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FINAL

FIVE-YEAR REVIEW

MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0099

Submission Date:

AUGUST 24, 1999

Prepared For:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

EPA Five-Year Review Signature Cover

Key Review Information

Site Identification		
Site Name: Marine Corps Base Camp Lejeune		EPA ID: NC6170022580
Region: 4	State: NC	City/County: Jacksonville, NC/Onslow County

Site Status	
NPL status: Final	
Remediation status (under construction, operating, complete): Under construction & operating	
Multiple OU's* (highlight): Yes ☒ No ☐ Number of OU's: 19	
Construction completion date: 6-30-95 [OU 1 (Interim ROD), RA Complete]	
Fund/PRP/Federal facility lead: Federal facility	Lead agency: Atlantic Division, Naval Facilities Engineering Command (LANTDIV)
Has site been put into reuse? (highlight): Yes ☐ No ☒	

Review Status			
Who conducted the review (EPA Region, State, Federal agency): LANTDIV			
Author name: Katherine Landman	Author title: Remedial Project Manager		
Author affiliation: LANTDIV			
Review period: 4-14-99		Date(s) of site inspection: 12/98	
Highlight: Statutory ☒ Policy ☐	Policy Type (name): 1. Pre-SARA ☐ 2. Ongoing ☐ 3. Removal only ☐ 4. Regional Discretion ☐	Review Number (1, 2, etc.) 1 ☒ 2 ☐ 3 ☐	
Triggering action event: Construction Compltion at OU 1, Site 24 (RA Complete)			
Trigger action date: 6/30/95		Due Date: 6/30/00	

*["OU" refers to operable unit.]

Deficiencies:

Two general deficiencies not affecting protectiveness were identified as follows:

- OU No. 6, Site 44: Fencing around site in need of repair or complete removal.
- OU No. 14, Site 69: Fence around site damaged by fallen trees.

Recommendations and Required Actions:

- OU No. 2, Site 69: Abandon Monitoring Well MW04.
- OU No. 4, Site 74: Solicit approval from EPA and NCDENR to discontinue groundwater monitoring.
- OU No. 6, Site 44: Repair or completely remove fence around site.
- OU No. 13, Site 63: Abandon the three monitoring wells at the site.
- OU No. 14, Site 69: Repair fence.
- Pre-RI Site 10: Prepare NFRAP that includes institutional controls to limit intrusive activities.
- Pre-RI Site 85: Conduct a removal action to address battery piles and impacted soil.

Protectiveness Statements:

All remedies implemented across the Operable Units and various sites at Marine Corps Base Camp Lejeune remain protective of human health and the environment. Only minor deficiencies were noted during site visits.

Other Comments:

For the Department of the Navy, Marine Corps Base, Camp Lejeune

_____

Signature Date

MajGen R. G. Richard
Commanding General
MCB Camp Lejeune

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LIST OF ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSF	Cancer Slope Factor
CWM	Chemical Warfare Materials
DDD	4,4'-Dichlorodiphenyldichloroethane
DDE	4,4'-Dichlorodiphenyldichloroethylene
DDT	4,4'-Dichlorodiphenyl Trichloroethane
DNAPL	Dense Non-Aqueous Phase Liquid
DoN	Department of Navy
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EMD	Environmental Management Department
ESD	Explanation of Significant Differences
FFA	Federal Facilities Agreement
FS	Feasibility Study
HPIA	Hadnot Point Industrial Area
IAS	Initial Assessment Study
IR	Installation Restoration
LANTDIV	Department of Navy, Atlantic Division
LDR	Land Disposal Restriction
LUCAP	Land Use Control Assurance Plan
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
NACIP	Navy Assessment and Control of Installation Pollutants
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NC DENR	North Carolina Department of Environment and Natural Resources
NC WQS	North Carolina Water Quality Standards
NEHC	Navy Environmental Health Center
NFESC	Naval Facilities Engineering Service Center
NFRAP	No Further Remedial Action Plan
NPL	National Priorities List

LIST OF ACRONYMS
(Continued)

O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
POL	Petroleum, Oil, and Lubricating Compounds
ppb	parts per billion
PRAP	Proposed Remedial Action Plan
Pre-RI	Pre-Remedial Investigation
RAA	Remedial Action Alternative
RCRA	Resource Conservation Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization
SEAR	Surfactant Enhanced Aquifer Remediation
SI	Site Investigation
STP	Sewage Treatment Plant
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TCRA	Time-Critical Removal Action
TPH	Total Petroleum Hydrocarbon
TSCA	Toxic Substances Control Act
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

The following document presents a review of all pending, completed, and ongoing response actions at Marine Corps Base (MCB) Camp Lejeune, North Carolina. The review provided within this document is consistent with Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). A review of all remedial actions is required every five years when, as is the case with MCB, Camp Lejeune, hazardous substances, pollutants, or contaminants remain above levels that permit unlimited use and unrestricted exposure. This periodic review and evaluation, hereinafter referred to as a five-year review, is intended to ensure that the selected remedial measures remain protective of public health and the environment; are functioning as designed; and, necessary operation maintenance is being performed.

