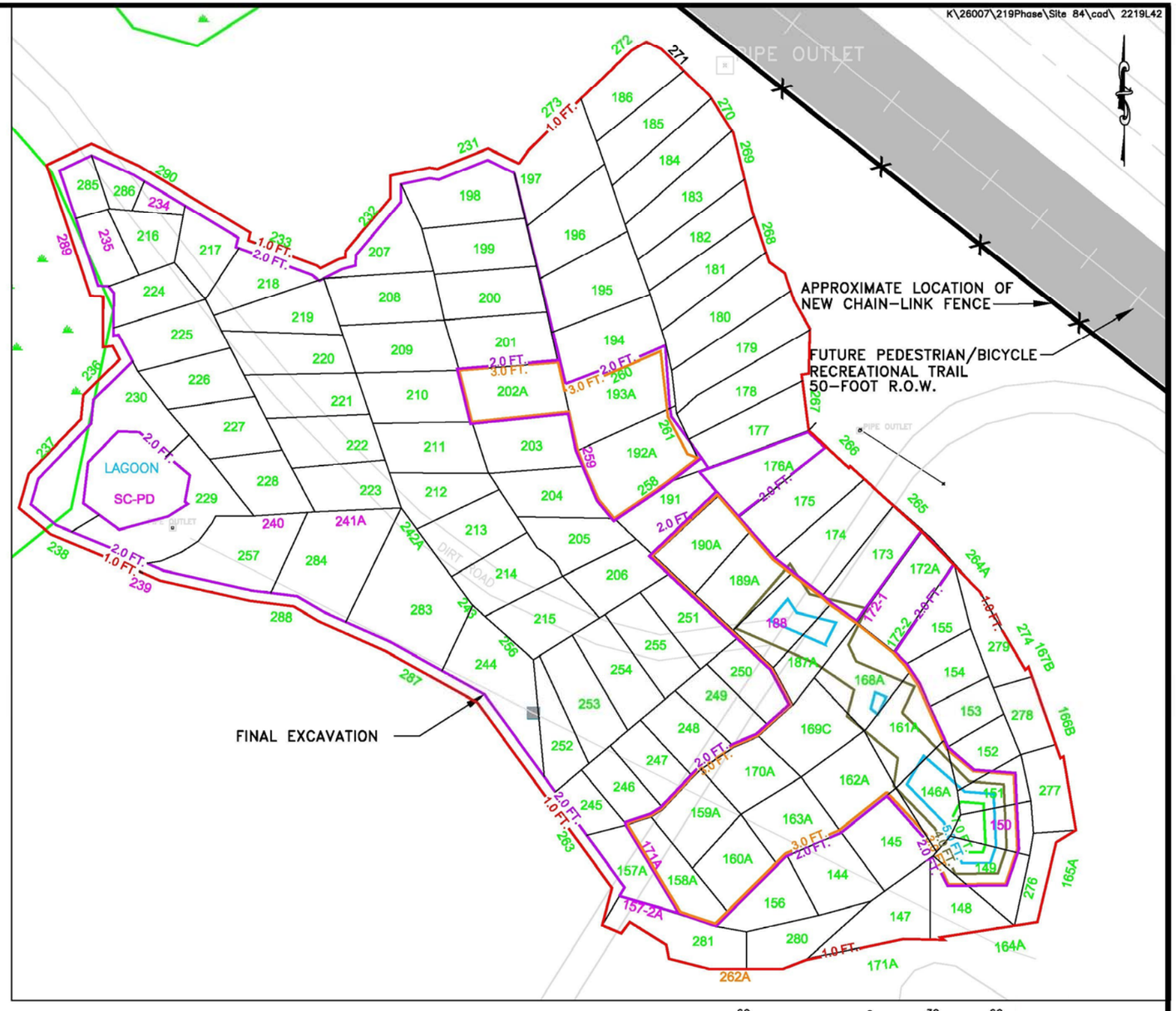


LEGEND

- ● Complete exposure pathway. Will be quantitatively evaluated.
- × Incomplete exposure pathway. Will not be quantitatively evaluated

SAMPLE ID	PCB Ensys Result	PCB Lab Result
SC-144	< 10.0	5.7
SC-145	NA	6.9
SC-146A	< 10.0	2.2
SC-147	< 10.0	0.23
SC-148	< 10.0	0.19
SC-149	< 10.0	1.3
SC-150	< 10.0	23
SC-151	< 10.0	0.3
SC-152	< 10.0	0.12
SC-153	< 10.0	1.3
SC-154	< 10.0	0.35
SC-155	< 10.0	6.1
SC-156	< 10.0	3
SC-157A	< 10.0	0.14
SC-157-1A	> 10.0	2.9
SC-157-2A	> 10.0	20
SC-158A	NE	ND
SC-159A	NE	0.29
SC-160A	< 10.0	8.3
SC-161A	< 10.0	7.8
SC-162A	NE	0.72
SC-163	> 50.0	NA
SC-164	< 10.0	0.062
SC-164A	NA	1.2
SC-165	< 10.0	0.062
SC-165A	NA	1.9
SC-166A	NA	5.4
SC-166B	NA	0.15
SC-167B	NA	1.2
SC-168A	< 10.0	6.7
SC-169C	NA	5.3
SC-170A	< 10.0	1.6
SC-171A	NA	17
SC-172-1	NA	37
SC-172-2	NA	3
SC-172A	NA	0.54
SC-173	NA	2.9
SC-174	< 10.0	6
SC-175	NA	3
SC-176A	NA	0.59
SC-177	< 10.0	6.7
SC-178	< 10.0	5.5
SC-179	< 10.0	3.7
SC-180	NA	0.72
SC-181	< 10.0	0.57
SC-182	< 10.0	9.2
SC-183	< 10.0	0.31
SC-184	NA	0.15
SC-185	NA	0.57
SC-186	NA	0.86
SC-187A	NA	0.01
SC-188	NA	12
SC-189A	NA	0.69
SC-190A	NA	0.91
SC-191	NA	2
SC-192A	NA	1.7
SC-193A	NA	2.1
SC-194	NA	2
SC-195	< 10.0	1.1
SC-196	< 10.0	1.9
SC-197	NA	0.17
SC-198	< 10.0	1.9
SC-199	NA	0.078
SC-200	< 10.0	0.12
SC-201	< 10.0	0.95
SC-202A	NA	2.7
SC-203	NA	3.4
SC-204	< 10.0	0.26
SC-205	NA	3
SC-206	NA	3.2
SC-207	< 10.0	0.84
SC-208	NA	0.79
SC-209	< 10.0	0.1
SC-210	< 10.0	0.026
SC-211	NA	ND
SC-212	< 10.0	0.18
SC-213	< 10.0	0.068

SAMPLE ID	PCB Ensys Result	PCB Lab Result
SC-214	< 10.0	ND
SC-215	< 10.0	ND
SC-216	< 10.0	ND
SC-217	< 10.0	0.27
SC-218	< 10.0	0.28
SC-219	< 10.0	0.067
SC-220	< 10.0	0.092
SC-221	< 10.0	0.043
SC-222	< 10.0	0.056
SC-223	< 10.0	3.4
SC-224	< 10.0	ND
SC-225	< 10.0	0.097
SC-226	< 10.0	ND
SC-227	> 10.0	6.7
SC-228	< 10.0	0.064
SC-229	> 10.0	7.5
SC-230	< 10.0	0.16
SC-231	NA	1.8
SC-232	NA	7.2
SC-233	NA	0.32
SC-234	NA	11
SC-235	NA	12
SC-236	NA	3.1
SC-237	NA	2.3
SC-238	NA	0.94
SC-239	NA	12
SC-240	NA	33
SC-241A	NA	15
SC-242A	NA	0.5
SC-243	NA	1.8
SC-244	< 10.0	1.3
SC-245	NA	0.74
SC-246	NA	8.2
SC-247	NA	10
SC-248	NA	1.8
SC-249	NA	0.78
SC-250	NA	5.2
SC-251	NA	0.56
SC-252	NA	ND
SC-253	NA	0.66
SC-254	NA	0.39
SC-255	NA	9
SC-256	NA	0.14
SC-257	NA	0.79
SC-258	NA	1.8
SC-259	NA	12
SC-260	NA	2.9
SC-261	NA	0.87
SC-262A	NA	730
SC-263	NA	0.79
SC-264A	NA	0.068
SC-265	NA	1.6
SC-266	NA	3
SC-267	NA	3.4
SC-268	NA	1.4
SC-269	NA	0.3
SC-270	NA	2.9
SC-271	NA	too wet
SC-272	NA	0.85
SC-273	NA	1.5
SC-274	NA	0.38
SC-275	NA	0.46
SC-276	NA	0.66
SC-277	NA	0.96
SC-278	NA	0.18
SC-279	NA	0.17
SC-280	NA	0.16
SC-281	NA	7.7
SC-283	NA	3.5
SC-284	NA	2
SC-285	NA	0.25
SC-286	NA	0.6
SC-287	NA	0.76
SC-288	NA	2.8
SC-289	NA	17
SC-290	NA	0.47
SC-PD	NA	20



NOTE:
THE EXCAVATION DEPTHS ARE ESTIMATED

LEGEND

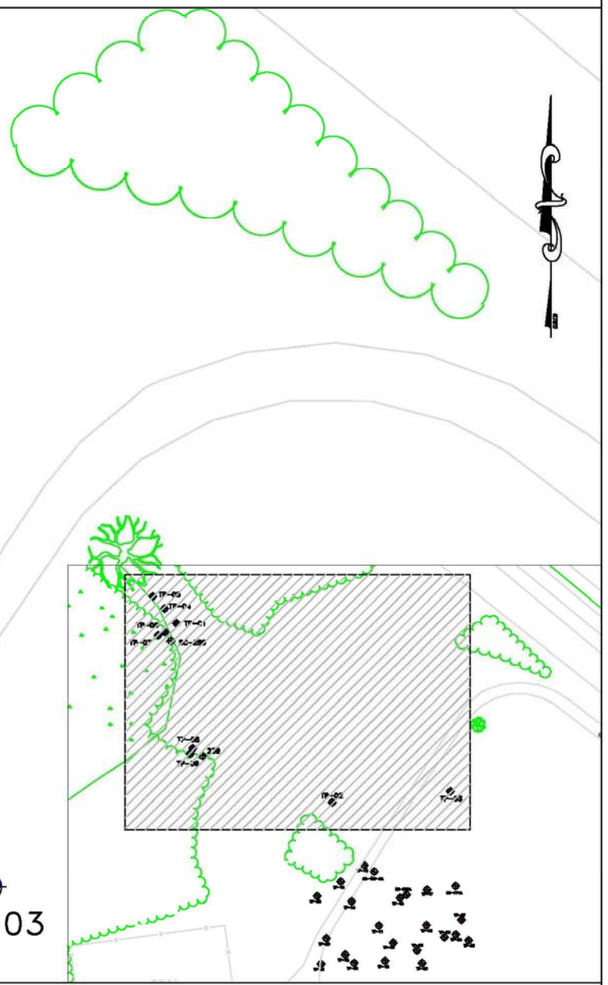
- FINAL LIMITS OF EXCAVATION
- 144 SOIL SAMPLE WITH PCB CONCENTRATIONS < 10 ppm
- 146 SOIL SAMPLE WITH PCB CONCENTRATIONS > 10 ppm, < 50 ppm
- 262 SOIL SAMPLE WITH PCB CONCENTRATIONS > 50 ppm
- EXCAVATED TO 1 FT
- EXCAVATED TO 2 FT
- EXCAVATED TO 3 FT
- EXCAVATED TO 4 FT
- EXCAVATED TO 5 FT
- EXCAVATED TO 7 FT

FIGURE 2-4
PCB CONFIRMATION SAMPLES
SITE 84 PHASE II NTCRA 2004

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

TP-05
TP-04
TP-06
TP-01
TP-07
SC-289
TP-08
239
TP-09
TP-02
TP-03



LEGEND

PHASE II: PCB >= 10 PPM ABOVE 2 FT

OCT 2005: PCB < 10 PPM ABOVE 2 FT

40 0 20 40

RHEA Engineers & Consultants, Inc.

