# 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

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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

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

1/21/09

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

With concurrence from:

1-14-09

Dexter R. Matthews, Director — Date
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.

## REFERENCES


Baker, 2002. "Final Remedial Investigation, Site 84, Operable Unit 19, MCB Camp Lejeune, North Carolina," May 2002.

Baker and CH2M Hill, 2002. "Final Feasibility Study Operable Unit No.19 Site 84/Building 45 Area", Baker Environmental Inc. May 2002.

MCB Camp Lejeune, 2002. "Action Memorandum, Operable Unit No. 19 (Site 84/Building 45 Area)," June 2002.

NCDENR, 2000. "Groundwater Section Guidelines for the Investigation and Remediation of Soil and Groundwater", Division of Water Quality, Groundwater Section. July 2000.

Rhēa, 2006. "Final Recommendations Report, Review, Recommendations, and Removal Action, Site 84, Operable Unit 19, MCB Camp Lejeune, North Carolina," September 2006.

Rhēa, 2007. "Final Project Closeout Report: Review, Recommendations, and Removal Action, Site 84, Operable Unit 19, MCB Camp Lejeune, North Carolina", Rhēa Engineers and Consultants, Inc. November 2007.

Rhēa, 2008. "Final Feasibility Study Amendment, Site 84, Operable Unit No. 19, MCB Camp Lejeune, North Carolina," Rhēa Engineers and Consultants, Inc., May, 2008.

TMS and Baker, 2005. "Final Site 84, Operable Unit 19, Phase II Interim Removal Action, Closeout Report, Marine Corp Base, Camp Lejeune, North Carolina," March 2005.

USEPA, 1990. "A Guide on Remedial Actions at Superfund Sites With PCB Contamination," Office of Solid Waste and Emergency Response (OSWER), 9355.4-01 FS, August 1990.

USEPA, 1999. "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents," USEPA 540-R-98-031, OSWER 9200.1-23P,PB98-963241, July 1999.

# 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 | |

**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-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**
**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-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<br>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<br>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<br>IR84-DP41-00MSD | X | | | | | |
| IR84-DP71-00 | 7/22/01 | 1525 | IR84-DP71-00MS<br>IR84-DP71-00MSD | X | | | | | |
| IR84-SB05-01 | 8/3/01 | 1240 | IR84-SB05-01MS<br>IR84-SB05-01MSD | | | | | X | |
| IR84-MW07-01C | 8/6/01 | 1200 | IR84-MW01-01CMS<br>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 (I) | 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 RcNE = not established

(2) Total endrin consisting of endrin, endrin aldehyde, an NA = Not applicable

(3) Value for chlordane U = Not detected at method detection limit

Region IX PRG = Region IX Preliminary Remediaiton GJ = Value is estimated

SS Background - Surface Soil background concentrations 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 lin 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 aste
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:<br>•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:<br>• the location and dimensions of any disposal areas and areas of potential environmental concern with respect to permanently surveyed benchmarks;<br>• the type location, and quantity of contamination known to exist on the site; and<br>•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) |