The U.S. Environmental Protection Agency (USEPA) has developed four levels of evaluation to be considered during preparation of a five-year review document. Descriptions of Type I, Type Ia, Type II, and Type III reviews are provided in the USEPA Office of Solid Waste and Emergency Response Directive 9355.7-02 and supplements (OSWER, 1991, 1994, and 1995). In the case of MCB, Camp Lejeune, all 42 Installation Restoration (IR) sites are subject to a Type Ia review due to continuing response work at a number of the sites. A Type Ia review is required when response work such as remedial actions, studies or investigations, periodic monitoring or sampling, removals, or other regular activity is ongoing and site-specific circumstances do not warrant new or additional risk calculations.

As the name suggests, reviews are required every five years after the initiation of remedial activities at the first site or operable unit (OU). This document represents the first five-year review conducted at MCB, Camp Lejeune as triggered by remedial measures at OU No. 1 during September 1993. All 42 IR sites at MCB, Camp Lejeune are subject to the same five-year review, not separate five-year reviews for each remedy or operable unit. In addition, five-year reviews will continue until contaminant levels permit unlimited use and unrestricted exposure following completion of all remedial activities. Because some sites are active and some inactive, all sites and remedies are incorporated in this first five-year review. Future reviews of inactive sites may or may not be conducted, as appropriate. A list of the 42 IR sites is provided in Table 1-1 and a graphic depiction of their location within MCB, Camp Lejeune is provided in Figure 1-1. [Note that all tables and figures are provided after the text portion of this document.]

This Five-Year Review document has been prepared by Baker Environmental, Inc. (Baker) for the Department of Navy, Atlantic Division (LANTDIV) and the Environmental Management Department (EMD) of MCB, Camp Lejeune. The report was submitted to the Navy Environmental Health Center (NEHC), the North Carolina Department of Environment and Natural Resources (NC DENR), and USEPA, Region IV.

1.1 Five-Year Review Format

The following Five-Year Review consists of three text sections. Section 1.0 serves as an introduction and statement of purpose for this review. Section 1.0 also includes an evaluation of applicable or relevant and appropriate requirements (ARARs), a site visit summary, and a schedule for the next five-year review. Section 2.0 provides a summary of all 42 sites included in the IR Program. Section 2.0 comprises a majority of this review document and includes discussions

concerning all pending, completed, and ongoing remedial actions. The focus of Section 2.0 is to determine whether the selected remedial actions remain protective of human health and the environment. Recommendations to correct or augment the selected remedial actions are also provided in Section 2.0. Lastly, Section 3.0 provides the references used during preparation of this document.

1.2 General Description of MCB, Camp Lejeune

MCB, Camp Lejeune is located in Onslow County, North Carolina and is host to five Marine Corps commands and two Navy commands. The host command provides support and training for the following tenant commands: Headquarters Nucleus, Second Marine Expeditionary Force; Second Marine Division; Second Force Service Support Group; Second Surveillance, Reconnaissance, and Intelligence Group; Sixth Marine Expeditionary Brigade; the Naval Hospital; and the Naval Dental Clinic.

The entire facility includes approximately 236 square miles and is located on the Atlantic Coastal Plain of North Carolina. All of the real estate and infrastructure is owned, operated, and maintained by the host command. MCB, Camp Lejeune is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The Atlantic Ocean forms the southeastern boundary of the facility; U.S. Route 17 and State Route 24 form the western and northwestern boundaries, respectively. The City of Jacksonville, North Carolina is located immediately northwest of MCB, Camp Lejeune. Three large, publicly owned tracts of land are located within 15 miles of the facility: Croatian National Forest, Hoffman Forest, and Camp Davis Forest. A majority of the land surrounding MCB, Camp Lejeune is used for agriculture. Estuaries along the coastline support commercial fishing, and residential resort areas are situated along the Atlantic Ocean adjacent to MCB, Camp Lejeune.

1.3 Environmental History

MCB, Camp Lejeune has been actively involved with environmental protection and remediation programs since 1983, beginning with the Navy Assessment and Control of Installation Pollutants (NACIP) Program. An Initial Assessment Study (IAS) was the first investigation conducted under the NACIP Program concerning potentially hazardous sites at MCB, Camp Lejeune. The IAS, conducted in 1983, identified areas of concern that might potentially cause threats to human health and the environment as a result of past storage, handling, and disposal of hazardous materials. Based upon a review of historical records, field inspections, and interviews, 76 areas of concern (AOCs) were identified. The IAS concluded that, while none of the sites posed an immediate threat to human health or the environment, further investigations to assess the potential long-term impacts were warranted at 23 of the 76 sites identified.