FIGURE 2-5
NORTHWESTERN BACKFILL AREAS 2005

SITE 84 OPERABLE UNIT 19
MCB CAMP LEJEUNE, NORTH CAROLINA

SIZE	FSCM NO.	DWG NO.	REV
		273-F4-B3	

SCALE 1" = 40' | SHEET

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

EXCAVATION AREA

ROAD FILL AREA

SOUTH FILL AREA

TP-13
SC-157-2A
TP-19
TP-30
TP-14
SC-262A
TP-10
TP-17
SC-171A
TP-27
TP-11
TP-16
TP-25
TP-24
TP-28
TP-20
TP-15
TP-23
TP-12
TP-22
TP-18
TP-26
TP-21
TP-29
TP-31
TP-33
TP-32

30 0 10 20 30

LEGEND

- PCB >= 50 PPM ABOVE 2 FT
- 10 PPM <= PCB < 50 PPM ABOVE 2 FT
- PCB < 10 PPM ABOVE 2 FT

RHEA Engineers & Consultants, Inc.

FIGURE 2-6
SOUTHEASTERN BACKFILL & EXCAVATION AREAS 2005

SITE 84 OPERABLE UNIT 19
MCB CAMP LEJEUNE, NORTH CAROLINA

SIZE	FSCM NO.	DWG NO.	REV
		273-F6-B5	

SCALE 1" = 30' SHEET

NAVFAC 5076/273/REPORTS/R2/DRAFT/FIGURES

FORMER RAILROAD

FENCE LINE

IP-14

IP-13

BM-6

MINOR BACKFILL AREAS

1 2 3 4 5 6 7 8

20 0 10 20
SCALE IN FEET

LEGEND

- FENCE
- FILL AREA
- IN-PLACE SAMPLE POINT
- BENCHMARK ELEVATION
- TREE LINE
- (8) COORDINATE POINT (SEE TABLE)

Point	PCB (ppm)	Original Elevation (ft)	Final Elevation (ft)
IP-13	0.27	4.25	6.26
IP-14	0.045	5.46	7.50
Note: PCB analysis by EPA Method 8082			

Benchmark	Easting	Northing	Elevation
BM-5	2495308.77	361373.14	18.88
BM-6	2495055.32	361618.18	6.76
Note: Northing and Easting shown in North Carolina State Plane feet; BM-5 shown on Figure 3.			

Coordinates for Backfill Areas		
Location	Easting	Northing
1	2494870.56	361711.52
2	2494856.76	361705.65
3	2494884.16	361641.24
4	2494897.96	361647.11
5	2494886.35	361551.22
6	2494881.91	361536.90
7	2494948.77	361516.18
8	2494953.21	361530.50

PRINTED DATE: MAY 2007

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS

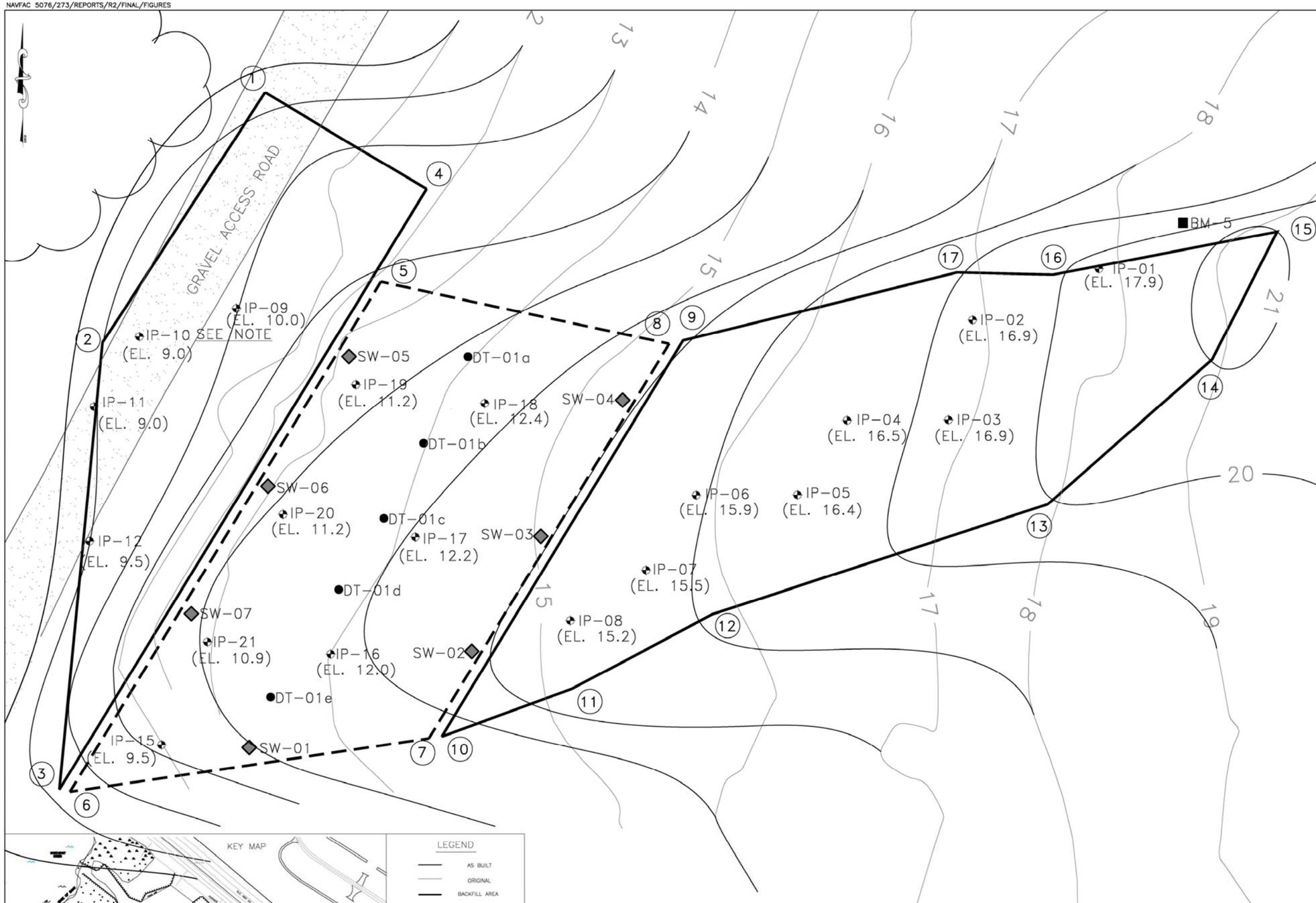
SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC

FIGURE 2-7 PCB CONFIRMATION PHASE III NTCRA 2006
NORTHWESTERN BACKFILL AREAS
MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4951 WILLIAM FLYNN HIGHWAY, SUITE 12
GIBSONIA, PA 15044

DRAWN BY	CHECKED BY	DATE	SCALE	JOB	SHEET NO.
MC	MG	MAY 2007	AS SHOWN	273	F4

NAVFAC 5076/273/REPORTS/R2/FINAL/FIGURES



Sample ID	PCB (ppm)
SW-01	8.2
SW-02	**20**
SW-03	**11.0**
SW-04	**36**
SW-05	**79**
SW-06	**960**
SW-07	**30**

Sample ID	PCB (ppm)	Sample ID	PCB (ppm)
IP-01	0.056	IP-10-DUP	**67**
IP-02	0.44	IP-11	2.4
IP-03	2.0	IP-12	4.2
IP-03-DUP	1.9	IP-15	0.26
IP-04	0.085	IP-16	0.84
IP-05	0.44	IP-16-DUP	0.4
IP-06	0.48	IP-17	**200**
IP-07	0.8	IP-18	**42**
IP-08	2.9	IP-19	**360**
IP-09	2.0	IP-20	**51**
IP-10	**78**	IP-21	3.5

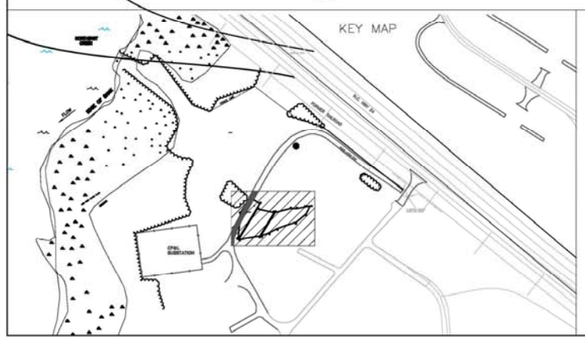
Method:
PCB analysis by EPA Method 8082
Shaded:
PCBs detected > 10 ppm

Benchmark	Easting	Northing	Elevation
BM-5	2495308.77	361373.14	18.88
BM-6	2495055.32	361618.18	6.76

Note: Northing and Easting shown in North Carolina State Plane feet; BM-6 shown on Figure 4.

Coordinates for Backfill and Excavation Areas

Location	Easting	Northing
1	2495126.22	361399.08
2	2495093.90	361349.31
3	2495085.32	361260.39
4	2495158.33	361379.85
5	2495149.24	361361.44
6	2495087.42	361259.92
7	2495158.78	361270.56
8	2495206.58	361349.05
9	2495209.34	361349.73
10	2495161.36	361270.94
11	2495187.23	361280.41
12	2495215.16	361295.25
13	2495281.80	361317.13
14	2495314.55	361345.96
15	2495327.47	361371.37
16	2495282.90	361362.81
17	2495263.81	361363.26



LEGEND
- AS BUILT
- ORIGINAL
- BACKFILL AREA
- EXCAVATION AREA
- IN-PLACE SAMPLE POINT
- BENCHMARK ELEVATION
- TREE LINE
- (EL. --) SAMPLE ELEVATION
- PRE-REMOVAL SUB-SAMPLES
- (1) COORDINATE POINT (SEE TABLE)
- SIDEWALL SAMPLES

NOTE: PCB CONCENTRATIONS WERE LESS THAN 10 PPM TO A DEPTH OF TWO FEET FOR SAMPLES TAKEN WEST (DOWNGRADIENT) OF THIS LOCATION IN DECEMBER 2005 (SAMPLES TP-19 AND TP-30) (RHEA, SEPTEMBER 2006).