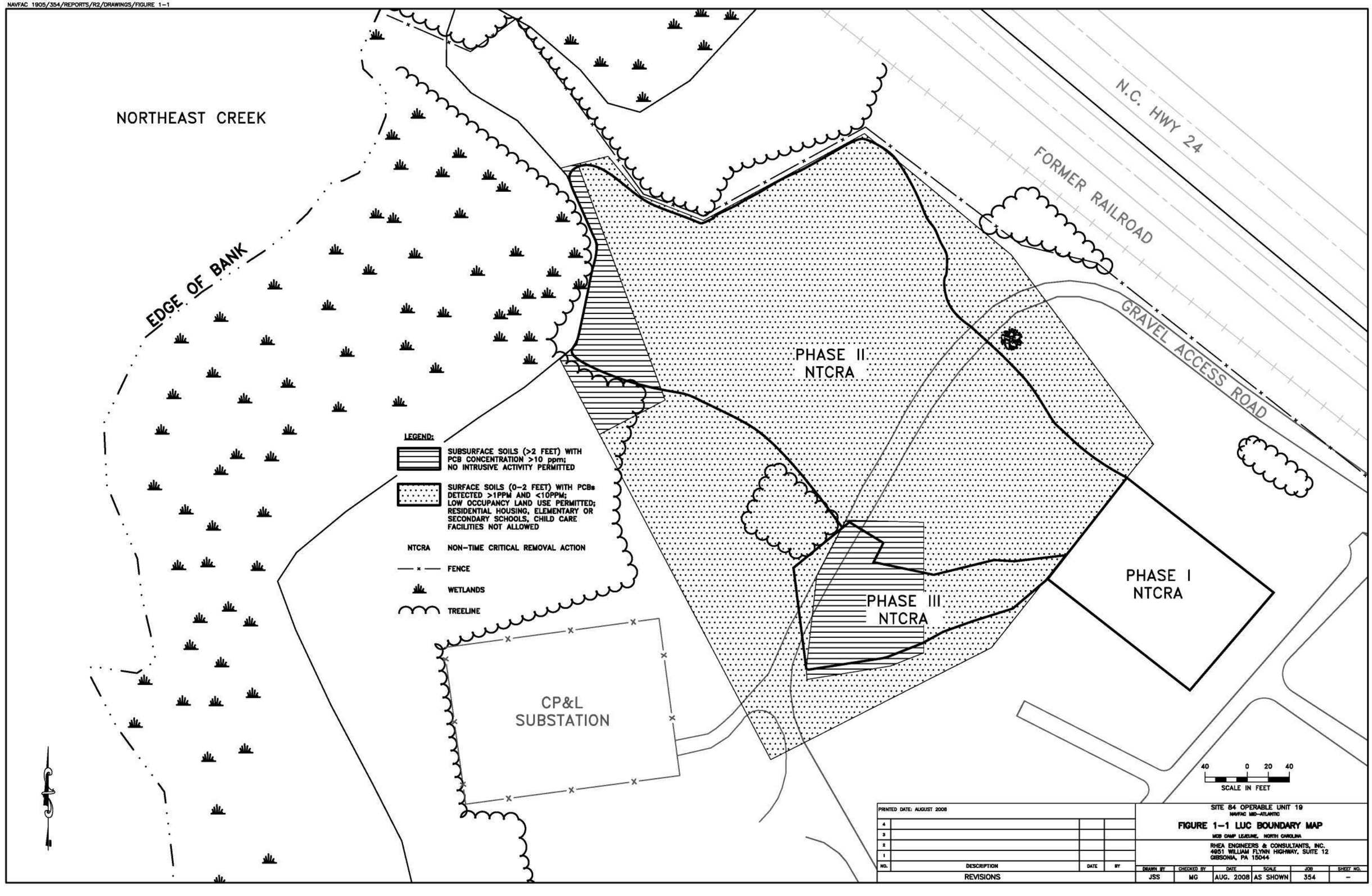
ARAR = applicable or relevant and appropriate requirement
CDLF = Construction and Demolition Landfill
CFR = *Code of Federal Regulations*
DOT = U.S. Department of Transportation
>greater than
≥ greater than or equal to
≤ less than or equal to
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials 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