The Department of Navy (DoN) initiated the IR Program in 1986, following enactment of the Superfund Amendments and Reauthorization Act (SARA). The IR Program, which was implemented to follow the requirements of SARA, replaced the NACIP Program. MCB, Camp Lejeune was placed on the CERCLA National Priorities List (NPL) in October 1989 (October, 1989). Following the NPL listing, a Federal Facilities Agreement (FFA) between USEPA Region IV, North Carolina Department of Environment, Health, and Natural Resources (now NC DENR), and the DoN was signed in February 1991. The FFA was prepared to fulfill the following objectives:

- To ensure that potential environmental impacts associated with past and present activities at MCB, Camp Lejeune are thoroughly investigated and appropriate CERCLA response actions are developed and implemented as necessary to protect public health and the environment;

- To establish a procedural framework and a schedule for developing, implementing, and monitoring appropriate response actions at MCB, Camp Lejeune in accordance with CERCLA, the NCP, and relevant USEPA remediation policy;

- To encourage public participation, facilitate cooperation, and exchange information among parties associated with the investigation and remediation process.

The original FFA pertained to 23 of the 76 initial sites identified in the IAS at MCB, Camp Lejeune. The 23 sites have since been investigated in accordance with the NCP, CERCLA, and SARA, under the terms and conditions of the FFA. Based upon the conclusions and recommendations identified by subsequent site inspections, newly identified sites throughout MCB, Camp Lejeune have been added to the original list of 23. A list of all 42 sites currently part of the IR Program is provided in Table 1-1.

1.4 Site Visit

Field verification of current site conditions is an integral part of the five-year review process. During the first week of December 1998, representatives of Baker performed a visual inspection of all 42 IR sites at MCB, Camp Lejeune. Prior to the inspections, the Baker representatives met with EMD personnel to discuss site visit activities and to consider any changes pertaining to the use or storage of hazardous materials at each site. A copy of the field log compiled during the site visit is provided in Attachment A of this document. Details regarding the site-specific findings are presented in Section 2.0. Printed copies of the photographs taken during the site visit are provided in Attachment B.

1.5 ARAR Review

The Supplemental Five-Year Review Guidance (OSWER, 1994) indicates that for ongoing remedial actions it is not necessary to assess the potential significance of all applicable or relevant and appropriate requirements. Nor is it required, in most circumstances, to recalculate the risk assessment. When ARAR changes do necessitate further action, such action may at any time be implemented through an Explanation of Significant Differences (ESD), a Record of Decision (ROD) amendment, amendment to a consent decree, or other enforceable documents administered by USEPA.

An elemental part of the five-year review process is to verify that selected remedial actions comply with site specific ARARs or, if not, to justify noncompliance. Typically ARARs are divided into three categories: chemical specific, location specific, and action specific. Tables 1-2, 1-3, and 1-4 provide listings of all ARARs applicable to MCB, Camp Lejeune. Although remedial measures at each site comply with ARAR provisions, to avoid redundancy, the lists are not repeated for each site. Site specific ARAR considerations are provided within the ROD documents, when applicable.

During preparation of this document, ARARs were reviewed for significant changes that would alter or augment the protectiveness of the selected remedial measures. The following lists of chemical specific, location specific, and action specific ARARs were reviewed for significant changes:

Chemical Specific ARARs

Safe Drinking Water Act
Reference Doses (RfDs)
Carcinogenic Slope Factors (CSFs)
Health Advisories
National Emission Standards for Hazardous Pollutants
National Ambient Air Quality Standards
EPA Ambient Water Quality Criteria
NC DENR Classification and Water Quality Standards Applicable to Surface Waters of North Carolina
NC DENR Groundwater Standards Applicable to North Carolina
NC DENR Regulations for Hazardous and Solid Waste
NC DENR Toxic Air Pollutant Rule
North Carolina Anti-Degradation Policy for Surface Water

Action Specific ARARs

Occupational Safety and Health Administration (OSHA) Regulations for Hazardous Waste Operations
Department of Transportation (DOT) Rules for Hazardous Materials Transportation
Resource Conservation Recovery Act (RCRA) Subtitles C and D
Land Disposal Restriction (LDR) Requirements
Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites
General Pretreatment Regulations for Existing and New
Sources of Pollutants
Toxic Substances Control Act (TSCA)
North Carolina Water Pollution Control Regulations
Protection of Archaeological Resources
North Carolina Sedimentation Pollution Control Act of 1973

Location Specific ARARs

Fish and Wildlife Coordination Act
Federal Endangered Species Act
North Carolina Endangered Species Act
Executive Order 1190 on Protection of Wetlands
Executive Order 11988 on Floodplain Management
Resource Conservation Recover Act (RCRA) Location Requirements
National Historic Preservation Act of 1966
Archaeological and Historic Preservation Act
Historic Sites, Buildings and Antiquities Act
Rivers and Harbors Act of 1899
Wilderness Act
National Wildlife Refuge System
Scenic Rivers Act
Coastal Zone Management
Clean Water Act

At the time of this review, no significant changes or alterations within the ARARs were noted that would either alter or augment the protectiveness of the selected remedial actions.

1.6 Next Five-Year Review

Statutory reviews are required within five years of initiating a remedial action at a site or OU. The date of remedial action initiation is established when a Potentially Responsible Party (PRP) or representative mobilizes to begin construction. This document represents the first five-year review conducted at MCB, Camp Lejeune as triggered by the initiation of remedial measures at OU No. 1, on 24 September 1993. In this case, the next five-year review will be required within five years of the original due date of this review, 24 September 2003.