10 0 5 10
SCALE IN FEET

PRINTED DATE: MAY 2007

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS

SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC
FIGURE 2-8 PCB CONFIRMATION PHASE III NTCRA 2006
SE BACKFILL & EXCAVATION AREAS
MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4951 WILLIAM FLYNN HIGHWAY, SUITE 12
GIBSONIA, PA 15044

DRAWN BY	CHECKED BY	DATE	SCALE	JOB	SHEET NO.
MC	MG	MAY 2007	AS SHOWN	273	F3

NAVFAC 1905/354/REPORTS/R2/DRAWINGS

NORTHEAST CREEK

EDGE OF BANK

WETLANDS

FENCE LINE

FORMER RAILROAD

N.C. HWY 24

GRAVEL ACCESS ROAD

PHASE II
NTCRA

PHASE III
NTCRA

PHASE I
NTCRA

CP&L
SUBSTATION

LEGEND OF LAND USE CONTROLS (LUCs)

SUBSURFACE SOILS (>2 FEET) WITH PCB CONCENTRATION >10 ppm. NO INTRUSIVE ACTIVITY PERMITTED.

SURFACE SOILS (0–2 FEET) WITH PCBs DETECTED >1PPM AND <10PPM. LOW OCCUPANCY LAND USE PERMITTED.

LEGEND

NTCRA NON-TIME CRITICAL REMOVAL ACTION

WETLANDS

40 0 20 40

SCALE IN FEET

PRINTED DATE: MAY 2007

NO.	DESCRIPTION	DATE	BY
4			
3			
2			
1			

REVISIONS

SITE 84 OPERABLE UNIT 19

NAVFAC MID-ATLANTIC

FIGURE 2-9 RAA 4: PCB REMOVAL ACTIONS W/LUCs

MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4951 WILLIAM FLYNN HIGHWAY, SUITE 12
GIBSONIA, PA 15044

DRAWN BY	CHECKED BY	DATE	SCALE	JOB	SHEET NO.
MC	MG	FEB. 2008	AS SHOWN	354	5

APPENDIX A

NCDENR CONCURRENCE LETTER

North Carolina
Department of Environment and Natural Resources

Division of Waste Management

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Dexter R. Matthews, Director

September 2, 2008

Attn: Gary Tysor
NAVFAC Midlant Environmental RPM, Camp Lejeune
Marine Corps North Carolina IPT
6506 Hampton Blvd
Norfolk, VA 23508-1273

RE: Concurrence with the August 2008 revised Draft Final Record of Decisions for OU# 19, Site 84 at MCB Camp Lejeune, NC, Soil and Groundwater
Camp Lejeune, NC6170022580
Jacksonville, Onslow County, North Carolina

Dear Mr. Tysor:

The NC Superfund Section has received and reviewed the revised Draft Final Record of Decision (ROD) for Ou#19, Site 84 at MCB, Camp Lejeune dated August 2008 and concurs that the selected remedy is protective of human health and the environment. The contamination levels now present at Site 84 are acceptable for industrial use and Land Use Controls will restrict the use of the property to industrial use.

The State's concurrence is based solely on the information contained in the Revised Draft Final ROD dated August 2008 for OU#19, Site 84. Should we receive additional information that significantly affects the conclusions of the ROD, we may modify or withdraw this concurrence with written notice to the Naval Facilities Engineering Command for Camp Lejeune and the EPA Region IV. If you have any questions or comments, please contact me, at (919) 508 8464 or email David.Lown@ncmail.net

Sincerely,

David J. Lown, LG, PE
Head, Federal Remediation Branch
Superfund Section

Cc: Randy McElveen, NC Superfund Section
Bob Lowder, EMD/IR
Gena Townsend, USEPA

APPENDIX B

STATISTICAL SUMMARIES

STATISTICAL SUMMARY
SURFACE SOIL ORGANICS (BEFORE NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/kg)								
2-Butanone (MEK)	4.756	11.5086	8.694	0.6954	0.9391	5.026	NO	NO
Acetone	32.986	139.4356	80.6976	0.7825	1.6322	27.302	NO	NO
Ethylbenzene	13.524	65.9326	36.0846	-0.8298	1.392	2.8487	NO	NO
Xylenes, total	6.098	23.779	14.2346	0.3068	1.0268	4.1666	NO	NO
SEMIVOLATILES (ug/kg)								
2-Methylnaphthalene	3872.64	18371.7849	10159.0324	4.1927	1.9145	1957.7469	NO	NO
Acenaphthene	1173.67	3988.8041	2538.5449	4.6483	1.9799	3698.151	NO	NO
Anthracene	2765.16	11142.1485	6577.741	4.7655	2.2261	12398.0323	NO	NO
Benzo(a)anthracene	8480.65	37850.3955	21432.1645	5.0833	2.5139	69003.872	NO	NO
Benzo(a)pyrene	6795.62	29872.1431	17017.1643	5.0853	2.4018	30451.0555	NO	NO
Benzo(b)fluoranthene	7751.34	33853.2607	19335.129	5.1069	2.4814	40857.7396	NO	NO
Benzo(g,h,i)perylene	2668.01	10932.6136	6408.8931	4.8849	2.1419	10702.8685	NO	NO
Benzo(k)fluoranthene	5342.37	23907.2441	13522.8662	4.8932	2.3125	18652.7751	NO	NO
Bis(2-ethylhexyl)phthalate	249.76	757.1721	508.8465	4.149	1.2865	335.4814	NO	NO
Carbazole	1781.41	7560.2762	4368.3586	4.6035	1.939	3157.2101	NO	NO
Chrysene	8181.1	35840.1916	20444.77	4.9955	2.6262	96011.8922	NO	NO
Dibenz(a,h)anthracene	866.87	3374.0754	2021.3992	4.4527	1.7466	1413.752	NO	NO
Dibenzofuran	565.06	1780.6617	1174.3605	4.4221	1.6969	1213.8138	NO	NO
Dibenzothiophene	424.5	474.4687	2542.7629	5.561	1.5165	53170.6124	NO	NO
Fluoranthene	13872.39	59734.8088	34312.2356	5.302	2.7876	243222.2476	NO	NO
Fluorene	1386.4	4099.7877	2789.2509	4.6603	2.0983	7468.8312	NO	NO
Hexachlorocyclopentadiene	274.92	837.8442	561.6106	4.2215	1.2911	363.9421	NO	NO
Indeno(1,2,3-cd)pyrene	2808.47	11732.6127	6823.0939	4.9923	2.0429	8790.9605	NO	NO
Naphthalene	414.22	1487.8391	923.3235	4.1675	1.4969	525.3675	NO	NO
Phenanthrene	9728.61	35918.5115	22019.0792	5.3335	2.8627	338404.524	NO	NO
Pyrene	12012.07	49745.8757	29033.9378	5.2512	2.8377	281986.6034	NO	NO
PESTICIDES / PCBs (ug/kg)								
4,4'-DDD	188.7217	629.5887	414.1455	1.3849	2.7326	4806.2789	NO	NO
4,4'-DDE	57.6834	116.1411	99.2676	1.2707	2.5696	2277.8123	NO	NO
4,4'-DDT	139.1054	272.1248	236.5395	2.1059	2.6495	7135.9174	NO	NO
BHC, alpha-	43.953	94.4888	77.7847	0.3889	2.6074	1089.5109	NO	NO
Chlordane, alpha-	4440.6149	11330.7056	8497.5663	2.009	4.0683	44122769.18	NO	NO
Chlordane, gamma-	5354.5368	13680.7316	10252.9134	2.0989	4.1437	75346385.18	NO	NO
Dieldrin	161.4489	312.5785	273.3674	2.2288	2.63	7482.7026	NO	NO
Endosulfan Sulfate	29.4785	55.5895	48.9261	0.503	2.7462	1949.9272	NO	NO
Endrin	57.5977	126.1254	102.7568	0.6611	2.5407	1109.8717	NO	NO
Endrin Aldehyde	144.0729	305.946	251.1057	2.017	2.5585	4298.5396	NO	NO
Endrin Ketone	25.551	51.5384	43.5813	0.3944	2.6089	1026.8434	NO	NO
Heptachlor	1905.7238	5110.5467	3735.5515	1.4979	3.7196	1785114.862	NO	NO
Heptachlor Epoxide	418.4958	1066.6831	800.421	1.1572	3.1905	47553.3347	NO	NO
Methoxychlor	81.1649	163.8893	138.5003	1.6218	2.587	3224.133	NO	NO
Aroclor-1248	2225.8288	16865.5781	5164.1635	3.8998	2.2265	1507.0811	NA	NO
Aroclor-1254	952.7253	5418.892	1896.809	4.446	1.8817	975.2076	NA	NO
Aroclor-1260	5200.1973	21242.6787	8901.114	6.1559	2.6293	54561.7753	NA	NO
TOTAL PETROLEUM HYDROCARBONS								
Gasoline Range Organics (ug/kg)	88.3182	262.5713	231.8076	2.6286	1.3771	207.0752	NO	NO
Diesel Range Organics (mg/kg)	188.3636	159.3614	275.4511	4.6127	1.4423	1794.0789	YES	YES