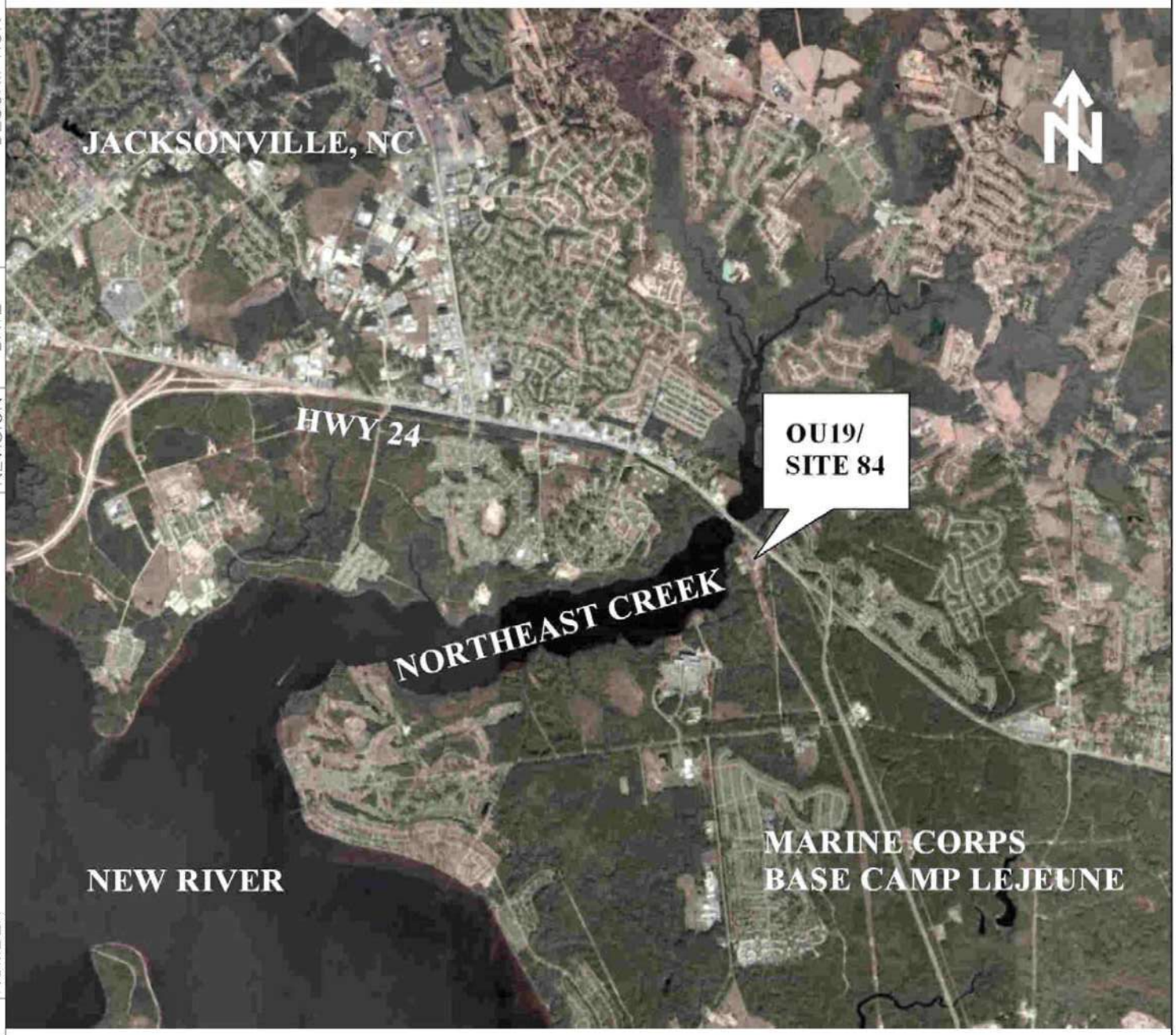
SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC

# FIGURE 1-1 LUC BOUNDARY MAP

MCB CAMP LEJEUNE, NORTH CAROLINA

RHEA ENGINEERS & CONSULTANTS, INC.
4951 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