Five-year reviews will continue until contaminant levels permit unlimited use and unrestricted exposure following completion of all remedial actions. Because some sites are active and some inactive, all sites and remedies are incorporated in this first five-year review. Future reviews of inactive sites may or may not be conducted, as appropriate and deemed necessary.

2.0 EVALUATION OF RESPONSE ACTIONS

Five-year reviews are intended to provide a thorough analysis of whether the selected response actions remain protective of human health and the environment. The more explicit purpose of five-year reviews is to confirm that the remedial actions, as stipulated in the ROD or remedial design, remain effective (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective). The focus of each site-specific review varies, depending upon the original goal of each response action. At MCB, Camp Lejeune the protectiveness of response actions are being assured through a combination of exposure protection, institutional controls, or long-term remedial action.

A further objective of the five-year review is to consider the scope of continued operation and maintenance (O&M). If O&M activities have either grown unexpectedly over time or simply require much greater effort than had been estimated, such factors may be an early indication of remedy decline. Rising efforts or costs may indicate that excessive attention or activity is required to ensure that the remedy functions properly or remains effective. During preparation of this five-year review, several O&M factors concerning the protectiveness of each response action were evaluated.

The subsections that follow describe the response actions at each site and provide an assessment concerning overall remedy protectiveness. Recommendations to correct or augment the selected response actions at each site are also provided within the subsections that follow. For ease of review, the following evaluation of response actions is presented according to Operable Unit.

Operable units are formed as an incremental step toward addressing individual site concerns. The formation of OUs is intended to either eliminate or mitigate a release, threat of a release, or pathway of potential exposure. The cleanup of a particular site may be divided into any number of OUs, depending upon the complexity of the problem. An individual OU may address distinct geographical portions of a site, specific site concerns, or initial phases of a remedial action. An OU may also consist of any set of similar actions performed over time or any actions that are conducted at the same time, but located in different portions of a site. In accordance with NCP guidance and appropriate CERCLA response activities, the Navy and Marine Corps have grouped 34 of the 42 IR sites into 18 OUs. The remaining 8 IR sites are classified as Pre-Remedial Investigation (Pre-RI) sites. Each of the 18 OUs and Pre-RI sites are listed in Table 2-1. The locations of each site and OU are depicted in Figure 1-1.

2.1 Operable Unit No. 1 (Sites 21, 24, and 78)

Operable Unit No. 1 is comprised of Sites 21, 24, and 78. As depicted in Figure 1-1, OU No. 1 is located approximately one-half mile east of the New River and three miles south of North Carolina State Route 24. The Final Record of Decision (ROD) for OU No. 1 was signed 15 September 1994.

2.1.1 Site 21 (Transformer Storage Lot 140)

Site 21 is situated entirely within Site 78 and, more regionally, within the Hadnot Point Industrial Area (HPIA) of MCB, Camp Lejeune. A former disposal pit located in the northern portion of Site 21 was used to drain oil from electric transformers during 1950 and 1951. The site was also used from 1958 to 1977 for pesticide mixing and as a wash-down area for equipment used during

the application of pesticides. The pesticide mixing and wash-down areas were located in the southern portion of the study area.

Findings from the 1993 Remedial Investigation (RI) indicated that pesticides and polychlorinated biphenyls (PCBs) had impacted soil within discrete portions of Site 21. Pesticide compounds were detected in surface soil samples obtained from the former mixing area. PCB compounds, specifically Aroclor-1260, were identified among surface soil samples obtained from the former oil disposal area and two smaller areas within Site 21.

2.1.1.1 Remedial Objectives

The selected remedial action alternative (RAA) for Site 21 addressed surface soils within three separate areas of concern (AOCs). The RAA included excavation of contaminated soil from Site 21, off-site treatment of the soil, and finally disposal of the soil at a permitted facility. Following the initial phase of the removal action, confirmatory sampling was completed to ensure that all remediation goals had been met. A total of 811 tons of contaminated soil were removed from the site. As a result, the remedial action greatly reduced the overall risk to human health and the environment posed by the contaminated soils. Residual soil contamination, however, prohibits the use or development of Site 21 for residential purposes.

2.1.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 21. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, a number of 55-gallon drums were observed within the central, fenced portion of Storage Lot 140. The drums appeared to be in fair condition, but were not clearly labeled. The contents of the drums, if any, could not be determined during the site visit.

2.1.1.3 Statement on Protectiveness

The selected remedy at Site 21, removal and off-site disposal of contaminated soil, has ensured the protectiveness to public health and the environment. This review of information and existing conditions suggests that the removal action, completed in 1995, was effective at reducing contaminant levels in soil. Residual soil contamination, however, prohibits the use or development of Site 21 for residential purposes.

A separate Memorandum of Agreement, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), stipulates certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP for MCB, Camp Lejeune. The LUCAP is intended to ensure that all site-specific remedies with land use controls remain protective of human health and the environment.