STATISTICAL SUMMARY
SURFACE SOIL ORGANICS (AFTER NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/kg)								
2-Butanone	7.8231	15.6097	15.5392	1.0053	1.2437	19.3652	NO	NO
Acetone	62.3923	192.1795	157.39	1.393	2.1181	1370.4539	NO	NO
Ethylbenzene	25.7162	91.426	70.9097	-0.5316	1.9169	52.6968	NO	NO
Xylenes (total)	10.7885	32.8821	27.0427	0.5751	1.3949	21.5783	NO	NO
SEMIVOLATILES (ug/kg)								
2-Methylnaphthalene	7145.3846	25495.8663	19748.435	4.2821	2.336	57887.4821	NO	NO
Acenaphthene	436.7115	946.2948	904.4815	4.2122	1.7354	2607.5134	NO	NO
Anthracene	626.9615	1415.2644	1326.5513	4.2371	1.89	5680.1834	NO	NO
Benzo(a)anthracene	639.9038	1654.1682	1457.5879	4.3121	1.8124	4762.1187	NO	NO
Benzo(a)pyrene	563.5769	1590.6887	1349.882	4.3275	1.6788	2476.9142	NO	NO
Benzo(b)fluoranthene	658.1538	1948.1056	1621.1363	4.3113	1.7268	2806.5731	NO	NO
Benzo(ghi)perylene	409.1346	931.9507	869.8141	4.2511	1.6651	2205.0483	NO	NO
Benzo(k)fluoranthene	395.9808	1043.4598	911.7811	4.1802	1.6154	1780.3472	NO	NO
Carbazole	260.5577	585.6401	550.0498	4.1134	1.4921	950.0093	NO	NO
Chrysene	770.7308	1938.3063	1728.8693	4.2067	1.967	7112.7112	NO	NO
Dibenz(a,h)anthracene	190.5577	359.7391	368.383	4.0555	1.3918	695.3267	NO	NO
Dibenzofuran	235.4615	508.11	486.6291	4.0668	1.4743	866.1231	NO	NO
Fluoranthene	1409.9038	4407.949	3588.8297	4.3983	2.009	18367.1219	NO	NO
Fluorene	957.3077	2519.751	2202.8645	4.3149	2.0521	19839.2658	NO	NO
Indeno(1,2,3-cd)pyrene	379.7115	887.0876	818.2143	4.4192	1.5175	1718.185	NO	NO
Naphthalene	145.4231	243.3119	265.6964	3.9704	1.2971	507.0031	NO	NO
Phenanthrene	3092.0962	7514.1123	6806.4527	4.6219	2.5102	364569.603	NO	NO
Pyrene	2044.4038	5014.6483	4523.2317	4.4593	2.3076	61662.1556	NO	NO
bis(2-Ethylhexyl) phthalate	143.0769	217.6981	250.6889	4.1369	1.2224	423.4872	NO	NO
PESTICIDES/PCBs (ug/kg)								
4,4'-DDD	4.7923	9.4489	9.9559	0.294	1.5525	42.5673	NO	NO
4,4'-DDE	0.9634	1.1283	1.58	-0.539	0.9672	2.3296	NO	NO
4,4'-DDT	2.3295	2.8733	3.8997	0.2974	1.0034	6.7623	NO	NO
Dieldrin	8.9886	16.3255	17.9101	0.8188	1.6179	87.744	NO	NO
Endosulfan sulfate	9.0733	14.3462	16.5108	0.1032	2.4117	1674.0436	NO	NO
Endrin	1.078	1.2983	1.7875	-0.4562	0.9941	2.6655	NO	NO
Endrin aldehyde	15.0083	22.6857	26.7692	1.2748	1.8278	292.8899	NO	NO
Endrin ketone	4.6454	8.4225	9.0119	-0.2703	2.0262	241.993	NO	NO
Methoxychlor	13.7394	25.1664	26.7863	0.7878	2.0377	728.8098	NO	NO
PCB-1248	274.7146	1041.3204	472.3172	3.7408	1.9609	619.4323	NA	NO
PCB-1260	5980.374	23024.5561	10349.5489	6.2315	2.7379	95624.6868	NA	NO
alpha-BHC	2.2723	6.2191	5.6709	-0.7161	1.3487	6.7765	NO	NO
alpha-Chlordane	4.4302	11.8434	10.9024	-0.2306	1.5623	25.9446	NO	NO
gamma-Chlordane	4.777	12.7355	11.7367	-0.2243	1.6224	31.3477	NO	NO

STATISTICAL SUMMARY
SURFACE SOIL INORGANICS (BEFORE NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
METALS (mg/kg)								
Aluminum	2634.8	1113.4972	3015.8125	7.8014	0.3879	3058.165	YES	NO
Antimony	0.8184	0.7405	1.0718	-0.5386	0.8243	1.2215	NO	NO
Arsenic	1.9264	2.426	2.7565	0.1091	1.0399	3.4921	YES	NO
Barium	13.024	12.8689	17.4274	2.2534	0.7877	18.6569	YES	NO
Beryllium	0.0405	0.0179	0.0466	-3.2946	0.4177	0.0478	NO	NO
Cadmium	0.1385	0.1669	0.1956	-2.6611	1.1918	0.283	NO	NO
Calcium	15241.44	27791.2265	24750.9436	8.1506	1.943	110808.1108	YES	NO
Chromium VI	4.906	3.8827	6.2346	1.4028	0.578	6.1195	YES	NO
Cobalt	0.2852	0.1408	0.3334	-1.3747	0.526	0.3619	NO	NO
Copper	11.2564	28.8671	21.134	1.1828	1.4851	25.8965	YES	NO
Iron	1934.24	653.1912	2157.7467	7.5044	0.3807	2259.8164	YES	YES
Lead	22.418	24.0664	30.653	2.5401	1.1587	48.4601	YES	NO
Magnesium	318.48	401.0414	455.7069	5.2644	0.9583	498.5091	YES	NO
Manganese	12.7	7.849	15.3857	2.3457	0.6679	17.487	YES	YES
Mercury	0.0345	0.0489	0.0512	-4.0278	1.1323	0.065	NO	NO
Nickel	1.3036	0.6648	1.5311	0.1418	0.512	1.6273	YES	YES
Potassium	90.66	66.2879	113.3422	4.2472	0.7593	132.287	YES	NO
Selenium	0.2004	0.0965	0.2334	-1.6685	0.308	0.2225	NO	NO
Sodium	47.932	56.6574	67.3188	3.5557	0.6491	57.4455	NO	NO
Thallium	0.2898	0.0672	0.3128	-1.2552	0.1668	0.3068	NO	NO
Vanadium	4.804	1.7319	5.3966	1.5109	0.3507	5.5127	YES	NO
Zinc	25.698	34.2045	37.402	2.4608	1.3582	71.4459	YES	NO

STATISTICAL SUMMARY
SURFACE SOIL INORGANICS(AFTER NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
METALS (mg/kg)								
Aluminum	2770.7692	1302.5965	3414.6653	7.842	0.4129	3565.2193	YES	NO
Antimony	0.6712	0.6039	0.9697	-0.7261	0.8046	1.2459	NO	NO
Arsenic	1.6838	1.7726	2.56	0.044	1.0817	5.2567	YES	NO
Barium	8.6346	6.0601	11.6302	1.9736	0.6061	13.0936	YES	NO
Cadmium	0.066	0.0706	0.1009	-3.1666	0.9207	0.1373	NO	NO
Calcium	4368.2308	5763.7217	7217.3387	7.3914	1.6208	44854.7932	YES	NO
Chromium	3.6731	1.6285	4.4781	1.2151	0.4305	4.8078	YES	YES
Cobalt	0.2527	0.104	0.3041	-1.4798	0.5178	0.3636	YES	YES
Copper	4.6085	7.6318	8.381	0.6342	1.3619	21.0996	YES	NO
Iron	1921.5385	652.4038	2244.0331	7.509	0.3375	2347.4881	YES	YES
Lead	20.4962	24.281	32.4987	2.2467	1.3522	103.3368	YES	NO
Magnesium	159.4154	97.6897	207.7051	4.8695	0.6919	265.7173	YES	YES
Manganese	8.8615	3.9329	10.8056	2.0731	0.5146	12.6483	YES	YES
Mercury	0.0391	0.0659	0.0717	-4.2392	1.362	0.1614	NO	NO
Nickel	1.1523	0.709	1.5028	-0.0149	0.5696	1.6733	YES	NO
Potassium	71.2654	64.0807	102.9416	3.9667	0.7948	129.1197	YES	NO
Selenium	0.2227	0.1284	0.2862	-1.5949	0.3951	0.2757	NO	NO
Vanadium	4.9154	2.1023	5.9546	1.5228	0.3747	6.1084	YES	NO
Zinc	12.5115	13.689	19.2782	1.9059	1.221	45.3531	YES	NO

STATISTICAL SUMMARY
SUBSURFACE SOIL ORGANICS (BEFORE NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/kg)								
1,2-Dichloroethene (total)	8.862	20.8566	16.3297	0.5267	1.5765	19.962	NO	NO
2-Butanone (MEK)	14.8272	30.3582	25.6969	1.2217	1.5377	36.5352	NO	NO
Acetone	33.6978	99.046	69.1612	1.2952	1.9214	121.6278	NO	NO
Benzene	14.3874	40.5219	28.8962	-0.0503	2.0034	57.3155	NO	NO
Chloroform	2.061	3.6518	3.3685	-0.1655	1.1651	3.4106	NO	NO
Ethylbenzene	117.556	334.0055	237.1464	0.3006	2.8484	2588.6016	NO	NO
Methylene Chloride	12.3424	30.6326	23.3104	0.5616	1.7347	30.3719	NO	NO
Styrene	3.1375	6.3352	5.4058	-0.405	1.6183	8.683	NO	NO
Toluene	11.3663	35.0249	23.9069	-0.3018	1.9399	25.9369	NO	NO
Xylenes, total	263.413	849.1781	567.4606	1.2224	2.4631	923.2873	NO	NO
SEMIVOLATILES (ug/kg)								
2-Methylnaphthalene	1222.9355	5054.6093	2763.7672	3.8689	1.687	572.7731	NO	NO
Acenaphthene	87.1048	181.3039	142.3729	3.7443	0.9133	96.0993	NO	NO
Anthracene	87.0726	163.8882	137.0318	3.7472	0.9569	102.344	NO	NO
Benzo(a)anthracene	191.7581	552.1553	360.0754	3.9605	1.2074	198.89	NO	NO
Benzo(a)pyrene	177.9355	478.9863	323.9482	4.0278	1.1514	193.6441	NO	NO
Benzo(b)fluoranthene	196.2823	524.1832	356.0727	4.0654	1.1962	216.7176	NO	NO
Benzo(g,h,i)perylene	112.9516	228.0369	182.4657	3.9414	1.0062	141.2347	NO	NO
Benzo(k)fluoranthene	122.5726	309.5384	216.9313	3.8568	1.0441	137.4988	NO	NO
Bis(2-chloroethoxy)methane	46.7177	67.4809	67.2884	3.5049	0.6212	51.2258	NO	NO
Bis(2-ethylhexyl)phthalate	141.9516	325.6875	241.2332	4.0675	1.0946	183.7456	NO	NO
Carbazole	71.2984	108.8899	104.4921	3.7476	0.8256	84.4873	NO	NO
Chrysene	190.1694	570.0182	363.932	3.8512	1.2552	209.3716	NO	NO
Dibenz(a,h)anthracene	65.879	100.1506	96.4086	3.703	0.7866	75.8384	NO	NO
Dibenzofuran	88.75	233.1149	159.812	3.6793	0.8918	85.89	NO	NO
Fluoranthene	294.9516	900.4216	569.4334	4.0881	1.346	314.2268	NO	NO
Fluorene	102.3871	270.3996	184.8149	3.7311	0.9765	103.5296	NO	NO
Hexachlorocyclopentadiene	60.5806	86.4112	86.9219	3.7616	0.6318	66.9303	NO	NO
Indeno(1,2,3-cd)pyrene	123.5081	233.5187	194.6932	4.1042	0.952	145.2556	NO	NO
Naphthalene	379.3468	1548.9545	851.5254	3.7967	1.3256	225.8801	NO	NO
Phenanthrene	413.2823	996.8698	717.1651	4.1285	1.5962	604.2903	NO	NO
Phthalic anhydride	145	35.3553	302.8435	4.9616	0.2463	289.8191	NA	NA
Pyrene	245.6048	757.2355	476.4382	3.9869	1.3096	265.1072	NO	NO
PESTICIDES / PCBs (ug/kg)								
4,4'-DDD	18.3023	79.042	42.3972	0.1818	1.7331	15.977	NO	NO
4,4'-DDE	12.776	56.4435	29.9821	-0.1219	1.7236	11.5314	NO	NO
4,4'-DDT	31.3185	126.5078	69.8828	0.7225	1.8004	36.4612	NO	NO
BHC, beta-	9.5956	45.773	23.5489	-0.6275	1.5509	4.7037	NO	NO
Chlordane, alpha-	544.7381	2529.997	1315.9747	0.3732	2.8145	1215.069	NO	NO
Chlordane, gamma-	690.4664	3248.1548	1680.624	0.3784	2.8926	1648.2116	NO	NO
Dieldrin	31.9097	152.5898	78.4247	0.5771	1.5301	14.997	NO	NO
Endrin Aldehyde	31.9766	152.5828	78.4895	0.5241	1.5682	15.4527	NO	NO
Heptachlor	255.1644	1241.7159	633.6853	0.0891	2.4197	155.0018	NO	NO
Heptachlor Epoxide	20.7496	73.9054	43.2787	-0.1972	1.8404	16.074	NO	NO
Methoxychlor	18.1898	81.59	43.0614	0.0798	1.709	13.6338	NO	NO
Aroclor-1248	1302.5453	7721.714	3445.7407	1.9335	2.121	317.5042	NO	NO
Aroclor-1254	275.5608	870.8505	517.2692	3.3054	1.7466	332.735	NO	NO
Aroclor-1260	1631.1831	7482.2533	3707.9152	3.0858	2.5705	5607.5431	NO	NO
TOTAL PETROLEUM HYDROCARBONS								
Gasoline Range Organics (ug/kg)	72534.5	205047.0397	209882.0407	4.008	3.9028	4.83717E+12	YES	NO
Diesel Range Organics (mg/kg)	727	1928.805	2018.9798	4.2222	1.8927	32931.0808	YES	NO