FENCE LINE

N.C. HWY 24

FORMER RAILROAD

GRAVEL ACCESS ROAD

PHASE II
NTCRA

PHASE I
NTCRA

PHASE III
NTCRA

WETLANDS

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

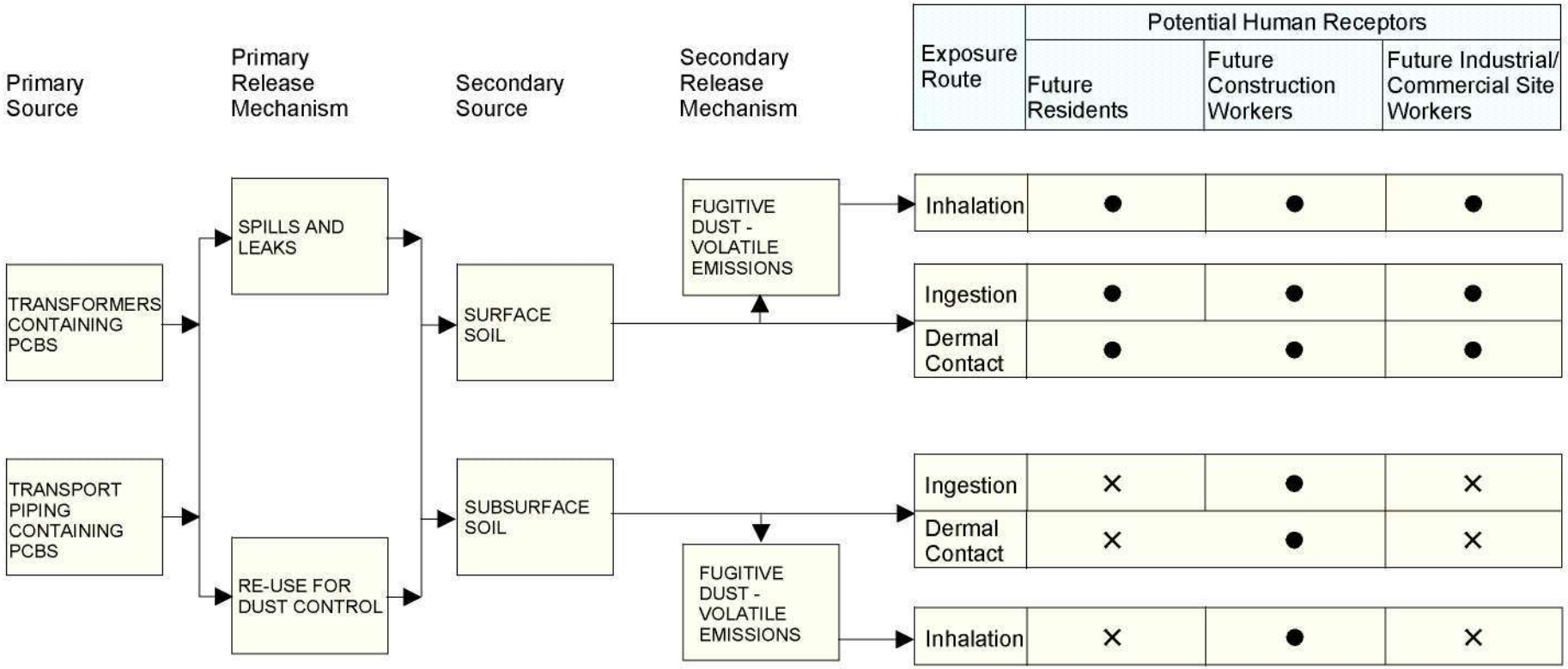
FIGURE 2-2 SITE 84 PLAN

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**

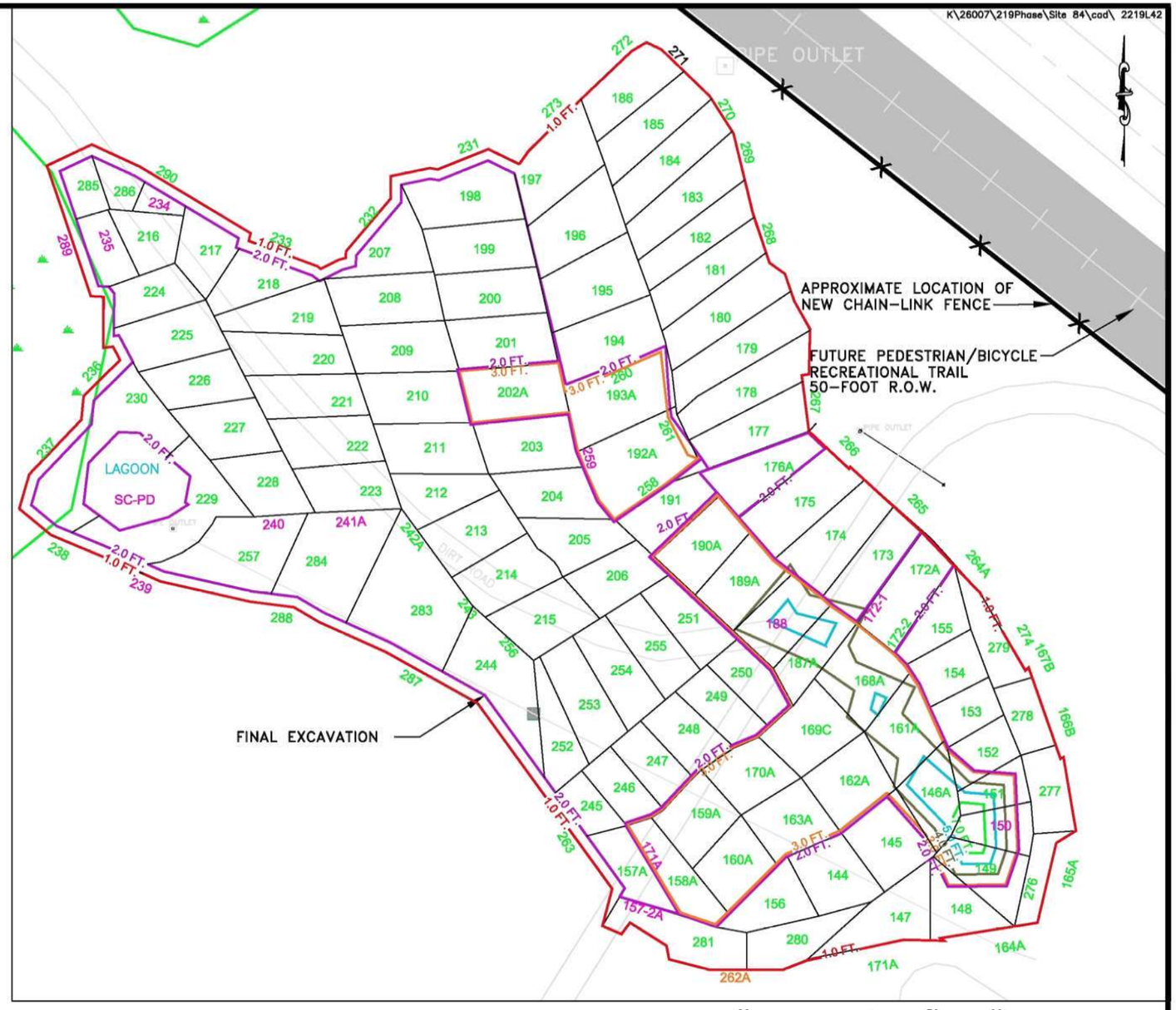



LEGEND

- ● 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

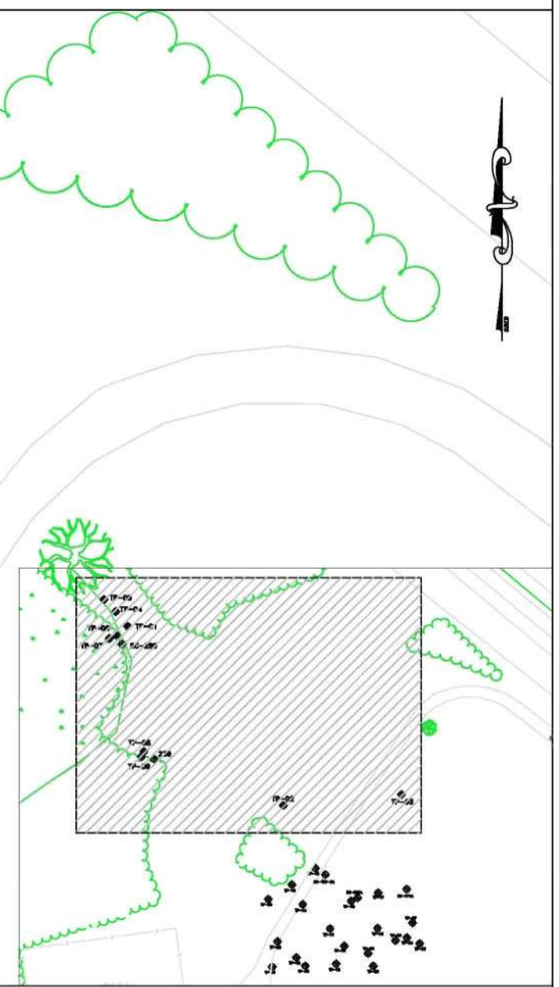
- FINAL LIMITS OF EXCAVATION
- 144 SOIL SAMPLE WITH PCB CONCENTRATIONS < 10 ppm
- 146 SOIL SAMPLE WITH PCB CONCENTRATIONS > 10 ppm, < 50 ppm
- 262 SOIL SAMPLE WITH PCB CONCENTRATIONS > 50 ppm
- EXCAVATED TO 1 FT
- EXCAVATED TO 2 FT
- EXCAVATED TO 3 FT
- EXCAVATED TO 4 FT
- EXCAVATED TO 5 FT
- EXCAVATED 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-11
TP-16
TP-27
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-32
TP-33

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.