2.1.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during this five-year review of Site 21. The completed remedial action has removed the soil contamination and has demonstrated compliance with all ARARs. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 21.

2.1.1.5 Recommendations

There are no known conditions at Site 21 that require additional remedial actions; therefore, no recommendations for technology upgrades or treatment modifications are warranted. However, general housekeeping is recommended to better identify and secure drums located within the central fenced compound of Storage Lot 140.

2.1.2 Site 24 (Industrial Area Fly Ash Dump)

Site 24 is also situated within HPIA, adjoining Site 78 to the south. The site was reportedly used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment sludge from the late 1940s to 1980. The upstream reaches of Cogdels Creek serve as drainage for this mostly wooded site. Unimproved roads and marsh areas are interspersed throughout the study area.

A Remedial Investigation and Feasibility Study (RI/FS) was conducted at Site 24 during 1993 and 1994. Findings from the RI/FS indicated that metals and pesticides, detected among a subset of soil and groundwater samples, were the primary contaminants of concern. However, after a thorough review and additional testing, only the presence of pesticides in groundwater warranted further consideration.

2.1.2.1 Remedial Objectives

The RAA for Site 24 required periodic monitoring of groundwater conditions that presumably had been adversely impacted by previous site operations. Groundwater samples from three monitoring wells were collected periodically and evaluated to determine the effectiveness of the selected remedy. The monitoring program at Site 24 was implemented during July 1996. Based upon results of the monitoring program at Site 24, the remedy was to be expanded, modified, or discontinued as deemed necessary and appropriate.

2.1.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 24. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.1.2.3 Statement on Protectiveness

The selected remedy at Site 24, groundwater monitoring, has ensured the protectiveness to public health and the environment. This review of information and existing conditions suggests that the remedy, completed in 1997, effectively confirmed that contaminant levels in groundwater had either attenuated or dissipated. Pre-existing soil conditions, however, prohibit the use or development of Site 24 for residential purposes. The LUCAP for MCB, Camp Lejeune ensures that land use controls at Site 24 remain protective of human health and the environment.

Groundwater monitoring was discontinued in December 1997 after evaluating the results of four sampling initiatives. The lack of pesticide and metal groundwater contamination at Site 24 was confirmed by analytical results collected over four consecutive quarters (Baker, 1998). During the 1993 RI, concentrations of the pesticide heptachlor epoxide and a number of metals exceeded either

applicable federal maximum contaminant levels (MCLs) or North Carolina Water Quality Standards (NC WQSs). It was later surmised that suspended soil material in the groundwater samples had contributed to the pesticide and metal detections; pesticides and metals have a tendency to adhere to soil material. As a result, a low-flow purge method was employed during the four monitoring initiatives of 1996 and 1997. The low-flow purge method effectively reduced the amount of suspended soil particles and thus, yielded a sample more representative of true aquifer conditions. No pesticides and much lower concentrations of naturally occurring metals were detected among the groundwater samples submitted for analyses from Site 24. As a result, groundwater conditions at Site 24 are therefore protective of human health and the environment.

2.1.2.4 Areas of Noncompliance

There were no areas of noncompliance noted during this five-year review of Site 24. The completed groundwater monitoring program has demonstrated compliance with all ARARs. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 24.

2.1.2.5 Recommendations

There are no additional remedial actions or monitoring activities required for Site 24; therefore, no recommendations for technology upgrades or treatment modifications are warranted.

2.1.3 Site 78 (Hadnot Point Industrial Area)

Site 78 is bordered by Holcomb Boulevard to the west, Sneads Ferry Road to the north, Louis Street to the east, and Main Service Road to the south. As the first developed portion of MCB, Camp Lejeune, HPIA has remained the center of command and activity since the early 1940s. The industrial area includes maintenance shops, refueling stations, administrative offices, printing shops, warehouses, painting shops, storage yards, a steam generation plant, and other light industrial facilities. Recreational areas and parade grounds are located in the southwest portion of Site 78.

An interim remedial action RI/FS was conducted in 1992 that focused upon the shallow groundwater aquifer at Site 78. Based upon that study, a groundwater extraction and treatment system was brought into service during 1995. A final RI/FS at Site 78 was completed during 1993 and 1994 based solely upon a review of existing analytical results. Findings from the RI/FS suggested that organic compounds, primarily chlorinated solvents and fuel-related compounds, had impacted shallow groundwater within the northern, central, and southern portions of the site. However, the central portion of the study area, adjacent to the Hadnot Point Fuel Farm had since been designated as Site 22 and was being addressed under the Underground Storage Tank (UST) Program. The northern and southern groundwater contaminant plumes, identified in the RI/FS, were being addressed through groundwater extraction and treatment.

2.1.3.1 Remedial Objectives

The RAA at Site 78 includes remediation of the shallow aquifer using an extraction and on-site treatment system, coupled with a groundwater monitoring program. Based upon site investigative results, separate groundwater extraction and treatment systems were constructed in the northern and southern portions of the study area. The remediation goals are stipulated in the Final ROD for OU

No. 1 (Baker, 1994) (See Table 1C, Attachment C). In addition to groundwater treatment, groundwater samples from monitoring wells and the treatment plants are being collected on a semiannual basis to determine the effectiveness of the entire remedial approach. The two treatment plants have been in operation since 1995.