STATISTICAL SUMMARY
SUBSURFACE SOIL ORGANICS (AFTER NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

VOLATILES (ug/kg)								
1,2-Dichloroethene (total)	12.8089	25.9177	25.0758	0.8223	1.8056	120.7301	NO	NO
2-Butanone	19.9518	36.4185	37.1887	1.5111	1.7077	140.7664	NO	NO
Acetone	51.3214	124.8996	110.4366	1.7822	2.1536	1816.4123	NO	NO
Benzene	14.8646	42.4184	34.9413	0.175	2.079	276.3447	NO	NO
Ethylbenzene	100.0891	269.1737	227.4894	0.6379	2.947	36015.3507	NO	NO
Methylene chloride	18.0268	38.1478	36.0822	0.9047	1.9657	218.2056	NO	NO
Styrene	4.2513	7.5729	7.8356	-0.0804	1.7945	47.2988	NO	NO
Xylenes (total)	210.7357	745.6757	563.6651	1.4207	2.4009	3284.9305	NO	NO
SEMIVOLATILES (ug/kg)								
2-Methylnaphthalene	2030.5556	6587.0012	4731.4182	4.036	2.0561	6379.5254	NO	NO
Acenaphthene	97.1667	223.5298	188.8204	3.7194	0.9652	121.8449	NO	NO
Benzo(b)fluoranthene	72.7083	106.6905	116.4545	3.8265	0.7762	96.7765	NO	NO
Chrysene	57.8611	84.8375	92.6469	3.5948	0.7814	77.303	NO	NO
Dibenzofuran	115.5278	302.9021	239.7265	3.7175	1.0284	148.3853	NO	NO
Fluoranthene	71.1528	103.9667	113.7822	3.7972	0.7897	95.7181	NO	NO
Fluorene	125	349.075	268.1309	3.6858	1.0664	153.8158	NO	NO
Naphthalene	608.9028	2023.2417	1438.4909	3.9075	1.628	862.2707	NO	NO
Phenanthrene	404.8889	1089.6349	851.671	3.9382	1.5277	690.8626	NO	NO
Phthalic anhydride	145	35.3553	302.8435	4.9616	0.2463	289.8191	N/A	N/A
Pyrene	65.6944	94.5657	104.4691	3.717	0.7981	89.3614	NO	NO
bis(2-Chloroethoxy)methane	59.0556	87.0066	94.7308	3.6159	0.7774	78.5255	NO	NO
bis(2-Ethylhexyl) phthalate	102.4306	122.7209	152.7497	4.0926	0.9824	181.9448	NO	NO
PESTICIDES/PCBs (ug/kg)								
4,4'-DDD	1.339	2.2782	2.2731	-0.3578	0.9426	1.9928	NO	NO
4,4'-DDE	0.7888	1.0529	1.2205	-0.6789	0.8175	1.162	NO	NO
4,4'-DDT	1.5903	1.9897	2.4061	0.1027	0.7342	2.2096	NO	NO
Dieldrin	1.3	1.0104	1.7143	0.1004	0.5104	1.6382	NO	NO
Endrin aldehyde	1.5028	2.1563	2.3869	0.0835	0.6225	1.8499	NO	NO
Methoxychlor	1.9835	5.5266	4.2496	-0.3434	1.0087	2.4705	NO	NO
PCB-1260	2406.4292	9261.1843	5646.3828	3.0357	2.7706	27035.0174	NO	NO
alpha-Chlordane	0.7868	1.3337	1.3337	-0.7355	0.7894	1.0287	NO	NO
beta-BHC	0.45	0.4285	0.6257	-1.0391	0.6117	0.5945	NO	NO
gamma-Chlordane	0.7893	1.4228	1.3727	-0.7679	0.8039	1.0428	NO	NO
TOTAL PETROLEUM HYDROCARBONS								
Gasoline Range Organics (ug/kg)	580000	ND	ND	13.2708	ND	ND	NO	NO
Diesel Range Organics (mg/kg)	5500	ND	ND	8.6125	ND	ND	NO	NO

STATISTICAL SUMMARY
SUBSURFACE SOIL INORGANICS (BEFORE NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
METALS (mg/kg)								
Aluminum	3176.7419	1651.9388	3680.3139	7.9219	0.5793	4033.0668	NO	NO
Antimony	0.428	0.2996	0.5193	-1.0005	0.4992	0.4965	NO	NO
Arsenic	0.8035	0.4842	0.9511	-0.4279	0.705	1.1096	YES	YES
Barium	8.7942	7.4464	11.0641	1.7891	0.9483	14.2712	YES	NO
Beryllium	0.04	0.024	0.0473	-3.3353	0.4442	0.0459	NO	NO
Cadmium	0.043	0.0405	0.0553	-3.3907	0.6134	0.0514	NO	NO
Calcium	5670.1742	12968.941	9623.5867	7.1456	1.6774	14839.034	YES	NO
Chromium VI	4.3161	2.3794	5.0414	1.3236	0.5391	5.2949	YES	NO
Cobalt	0.2935	0.1595	0.3421	-1.3882	0.6156	0.3819	NO	YES
Copper	3.0055	5.7251	4.7507	0.2128	1.2944	5.9163	YES	NO
Iron	1951.0645	1369.9225	2368.6675	7.3432	0.7455	2753.9658	YES	NO
Lead	7.8361	10.9199	11.1649	1.6158	0.85	10.335	YES	NO
Magnesium	172.1065	186.7738	229.0421	4.8012	0.8235	241.6727	YES	NO
Manganese	10.2816	11.5622	13.8062	1.8592	1.0189	17.9471	YES	NO
Mercury	0.0164	0.0116	0.0199	-4.3537	0.7342	0.0226	NO	YES
Nickel	1.1058	0.6593	1.3068	-0.0571	0.5919	1.3983	YES	NO
Potassium	90.3113	47.3814	104.7549	4.3377	0.6389	119.9395	NO	YES
Selenium	0.2674	0.1582	0.3156	-1.4439	0.4707	0.3112	NO	NO
Sodium	30.9274	11.1467	34.3253	3.3999	0.2168	32.9296	NO	NO
Thallium	0.363	0.1773	0.417	-1.0912	0.3622	0.4054	NO	NO
Vanadium	4.8677	2.5132	5.6338	1.4392	0.5772	6.157	YES	YES
Zinc	8.8968	10.8371	12.2003	1.5371	1.1774	16.7532	YES	NO

STATISTICAL SUMMARY
SUBSURFACE SOIL INORGANICS (AFTER NON-TCRA)
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

METALS (mg/kg)								
Aluminum	3521.0556	2089.9316	4377.9885	7.9479	0.7521	5776.6666	YES	YES
Antimony	0.3449	0.2397	0.4432	-1.1623	0.3652	0.3967	NO	NO
Arsenic	0.8564	0.5575	1.085	-0.4171	0.813	1.5001	YES	YES
Barium	7.8289	7.6953	10.9842	1.5988	1.0153	17.4289	YES	NO
Beryllium	0.0445	0.0287	0.0563	-3.2476	0.4931	0.0559	NO	NO
Cadmium	0.0344	0.0273	0.0456	-3.5231	0.4802	0.0419	NO	NO
Calcium	6887.2167	16562.4916	13678.3214	6.8957	1.8579	38774.362	NO	NO
Chromium	4.6111	2.6144	5.6831	1.3579	0.6303	6.677	YES	YES
Cobalt	0.2956	0.1608	0.3615	-1.3933	0.6568	0.4399	NO	YES
Copper	1.2489	1.3722	1.8115	-0.3148	1.1111	3.0544	YES	NO
Iron	1958.2222	1506.6367	2575.9872	7.3332	0.723	3007.1525	YES	NO
Lead	4.4817	2.9667	5.6981	1.2964	0.6756	6.6282	YES	NO
Magnesium	195.4889	240.5106	294.1053	4.7657	1.0195	416.7047	YES	NO
Manganese	9.2989	12.8654	14.5741	1.6179	1.1267	21.7184	YES	NO
Mercury	0.0129	0.0094	0.0168	-4.6016	0.7393	0.0201	NO	YES
Nickel	1.0067	0.5833	1.2459	-0.1705	0.6547	1.4906	YES	YES
Potassium	91.8444	58.9235	116.0048	4.272	0.7878	153.4877	YES	YES
Selenium	0.2814	0.1605	0.3472	-1.3913	0.4842	0.3546	NO	NO
Sodium	32.7903	14.4441	38.7128	3.4408	0.2767	36.7242	NO	NO
Thallium	0.4011	0.2114	0.4878	-1.0112	0.4205	0.4884	NO	NO
Vanadium	5.2028	3.1874	6.5097	1.428	0.7355	8.3297	YES	YES
Zinc	5.6472	8.3804	9.0834	1.0951	1.0616	11.4322	YES	NO