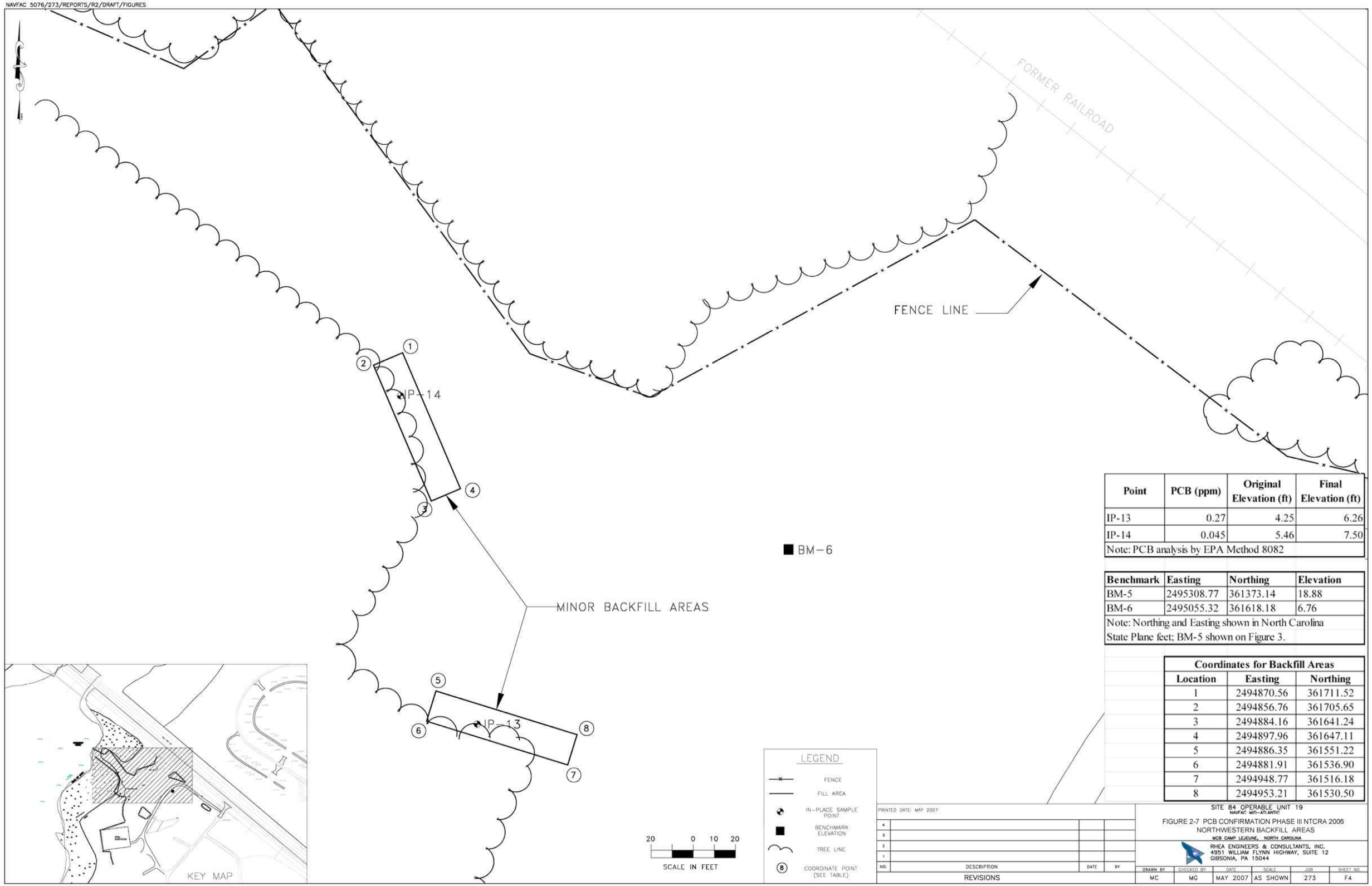
FIGURE 2-6
SOUTHEASTERN BACKFILL & EXCAVATION AREAS 2005