2.1.3.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 78. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, due to the large size of Site 78 and the number of operations conducted within its borders, only suspect portions of the site were inspected.

2.1.3.3 Statement on Protectiveness

A review of conditions and historic monitoring data indicates that the selected remedy in place is effectively restoring groundwater quality to northern and southern portions of Site 78. Continual monitoring and groundwater treatment will be maintained until it is determined that site contaminants do not pose a threat to human health and the environment. The monitoring program ensures that site conditions do not worsen or degrade over time and also confirms that groundwater extraction efforts remain effective.

Two separate phases of upgrades to the groundwater extraction and treatment systems at Site 78 have been initiated during the past four years. Figures 2-1 and 2-2 depict the northern and southern treatment systems at Site 78. Three groundwater extraction wells were added to the southern treatment system during the most recent upgrade phase. One extraction well was also added to the northern treatment system and two other existing extraction wells were refurbished. The upgrades were the result of supplemental data evaluations performed during the RI/FS and groundwater monitoring program. In addition, recent alterations to the monitoring program have resulted in a more accurate depiction of true groundwater conditions. Because the groundwater extraction and treatment systems at Site 78 undergo periodic evaluation, the protectiveness of the systems is ensured. If any additions or changes to the systems are necessary, they will be incorporated into the current O&M program.

Annual O&M costs were estimated, as of September 1994, to be $30,000 during the first five years of monitoring and treatment system operation. The annual costs were also projected to decrease from $30,000 to $15,000 during O&M years 6 through 30. However, during the first four years of operation, the average annual O&M cost has exceeded the initial estimate of $30,000. Problems associated with continued operation of the plants and monitoring requirements have necessitated additional labor and materials. Specifically, problems associated with plant equipment and natural groundwater conditions (e.g., metals and suspended sediment) have required that unforeseen maintenance be completed. Also, the two treatment plants receive additional waste streams from other sources within MCB, Camp Lejeune. The additional waste streams, while reducing the overall cost of waste treatment, effectively hasten equipment failure and maintenance schedules.

In addition to the unanticipated O&M costs associated with the Site 78 systems, a number of recommendations have recently been implemented. For example, five additional recovery wells are currently being installed at Site 78 that, when completed, will capture the most contaminated portions of the shallow groundwater plumes. Also, three additional monitoring wells were installed

during 1998 that permit more representative sampling. It is anticipated that these modifications, while negatively impacting short-term cost projections, will reduce the long-term O&M costs and increase the efficiency of the treatment systems.

2.1.3.4 Areas of Noncompliance

Aside from groundwater contamination, there were no other areas of noncompliance noted during this five-year review of Site 78. Restoration of the groundwater resource is being achieved through active treatment systems. The ARARs listed in Section 1.0 remain applicable to Site 78 and provide the basis for continued groundwater treatment and monitoring. The monitoring program continues, on a semiannual basis, to ensure that the treatment systems are operating effectively. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 78.

2.1.3.5 Recommendations

There are no additional remedial actions or monitoring activities required for Site 78; therefore, no additional recommendations for technology upgrades or treatment modifications are warranted. Several proactive recommendations concerning groundwater treatment and monitoring at Site 78 have been implemented during the past four years. Additional recommendations may be required, based upon information presented in future monitoring and O&M reports. If any alterations to the treatment systems are necessary, the changes will be incorporated into the current O&M program.

2.2 Operable Unit No. 2 (Sites 6, 9, and 82)

Operable Unit No. 2 is comprised of Sites 6, 9, and 82. As depicted in Figure 1-1, OU No. 2 is located approximately 1.6 miles east of the New River and 0.9 miles south of North Carolina State Route 24. The Final ROD for OU No. 2 was signed 24 September 1993.

2.2.1 Site 6 (Storage Lots 201 and 203) and Site 82 (Piney Green Road VOC Area)

Sites 6 and 82 adjoin one another and together comprise over 200 acres. The sites are bounded by Wallace Creek to the north, Site 9 to the south, Piney Green Road to the east, and Holcomb Boulevard to the west. Site 6 is comprised of equipment staging and open storage areas, including Lots 201 and 203. Site 82 is a mostly wooded area that borders Site 6 to the north. Because the nature of contamination detected at both sites is the same and a common boundary is shared, the information presented within this subsection pertains to Site 6 and Site 82.

Prior to the late 1980s, much of the northern portion of the two sites (i.e., Storage Lot 203 and Site 82) was used for storage, disposal, and handling of hazardous waste and materials. During the initial site reconnaissance in 1991, evidence of disposal was noted throughout the border area between the two sites, within Lot 203, and just north of Lot 201. Located in the central and southern portions of Site 6, Lot 201 has been used to stage equipment and material since the 1940s. Lot 201 was also reportedly used to store pesticides and PCBs until the late 1980s. Currently, the central portion of Site 6 that surrounds and includes Lot 201 is used for equipment staging and to support recycling activities.