STATISTICAL SUMMARY
GROUNDWATER ORGANICS
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/L)								
2-Butanone (MEK)	1.7618	2.2637	2.6623	-0.4622	1.4842	6.1994	NO	NO
Benzene	1.3653	2.088	2.196	-1.3036	1.8659	10.0419	NO	NO
Carbon Disulfide	1.6679	2.3274	2.5938	-0.9836	1.8453	13.0384	NO	NO
Chloroform	3.2253	4.9712	5.2029	-0.5619	2.2102	96.0667	NO	NO
Chloromethane	1.6582	2.3359	2.5875	-1.1927	2.0285	27.8956	NO	NO
Ethylbenzene	1.8505	2.4284	2.8166	-1.0819	2.1389	44.8534	NO	NO
Methyl Tert-Butyl Ether (MTBE)	1.6474	2.3423	2.5792	-1.2525	2.0523	28.3928	NO	NO
Methylene Chloride	1.7808	2.2521	2.6767	-0.4326	1.4947	6.5409	NO	NO
Trichloroethene (TCE)	1.6332	2.3502	2.5682	-1.2587	2.0146	24.9653	NO	NO
Xylenes, total	1.7779	2.2792	2.6846	-0.5988	1.6335	9.0526	NO	NO
SEMIVOLATILES (ug/L)								
2-Methylnaphthalene	0.3762	0.2025	0.4763	-1.048	0.3296	0.4479	NO	NO
Naphthalene	0.5154	0.5062	0.7656	-0.8447	0.4907	0.6537	NO	NO
PESTICIDES / PCBs (ug/L)								
4,4'-DDD	0.0156	0.0208	0.0259	-4.957	1.2421	0.0497	NO	YES
4,4'-DDE	0.0108	0.0202	0.0208	-5.221	0.9506	0.0185	NO	YES
4,4'-DDT	0.0171	0.0227	0.0283	-4.8487	1.2282	0.0537	NO	YES
BHC, beta-	0.0135	0.017	0.0219	-4.9494	1.1312	0.0395	NO	YES
Chlordane, gamma-	0.0108	0.0192	0.0203	-5.3056	1.0386	0.0229	NO	YES
Endosulfan I	0.0101	0.0188	0.0194	-5.2919	0.949	0.0172	NO	YES
Heptachlor Epoxide	0.0095	0.0185	0.0186	-5.3289	0.9148	0.0156	NO	YES
HERBICIDES (ug/L)								
Dinoseb	0.1427	0.4102	0.3455	-3.9092	1.6971	0.6918	NO	NO
MCPA	10.4615	14.0986	17.4307	1.8545	0.8738	18.394	NO	NO

STATISTICAL SUMMARY
GROUNDWATER INORGANICS
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
METALS (mg/L)								
Aluminum	0.4075	0.2382	0.5252	-1.2177	0.9897	1.0895	NO	YES
Antimony	0.002	0.0027	0.0033	-6.522	0.6642	0.0029	NO	YES
Arsenic	0.0054	0.0081	0.0094	-5.7811	0.918	0.01	NO	YES
Barium	0.0403	0.0364	0.0583	-3.6153	1.0067	0.1165	YES	YES
Beryllium	0.0007	0.0002	0.0008	-7.2487	0.2252	0.0008	YES	YES
Cadmium	0.0002	0.0002	0.0003	-8.654	0.5369	0.0003	NO	YES
Calcium	45.8308	30.7564	61.0342	3.4369	1.1748	189.8292	YES	YES
Chromium VI	0.0009	0.0005	0.0011	-7.0829	0.3729	0.0011	NO	YES
Cobalt	0.0013	0.0014	0.002	-6.9839	0.7102	0.002	NO	YES
Iron	13.2868	22.6709	24.4934	0.2043	2.5747	5897.0693	YES	NO
Magnesium	4.9215	3.6964	6.7487	1.2272	1.0226	15.2444	YES	YES
Manganese	0.0997	0.1297	0.1638	-3.1963	1.5297	0.8757	YES	YES
Mercury	0	0	0	-10.218	0.204	0	NO	YES
Nickel	0.002	0.0027	0.0033	-6.5663	0.6658	0.0028	NO	YES
Potassium	2.7992	3.4931	4.5259	0.3287	1.2926	13.1454	YES	NO
Sodium	8.4731	6.1412	11.5088	1.8849	0.7613	15.31	YES	YES
Thallium	0.003	0.0011	0.0035	-5.8688	0.2996	0.0035	NO	YES
Vanadium	0.0015	0.0011	0.002	-6.7927	0.8018	0.0029	YES	YES
Zinc	0.0315	0.0839	0.073	-4.6374	1.1344	0.0543	NO	YES

STATISTICAL SUMMARY
LAGOON SURFACE WATER ORGANICS
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/L)								
Acetone	5.6	ND	ND	1.7228	ND	ND	NA	NA
Benzene	1.2	ND	ND	0.1823	ND	ND	NA	NA
Toluene	2.7	ND	ND	0.9933	ND	ND	NA	NA
Xylenes, total	3.5	ND	ND	1.2528	ND	ND	NA	NA

STATISTICAL SUMMARY
LAGOON SEDIMENT ORGANICS
SITE 84 - BUILDING 45 AREA
MCB CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
VOLATILES (ug/kg)								
Xylenes, total	910	ND	ND	6.8134	ND	ND	NA	NA
SEMIVOLATILES (ug/kg)								
2-Methylnaphthalene	10000	ND	ND	9.2103	ND	ND	NA	NA
Bis(2-ethylhexyl)phthalate	2400	ND	ND	7.7832	ND	ND	NA	NA
Naphthalene	2000	ND	ND	7.6009	ND	ND	NA	NA
Phenanthrene	2500	ND	ND	7.824	ND	ND	NA	NA
PCBs (ug/kg)								
Aroclor-1248	1085.7143	1159.2182	1937.106	6.2014	1.5148	61973.3667	YES	YES
Aroclor-1260	14142.8571	13047.7146	23725.7948	9.2151	0.8857	51223.5513	YES	YES
TOTAL PETROLEUM HYDROCARBONS								
Diesel Range Organics (mg/kg)	6466.6667	4463.5561	13991.5771	8.6285	0.6407	427411.8192	YES	YES

APPENDIX C

PRAP PUBLIC MEETING MINUTES

PUBLIC MEETING

IR SITE 84 PROPOSED REMEDIAL ACTION PLAN (PRAP)
CAMP LEJEUNE

APRIL 29, 2008
COASTAL CAROLINA COMMUNITY COLLEGE
444 WESTERN BOULEVARD
JACKSONVILLE, NORTH CAROLINA 28546

* *

MEETING MODERATOR - MR. ROBERT LOWDER
IR PROGRAM MANAGER
MCB CAMP LEJEUNE EMD/EQB
BUILDING 12, POST LANE (ROOM 236)
CAMP LEJEUNE, NORTH CAROLINA
28542-0004

PRESENTER - MS. MARCELLA J. GALLICK, P.E.
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LIST OF ATTACHMENTS

ATTACHMENT [1] Public Meeting Agenda, April 29, 2008

COURT REPORTER NOTE: The public meeting portion of the Restoration Advisory Board (RAB) meeting convened at 6:00 p.m., in Room 103 of the Business Technology Building, Coastal Carolina Community College.

MR. ROBERT LOWDER: All right, folks, welcome. Again, I think -- we don't have any new folks in here. Mr. McAdams, you're back. Did they put you all back together?

MR. McADAMS: Yeah.

MR. LOWDER: Now, what was it, a rotator cuff? MR. McADAMS: I had a frozen shoulder. I've got a bone spur.

MR. LOWDER: Oh, okay.

MS. McADAMS: But they can't operate on me because my heart's so bad.

MR. LOWDER: Oh, yeah.

MR. McADAMS: So what they did was they call a -- they put you to sleep and they yank out of the socket, and they twirl it around a little bit, and stuff it back in.

MR. LOWDER: Oh, my God.

MR. McADAMS: It worked. I got 80 per cent of my arm back.

MR. LOWDER: Geez. They got the spur out?

MR. McADAMS: No, that's still in.

ATTENDEE: You can't argue with success.

MR. McADAMS: Yeah. I mean, it had a -- they thought they were just going to drill that out and fix it, but the

heart doctor said no way 'cause he was afraid of where the debris would go. I've got stents in.

MR. LOWDER: How long were you held up?

MR. McADAMS: Well, it was frozen about three months, but the operation took 20 minutes.

MR. LOWDER: Is that right?

MR. McADAMS: He told me he just lowered the table, put his knee against it, kicked it, it went far right, and he got behind me and yanked it out of the socket. I said, Don't tell me anymore. It feels better. Just let me out of here.

MR. LOWDER: All right. Well, welcome back; welcome back. All right. Well, if you're looking at the agenda here, what we'll start with is the Site 84 PRAP, Proposed Remedial Action, up there at Site 84, and Marcella Gallick will be -- from Rhea Engineers -- will be heading this discussion up. And without further ado, Marci.

MS. MARCELLA J. GALLICK: And I'm new to a RAB meeting. Okay. I'm not going to tell you -- oh.

ATTENDEE 1: This gentleman didn't sign in yet.

ATTENDEE 2: I didn't, either.

MS. GALLICK: I'm going to talk about Site 84. I've been working with the Navy and Camp Lejeune for the last couple of years trying to get the site to a closure situation. And, I'm going to kind of go through the history with you of what's been done in the past and where we want to

go from here. So, if you have any questions during my talk, you know, you can ask or at the end, whatever. So let's move on.

Okay. Here's an aerial shot of where Site 84 is. (Indicating the first of slide series.) You can see -- you can see Camp Lejeune right here. This is right at the -- outside the entrance to the main gate. North, you cross Northeast Creek and you're coming into the main gate on 24, and if you look off to your right you can see Site 84. There's a fence there, and the fence -- and it's also where the bike trail is now, the City of Jacksonville bike trail. And that's where our site is.

Okay. Just a little bit of the details about the site. It's one mile west of the main gate. On the site, or not -- no longer, but what used to be on the site was a building called Building 45, used for numerous things, but at one point used for maintenance of transformers. Tidewater Electric, I believe, leased the building off of the Navy. That -- that was stopped in 1965, and the Navy took it back over and they did vehicle maintenance, heavy equipment vehicle maintenance in that building. And that went on through the early 1990s. Also on this site was a man-made lagoon, and I'll show you a -- a sketch of what this kind of looks like, or where -- where it used to be, and I'll show you where that is. But from the lagoon to -- from the

building to the lagoon was a pipe that originally -- it supposedly came right from the drains of the building to the lagoon. Later I think they had a oil/water separator in it. So that's just kind of like an overall picture of the site.

Also, I'll show you on this sketch or on this drawing, next, there's an area that we've called the Utility Corridor, but the major communications lines from the base out, you know, out and away from the base come through this site, and it's a spider web of all kinds of communications lines and utility lines, and that plays in -- plays into what we ended up doing at the site so far. So just remember that and I'll be talking about that later.

Okay. So here is what the site looks like today, but let me show you that if anyone has a history here -- okay -- you can see (indicating locations) that the Northeast Creek over there and these are existing wetlands, so that, we didn't touch. And then here is where you come in from 24. And Building 45 was about in this area. And then the pipe crossed here, and this is where -- about where the man-made lagoon was. So there -- we've done steps out at the site since the original investigation was done, and these structures have been removed, and I'll talk a little bit about that. But that's just to kind of give you a background of the site and what it used to look like.

Okay, so in this presentation, I'm going to try

to summarize the Proposed Remedial Action Plan that we've come up with for Site 84 and talk about the public comment period. And let me just say that I have -- I don't know if any of you have, you know -- we had a public notice if you went on the Admin Record and found the -- the proposed plan, but I have copies over here if you want to take one so I don't have to take it home with me, but I have a ton of them here. Okay, and then -- and then any questions you might have.