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




| 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 |

LEGEND

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

PRINTED DATE: MAY 2007

| NO. | DESCRIPTION | DATE | BY |
|---|---|---|---|
| 4 | | | |
| 3 | | | |
| 2 | | | |
| 1 | | | |

REVISIONS

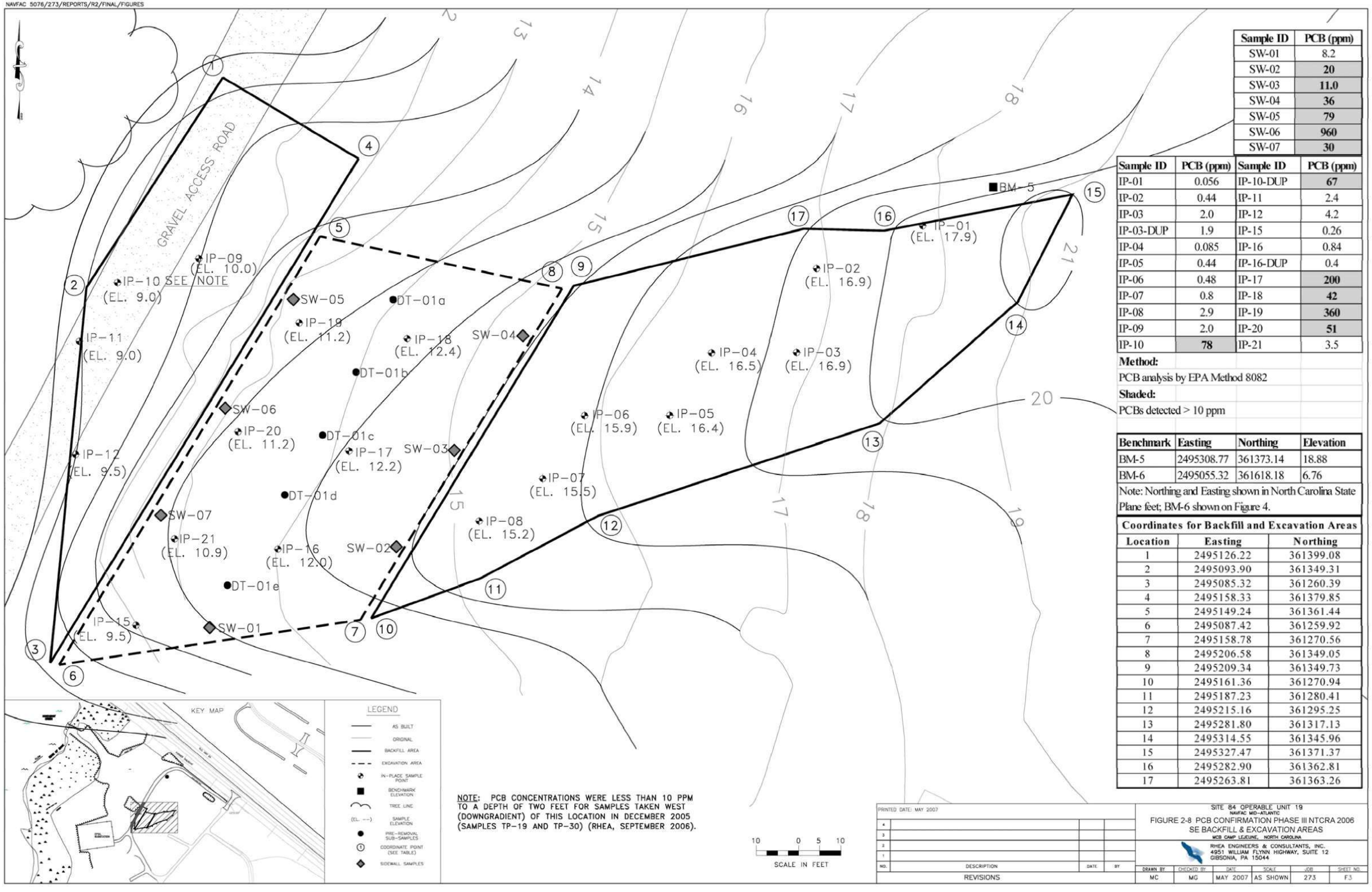
SITE 84 OPERABLE UNIT 19
NAVFAC MID-ATLANTIC

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

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

COURT REPORTER - BOBBIE G. NEWMAN

**CAROLINA COURT REPORTERS, INC.**
105 Oakmont Professional Plaza
Greenville, North Carolina 27858
TEL: (252) 355-4700 (800) 849-8448
FAX: (252) 355-4707

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

COUNTY OF PITT )

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