The RI/FS of OU No. 2 was initiated in August 1992 and concluded in September 1993 with the completion of the Final ROD. Several areas of concern were identified during separate phases of the RI. Based upon findings presented in the RI report, a time-critical removal action (TCRA) was conducted in 1994. During the removal action, twenty drums of 4,4'-dichlorodiphenyl trichloroethane (DDT) were removed and contaminated soil was excavated. Another TCRA was conducted in 1995 to remove empty drums, batteries, debris, and contaminated soil from a number of areas within Sites 6 and 82. The soil excavated during the second TCRA was contaminated with petroleum, oil, and lubricating (POL) compounds.

Groundwater sampling conducted during the RI revealed the presence of volatile organic compounds (VOCs) in the surficial and Castle Hayne aquifers. Chlorinated compounds were detected in samples obtained from the uppermost portion of the surficial aquifer to 150 feet below ground surface. Groundwater at Site 6 and at Site 82 remains contaminated with VOCs such as trichloroethene (TCE), 1,2-dichloroethene, and vinyl chloride. The highest levels of contamination are present where Sites 6 and 82 adjoin. Construction of a groundwater extraction and treatment system was initiated in December 1994 and full-scale operation of the treatment system began in July 1996. In 1997, a groundwater monitoring program was initiated to monitor the effectiveness of the treatment system and to ensure that site contaminants do not migrate from the study area. Monitoring wells associated with the monitoring program are sampled on a semiannual basis. Groundwater recovery wells associated with the treatment plant are sampled on a quarterly basis. Monitoring and treatment system evaluation reports are provided as part of the continual monitoring and O&M support.

2.2.1.1 Remedial Objectives

The RAA at Sites 6 and 82 includes remediation of the shallow and deep aquifers using an extraction and on-site treatment system, coupled with a groundwater monitoring program. The remediation goals are stipulated in the Final ROD for OU No. 2 (Baker, 1993) (See Table 2C, Attachment C). In addition to groundwater treatment, groundwater samples from recovery wells and the treatment plant are collected on a quarterly and monthly basis, respectively, to determine the effectiveness of the entire remedial approach. The treatment plant has been in operation since 1996.

2.2.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Sites 6 and 82. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. The groundwater treatment facility continues to operate efficiently and on a continual basis. The remedial action contractor performs routine maintenance of the treatment system and groundwater recovery wells.

2.2.1.3 Statement on Protectiveness

The existing groundwater conditions at Sites 6 and 82 do not meet state or federal water quality criteria. However, the remedial action in place is operating to restore the groundwater resource. There are no immediate areas of noncompliance associated with the treatment system or the O&M procedures at Sites 6 and 82. A physical inspection of the sites has not identified any areas of concern aside from the existing groundwater conditions that require further action.

A review of conditions and historic monitoring data indicates that the selected remedy in place is slowly restoring groundwater quality to Sites 6 and 82. Continual monitoring and groundwater treatment will be maintained until it is determined that site contaminants do not pose a threat to human health and the environment. The monitoring program ensures that site conditions do not worsen or degrade over time and also confirms that groundwater extraction efforts remain effective. It is reasonable to suspect that natural attenuative processes are having some reductive effect upon the contamination that remains in the groundwater. Based upon the available data, it also appears that the contaminant plumes have stabilized and may have begun to shrink.

Figures 2-3 and 2-4 depict the shallow and deep groundwater extraction systems at Site 82. Because the groundwater extraction and treatment systems at Site 82 undergo periodic evaluation, the protectiveness of the systems is ensured. If any additions or changes to the systems are necessary, they will be incorporated into the current O&M program.

Annual O&M costs were estimated, as of September 1993, to be $227,000 per year during the first 30 years of monitoring and treatment system operation. However, during the first three years of operation, the average annual O&M cost may have exceeded the initial estimate. Problems associated with continued operation of the plant and monitoring requirements have necessitated additional labor and materials. Specifically, problems associated with plant equipment and natural groundwater conditions (e.g., metals and suspended sediment) have required that unforeseen maintenance be completed. Also, the treatment plant receives additional waste streams from other sources within MCB, Camp Lejeune. The additional waste streams, while reducing the overall cost of waste treatment, effectively hasten equipment failure and maintenance schedules.

In addition to the unanticipated O&M costs associated with the treatment systems, additional recovery wells were installed to capture the most contaminated portions of the shallow groundwater plumes. Also, three additional monitoring wells were installed during 1998 that permit more representative groundwater sampling. It is anticipated that these modifications, while negatively impacting short-term cost projections, will reduce the long-term O&M costs and increase the efficiency of the treatment systems.

2.2.1.4 Areas of Noncompliance

Aside from groundwater contamination, there were no other areas of noncompliance noted during this five-year review of Site 6 and Site 82. Restoration of the groundwater resource is being achieved through active treatment systems. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater treatment and monitoring. The monitoring program continues, on a semiannual basis, to ensure that the treatment systems are operating effectively. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 6 and Site 82.