Okay. The first thing that was done at the site, there were some other things, but the first major thing was the Remedial Investigation, and that was completed in 2002. And they -- they drilled borings, they took ground wells, they took ground water samples, they took soil samples, they took samples in Northeast Creek, they took samples in the lagoon. So it was a pretty comprehensive sampling program over the entire site. Following the Remedial Investigation, they did -- prepared what was called a Feasibility Study. So once you understand where your -- what your contamination is, where your contamination is, then you look at different alternatives to clean up the site. And you look at alternatives that vary from doing nothing to doing the maximum you could possibly do just so you get a sense of what, you know, what the level of effort is to do these things and how they're protective of the environment,

and many, many, many other issues that I'll mention later. Then they prepared what's called a Proposed Plan. Now, don't get confused because this is another proposed plan, but in 2002, they prepared a Proposed Plan. And the alternative they selected was excavation and off-site disposal at a landfill. And the excavation was based on that site being used for industrial uses, which I'll also talk about later, but -- as opposed to residential. You know, they weren't planning to build homes there; they were planning to use it for storage, warehouses, or something like that. Okay. However, the Proposed Plan was not implemented because there were -- there were administrative issues much higher up than Camp Lejeune between DOD and USEPA, administrative issues. And so, rather than do nothing because these issues were not getting resolved, the Navy decided that they would take some action and do some non-time critical removals because they knew they had contaminated soil, PCB-contaminated soil. And so instead they developed an Action Memorandum to do removal actions on the site.

There were actually three removal actions done. The first one, the first non-time-critical one, was done in 2002 after that memorandum was done. And the Building 45 that I talked about before -- actually in 1999, they took the building down to the ground -- but in 2002 they removed the foundation and they removed the contaminated soil around the

foundation. And at that point, they cleaned it up to one ppm of PCBs, which is basically at residential clean-up level, but there was -- at that point, they weren't positive of what they wanted to use the site for. But -- but that's -- that area, Phase I, was cleaned up to one part -- part per million. As part of that clean up, they removed 5,000 tons of less than 50 ppm of PCB-contaminated soil and 150 tons of PCB waste. And that, if you're -- any of you are familiar with TSCA, that's the regulation. Once it's over 50, it's, you know, goes to a much higher level, much more protective where it gets disposed of, so -- and also as part of that Phase I, they -- it had been reported that transformers that had been maintained, or cleaned out, or recycled in that building, that the casings had been thrown into this man-made lagoon, and they recovered 20 old transformers from the lagoon, as part of this Phase I.

Then we moved into Phase II, and this was in 2004. You know, the Phase I had just removed the soil around the building, and they knew there was more contaminated soil than that. They had done confirmation samples at the outside of their excavation and knew they had to go further. So Phase II just continued that excavation, as well as they removed the sediment from the lagoon that was contaminated. But let me step back -- that, none of the Northeast Creek -- wasn't contaminated, so there was no issue with that. They

removed the steel pipe that -- that I had mentioned before went from Building 45 to the lagoon. They backfilled all this area with clean backfill. And at this point, the clean-up goal went to 10 ppm, which is the industrial. Like I said, if -- that they -- that the Navy or their, you know, MCB -- that Camp Lejeune would then build a storage building or warehouse on it. And at this -- part of this phase, they excavated and disposed of 12,000 tons of less than 50, and 400 tons of PCB waste, which is the -- greater than the 50 ppm. However, at the end of this removal on the Southeast side of the site, the contamination was still much greater than 50. But it was stopped just to kind of regroup and to, you know, do a little bit more evaluation of where this waste might go, and to, you know, bound the problem a little bit better than it had been because this one became a lot bigger than was -- was expected originally.

So we move to Phase 3, Non-time-Critical Removal Action. And this -- for this removal, we went down two feet. We excavated at least two feet because that's the definition of surface/surface soil. And this whole clean up is based on risk, meaning that there's certain risks if the contamination is in the top two feet or greater than two feet. And there's risk for residential type individuals or industrial type workers. So -- so we dug that up and we -- then we also had some areas that's -- if you remember, I mentioned that

utility corridor, which was just like a spider web or is a spider web of all kinds of communication lines. We weren't able to dig up there, and actually some of the waste results we got back were greater than 100 ppm's, so in that area we covered it with four feet of soil and we put a fabric liner on it to be a separation from anyone who might excavate into this -- into this area.

Okay. So here's a kind of an overview of what these areas are. Phase I, that's what I said was cleaned up to 1 ppm. Phase II, a much, much larger area was cleaned up to 10. And then Phase -- and 10 -- until they got up to 10. So in some cases, they only went a foot down versus two feet down. And then Phase III was cleaned up to 10 also. But along this corridor, we weren't able to dig so we had to backfill, and -- and some other places we had to backfill. So the ultimate goal was 10, but because we could not get the 10 across the whole site, part of our clean up or part of our plans for the future would have to be land use controls, and that will be things I'll talk about later but it's to -- just to give you a taste of what it is, you -- you limit who can excavate into the soil. If -- you can't dig into the soil unless you're doing it to remediate it, so that's one thing. And then you can also have deed restrictions so that, you know, you protect the site in the future to make sure nobody digs.

Okay. So let me just summarize the three removal actions that we had. Basically it cost $3.5 million to do those three removal actions. We cleaned up to 10 ppm for industrial use to the extent possible; some places we weren't able to do that. And then the Preferred Alternative from the 2002 Proposed Plan that I mentioned earlier, basically we met that except now we'll have to have land use controls if that alternative is selected to go into the future because we weren't able to get the clean up all the way to 10.

Okay. I'm going to back up a little bit and just go through the history of the contamination. Because so far I've just been saying PCBs, but we started out with more than PCBs, and so let me just give you a little bit of history. When we first did the RI, our impacts were PCBs, PAHs, which are heavy, semi-volatile compounds, pesticides, and total petroleum hydrocarbons. Okay. We also found the groundwater was contaminated with both pesticides and total petroleum hydrocarbons. Now the PAHs and the pesticides, they were mostly around Building 45, and probably because that's where maintenance was done, and also where they would spray because there was -- that's where workers were for the pesticides. So all of that was removed during the Phase I. So those two compounds drop out in -- as we go further into Phase II. The TPH contamination that's both -- in the soil and the groundwater, that's being addressed by the UST

Program. So the UST Program's responsible for all the petroleum-type contaminants at Camp Lejeune, and so they're taking care of that. They have a treatment plant on site right now, and they're thinking, you know, they're determining now what else they want to do to clean up the TPH contamination.

In 2005, we still had pesticides that were showing up, prior to 2005, in the groundwater. But we did a sampling program in 2005, and we didn't detect any pesticides. So they -- so the groundwater issues dropped out.

So what we were left with at the end of the -- in 2006 when we were done with the three removal actions, was that we had PCB contamination in both the surface and the subsurface soil. Surface, like I said, zero to two feet; subsurface, greater than two feet.

Okay. Also with the removal actions, talking a little bit about the risks because this is a risk-driven -- this has been viewed as a risk-driven site. The risk to the industrial workers of the surface soils was eliminated by doing these removal actions. There was also ecological risk assessment done and it was determined that the top foot of soil was a problem, but over the whole site, the top foot was totally removed. So that was all removed and replaced with clean soil. So basically the ecological risk drops out as a

result of these three removal actions.

And, like I said before, the -- what was remaining was PCB in the surface and the subsurface soil. And the risks that remained -- one is, in the surface soil, in zero to two feet, we still have a risk for future adult and child residents. And in the subsurface soil, we still have a risk for industrial workers. So our focus going forward is on those risks and -- and to mitigate those risks.

Okay. So -- so we had to develop goals for protecting human health in the environment. And what we did was basically we're looking at the surface and subsurface soils in excess of the clean up goal. The clean up goal is for industrial use; it's 10 ppm. If we can't clean it up to 10 for whatever reason, like I said, because of the utility corridor and not being able to access that soil, then we have to make sure that the industrial worker will not be exposed to that contamination. We do that with deed restrictions, we do that with separation fabrics, we do that just by, you know, on a -- the plat map or whatever. And so then what -- whoever looks at the documents related to that site will know that they can't just go out there and dig. Utility workers just can't go out there and dig to fix the lines or anything if they don't have the proper training and haven't developed the proper plans to do that work.

Okay. And, like I said, our goal is -- is -- a

USEPA Risk Based Guidance document is what we used. Their -- actually -- the -- the goal for an industrial use, land use, for EPA is 10 to 25, but we picked the more conservative, 10. And, like I said, it's for storage areas or warehouse. Now, just to get a perspective of what this means, this -- the -- the definition in TSCA for low occupancy land use is that a person that is unprotected can't be present on the site for more than 6.7 hours a week or 335 hours in a year, which obviously isn't very much time. So it wouldn't be a worker that was there five days a week. It would be someone who's just coming in and out to a warehouse, based on how our clean up levels are designed.

So -- so where are we today? You know, we were here with -- still have some contamination on the site and we want to get the site closed. So -- so when I told you about what happened back in 2002 where they did the investigation, they did a feasibility study to look at the alternatives, we basically had to do the same thing. We created what I call up there a Feasibility Study Amendment. So we did an amendment to the original Feasibility Study, and we came up with four action alternatives to address what's left of the PCB contamination at Site 84. And when you do one of these Feasibility Studies, you want to kind of bound your problem, so our first alternative is no action; that's basically where we are today. Do nothing else. Don't put any land use

controls in. Don't do anything, like walk away. Our number 2 is the most we can do. That means take the site and dig it up to that 1 ppm so that any family can live there, any house can be built. There would be no land use controls required. The third alternative there is to, like I said before, we have some greater than 1 ppm in the top two feet of surface soil, so it's to go over the whole site and put two more feet of clean soil on it. You could have residents living there, but they can never dig down -- dig into the ground; okay? Now how realistic is that, but it is one of our alternatives. Okay. And then four is where we are today, but adding land use controls to it. So that's kind of how we bounded the problem of -- at the site.

Okay. So this is kind of just a little summary of what these alternatives involve. To totally dig up, down to 1 ppm, would require excavating and disposing of 20,000 tons of less than 50 PCB soil and 6,000 tons of greater than 50. The RAA 3 with two additional feet of cover over the site is 18,000 cubic yards, and these are pretty large numbers. And that would also require annual maintenance for, you know, as many years as that contamination was in the ground. And RAA 4 would be, like I said before, as it is today, but we would do annual maintenance and we would also like to have land use controls for both three [RAA 3] and four [RAA 4].

Okay. In the -- when you do a Feasibility Study or a Feasibility Study Amendment like this, as you can see here, there are seven evaluation factors -- actually nine evaluation factors, but you're comparing -- you compare the alternatives against seven of those. One being you -- you look at the -- how they protect human health and the environment. And secondly, there're certain regulations out there, there's certain guidance out there. You make sure that your alternatives can meet that. And these first two are called the threshold criteria. So an alternative that you pick has to meet those two as a minimum. Then you have long-term effectiveness and permanence, so what you do out there, how long is it going to last, and is it going -- is it going to be permanent, is it going to be effective. Something that has land use controls isn't going to be as effective and permanent. I mean, it can be, but there's a chance it might not be, compared to something that totally cleans up the site. So this whole analysis is -- is relative. You're looking relatively at your four alternatives and how they compare to each other.

Continuing on with the evaluation factors, one of them -- the goal is to reduce toxicity, mobility, and volume through treatment. Now that's a push at EPA, but truly none of ours involve treatment because PCBs, to treat them would be to incinerate them, which is an extremely

costly and difficult process to do.

Short term effectiveness. Now this is an interesting evaluation factor because something that cleans up the entire site and has lots of trucks and taking lots of contamination to another state, in the short term, has more risks than something that, say, covers up that waste, and no one is exposed to it. I mean, you have workers exposed to it; you have trucks carrying it. So you have to think in terms of in the short term is it effective. But also we have long term effectiveness, so, you know, these balance out.

Implementability of -- is it imple- -- can you implement this. Now for instance, the no action alternative, it's pretty easy to do the no action; right? However, it doesn't meet the threshold criteria because you have no land use controls, and you're not really going to be -- be protecting the -- either industrial workers or residents or -- or kids that somehow, you know, find their way on this site, climb the fence or something. So, you know, you just have to be careful about that.

Then cost is the final one that you compare it against. And then keep in mind that all of our alternatives that are left, already we've spent $3.5 million, so you would tack $3.5 million onto all the prices that we already -- that we got for the going-forward alternatives.

So here is just like a visual, and you might not

be able to read that, but the -- the squares right here (indicating) is like the best when you're doing a relative evaluation and the open circles are the worst. So obviously Alternative 1, where you do no action, it -- it's really not feasible to do that. Alternative 2, that's where you're digging up all the soil down to 1 ppm. You know, it's -- it's good for some things; however, the cost is -- is over $6 million. It's -- it's almost double what the cost has been to date. So -- and the other thing is that Camp Lejeune wants to use the site for industrial use, so to take it down to residential is not really the goal. Likewise, 3, it's -- it -- generally about $600,000, so this is $6 million, this is $600,000. It's not too different from 4, but 4, if you look at it, has the highest range, so it's $60,000 because all you're doing there is doing maintenance based, you know, plus, of course, the $3.5 million already spent to date.

Okay. So based on our -- our conclusion from doing -- going through that whole analysis, is that RAA 4 is the Preferred Alternative. It involves the removal actions we've already done, it involves the land use controls, and it's, you know, it's pretty much what the original alternative was, Preferred Alternative back in 2002 except with the land use controls. The land use controls will include restrictions on intrusive activity except to monitor, if someone wanted to put in wells and monitor, or future

remediation -- if down the road utility lines would get transferred and then we would remediate the utility corridor. Also because -- whenever you leave contamination on the site above the goal, then the Navy will institute five-year reviews. So they're -- every five years they look to make sure that it's still protected, and, you know, all the things that you've said in the -- in the feasibility stage is still -- are still, and it's still, you know, good to go or then they would re-evaluate it at that point if it wasn't.

So here's, I think, a visual of -- of what that alternative is. This area -- these areas are the ones that -- where intrusive activities are not permitted because the contamination is greater than 10. This one is hardly any greater than 10, but this one, you know, can be over 100 or higher, you know. But it's at a depth of at least two feet and in some cases four feet. So it's industrial -- they can't dig into this. I mean, they can still work in this area and this is fine for industrial work. They could -- there's no problem with intrusive activities because it's all less than 10. Greater than 1 -- residential, it wouldn't work, but industrial would be okay.

Okay. So I'm going to talk a little bit about the public comment period. It -- it pretty much starts today and it goes until May 27. Whatever questions you ask today, they will be part of the -- the questions, but you could also

submit written questions. And if you go on the -- you can either see on there or you can go in the Administrative Record and see the process of who you submit it to and how you submit it. Yes, that's what I've said there (indicating a new slide) so you just want to -- you can look at that Administrative Record to find out, you know, how -- what the next step's to make comments.

Okay. Then following the acceptance of a proposed plan, you know, we'll look at your comments. The Navy will respond to your comments. And -- and if the proposed plan's approved or it might be revised -- it depends -- the -- once it is approved, though, the Record of Decision will be written. And the Record of Decision will include what's called a Responsiveness Summary and that will be -- like all of your comments and responses to them along with a whole summary of all the things that are in the FS and the RI and -- and the whole Administrative Record related to Site 84.

Following approval of the ROD, then it will be signed by the Navy, Camp Lejeune, USEPA, with concurrence from North Carolina. And the Preferred Alternative will be implemented. Now if RAA 4 is selected where -- where we're leaving contamination in place, or RAA 3, for that matter, we'll have to do maintenance going forward. That will include the soil cover and the vegetation on the soil cover

because you don't want the cover and its soil to, you know, go into the creek and you lose the cover, so you maintain the vegetation and soil cover, maintain the fence, and, like I said before, five-year reviews.

And that's all I have, so any questions?

MR. TOM MATTISON: I have one thing I would like to ask you about. We have the LSM-45 at Mile Hammock Bay. It's a Landing Ship Medium that was used in the Battle of Okinawa in World War II and the last one in existence. And the Marine Corps Museum of the Carolinas has been working on -- with it, but my -- my thoughts on the thing is that would be a excellent place for something like that.

MR. LOWDER: Yeah.

MR. MATTISON: Make a parking lot out of it, and it would be in a visible type thing and it would be something that, you know, we could use when the Second Marine Division comes to -- to town for a parking lot so they could go visit the base and this kind of stuff.

MR. LOWDER: Right. And -- and I agree. And that was one of -- one of the ideas that was presented to us probably about a year, year and a half ago. So to go ahead, you know, we could tow that ship or boat right there at the canal right where the -- the overpass is in that area, and then put a Marine Corps museum right there, and just --

MR. MATTISON: I don't think a museum --

MR. LOWDER: -- and --

MR. MATTISON: -- needs to be there --

MR. LOWDER: Well --

MR. MATTISON: -- but just the ship itself and a parking lot.

MR. LOWDER: And that -- and that might still be viable to do. And that might be something we just propose to them, but as -- as a part of the Marine Corps museum, that was one of the options; go ahead and tow that boat over there using that as part of the museum. Go through --

MR. MATTISON: Yeah.

MR. LOWDER: -- maybe a structure or a building and then through the back of the building go to that. I saw some plans on it, but we just couldn't get the closure on this site or the Record of Decision on this site done in time to be sure that people were safe when we went into that area or when people --

MR. MATTISON: Yeah.

MR. LOWDER: -- were walking in that area. But I'm with you on that. Something like that where we could put maybe a structure -- out, you know, where people aren't all the time, like at an administrative building. A museum would have been great, just passing people through there all the time, and maybe a parking lot to cap, you know, most of the area out there.

MR. MATTISON: Yeah.

MR. LOWDER: A lot of the area -- there is a lot of utilities going through here. As you know, the gas or CP&L goes -- goes through there or Progress Energy, or whoever they are right now, and fiber optics and things like that, so we've got to be careful where we put things. But something like that is really what the Base is looking at. Something that can almost provide a cap out there, but still provide some type of use because it is a nice piece of property right there, right next to that water.

MR. MATTISON: It would be --

MR. LOWDER: You know.

MR. MATTISON: -- it would be a really, in my opinion, something to save -- that LSM-45.

MR. LOWDER: Right. Right. And on another part of that, we need to refurbish that --

MR. MATTISON: Yeah.

MR. LOWDER: -- that boat, too, before we get it out there. But that -- that is something that the Base is looking at.

MR. RICHARD D. MULLINS: When --

MR. LOWDER: Yes, sir.

MR. MULLINS: -- just a question. When -- when you were looking at that, was there any thought given to maybe just doing more work on that one -- the smaller area that had

the larger concentrations?

MS. GALLICK: You mean the utility area?

MR. MULLINS: Yeah. The one that was kind of at the bottom of your -- of your visuals. The larger was --

MR. LOWDER: Right.

MR. MULLINS: -- less than 10 --

MS. GALLICK: Right.

MR. MULLINS: -- and then the bottom one, was there any thought to maybe to --

MR. LOWDER: And -- and that's what I was talking about --

MR. MULLINS: -- doing --

MR. LOWDER: -- as far as the utilities corridors go.

MR. MULLINS: That's all --

MR. LOWDER: That --

MR. MULLINS: -- in there.

MR. LOWDER: Right. The fiber optics --

MR. MULLINS: Right.

MR. LOWDER: -- and stuff, we'd have -- it would be actually more detrimental to the folks with shovels in there, starting to shovel this out while we're doing it. It costs a lot of money to -- to keep --

MR. MULLINS: Okay.

MR. LOWDER: -- it out of those areas. Now that's -- when they have to go main -- do maintenance on

those lines and things like that, we're going to have to either remediate those areas while they're in there or if -- if the folks who we provide leases to for their utility corridor, if they don't want to be in those areas anymore, they can -- on their own accord, we can lease them some more property and go around those areas, and that would be great for us. We could get rid of those utilities in that area and go ahead and clean that up. But as it stands right now, that's -- that's not an option for us right now. Well, it is an option, but it's --

MR. MULLINS: At least --

MR. LOWDER: -- an expensive option.

MR. MULLINS: -- as lease holder, can't you make them?

MR. LOWDER: What's that? Oh, yeah.

MR. MULLINS: If you make them move.

MR. LOWDER: Well, yes, we can make them move, but it costs us a whole lot of money. That's, you know, that's part of the cost associated with this. They would make us pay for digging up those fiber optics and reconnecting fiber optics in a different area. So that's something we have to take into account also, the cost factor that -- so in the future, if they do want to maintain or replace those lines, we would just make them replace them in another area, as feasible as possible.

MR. MULLINS: That's a good question.

MR. LOWDER: Yeah, it is. Yes, sir?

MR. RANDY MCELVEEN: How about when them lines were put down there -- didn't people go -- did workers go down in that contaminated area when the lines were put down or were they aware of it and took precautions?

MR. LOWDER: Well, when the lines were put down, I -- I don't know when those lines were put down, to tell you the truth. Absolutely it could have -- it could have been contaminated at the time. I just don't know -- we just don't know when the contamination began. We just know when we had to clean it up, so --

MR. MCELVEEN: Thanks.

MR. MARVIN POWERS: You know, my gut feeling is that it -- the reason it's there is because of the utilities, from the trucks.

MR. LOWDER: Because of the utility --

MR. POWERS: The trucks.

MR. LOWDER: You think it's --

MR. POWERS: It's sort of the --

MR. LOWDER: -- that was a migration pathway?

MR. POWERS: Yes.

MR. LOWDER: Percolation pathway. It could have been.

MR. POWERS: Personally -- but like you said we don't

know.

MR. LOWDER: Absolutely.

MR. POWERS: Yes.

MR. LOWDER: And for future use, like we said, we'll put land use controls in those areas to protect other folks where we left over 50 in those -- and other areas also.

MS. GALLICK: Any other questions?

MR. LOWDER: Well, thanks, folks. What we're going to do is we'll end this at this time -- the public meeting at this time and we'll take a little break to let this young lady wrap up and go out of here. We don't need to -- we don't need you in here to wrap up, but you are welcome to stay for the RAP. But we'll go ahead and take a go -- we'll go ahead and take a 10 minute break right now.

***** THE PUBLIC MEETING CONCLUDED AT 6:30 P.M. *****

STATE OF NORTH CAROLINA)

) C-E-R-T-I-F-I-C-A-T-I-O-N

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