2.2.1.5 Recommendations

There are no additional remedial actions or monitoring activities required at Sites 6 and 82; therefore, no additional recommendations for technology upgrades or treatment modifications are warranted. Several pro-active recommendations concerning groundwater treatment and monitoring have been implemented during the past three years. Additional recommendations may be required, based upon information presented in future monitoring and O&M reports. If any alterations to the treatment systems are necessary, the changes will be incorporated into the current O&M program.

2.2.2 Site 9 (Fire Fighting Training Pit at Piney Green Road)

Site 9 is located immediately south of Site 6 and west of Piney Green Road. The area encompasses only 2.6 acres. The fire training area consists of a concrete-lined pit with an oil and water separator. There were four 500-gallon aboveground storage tanks (ASTs) near the training area that have since been removed. The fire training pit has been used for training since the early 1960s. Until 1981, the training exercises were conducted in an unlined pit. Flammable liquids including heating oil, solvents, and fuels were used as accelerants during the training exercises.

Soil and groundwater samples collected during the RI at Site 9 did not reveal extensive contamination. The absence of widespread soil and groundwater contamination may be due to combustion during training exercises. No remedial actions were required at this site. However, during Fiscal Year 1999, plans to upgrade the fire training area will be completed, and new clean-burning apparatus will be installed.

2.2.2.1 Remedial Objectives

Due to the very minimal impact of fire training activities upon the study area, there were no remedial actions required at Site 9.

2.2.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 9. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.2.2.3 Statement on Protectiveness

Conditions at Site 9 remain protective of human health and the environment. An eight-foot cyclone fence was installed around the perimeter of the site in 1995 to limit access. In addition, the existing fire training pit will be replaced with a clean-burning apparatus during Fiscal Year 1999. The existing oil and water separator will also be removed during upgrade of the training systems.

2.2.2.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 9.

2.2.2.5 Recommendations

There are no remedial actions or monitoring requirements at Site 9; therefore, no recommendations to modify the remedy are warranted. However, it is recommended that one monitoring well (09-MW04) remaining at the site be abandoned. This monitoring well is located adjacent to Piney Green Road.

2.3 Operable Unit No. 3 (Site 48)

Operable Unit No. 3 is comprised of Site 48 only. As depicted in Figure 1-1, OU No. 3 is located adjacent to the New River and approximately two miles east of U.S. Highway 17. The final ROD for OU No. 3 was signed on 10 September 1993.

2.3.1 Site 48 (MCAS Mercury Dump)

Site 48 is located within Marine Corps Air Station (MCAS) New River. Longstaff Road forms the western boundary of Site 48 and the New River forms the eastern boundary. An unnamed tributary to the New River borders the site to the north. The site includes approximately four flat acres and consists of Building AS-804 and a lawn area behind the building. From 1956 to 1966 mercury was drained from radar units periodically and disposed in woods near the photo lab (Building AS-804). Approximately 1 gallon per year over 10 years, i.e., more than 1,000 pounds total, was hand carried to an area between Building AS-804 and the New River. This mercury was then dumped or buried in small quantities at randomly selected spots. The building is currently used as a classroom training facility for Nuclear, Biological, and Chemical Warfare training.

During the 1992 RI/FS, historical aerial photographs were obtained and evaluated in order to identify the suspected disposal area. A geophysical investigation was also performed to identify the presence of mercury. The geophysical investigation did not reveal anything associated with mercury disposal. A soil and groundwater investigation was conducted, focusing upon the anomalies identified in aerial photographs. Results of this study did not identify mercury in either the soil or groundwater. The RI concluded that the absence of mercury at Site 48 was most likely due to washout of the area and periodic flooding during severe storms because of its proximity to the New River.

2.3.1.1 Remedial Objectives

Due to the absence of contamination at Site 48, there were no remedial actions required.

2.3.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 48. The site visit was also performed to examine existing conditions and to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.3.1.3 Statement on Protectiveness

Conditions at Site 48 remain protective of human health and the environment. The RI/FS completed in 1992 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.3.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 48. The ARARs listed in Section 1.0 remain applicable to Site 48.

2.3.1.5 Recommendations

There are no remedial actions or monitoring activities required at the site; therefore, no recommendations to modify the remedy are warranted.

2.4 Operable Unit No. 4 (Sites 41 and 74)

Operable Unit No. 4 is comprised of Sites 41 and 74. As depicted in Figure 1-1, the two sites that comprise OU No. 4 are located approximately eight miles from one another, on opposite sides of the New River. The Final ROD for OU No. 4 was signed 5 December 1995.

2.4.1 Site 41 (Camp Geiger Dump Near Former Trailer Park)

Site 41 is located within MCAS New River portion of MCB, Camp Lejeune and is comprised of approximately 30 acres. The site is situated between Highway 17 to the west, Tank Creek to the south, an unnamed tributary to the north, and an unimproved road to the east. During the period 1946 to 1970, the area was used as an open burn dump. Construction debris, POL wastes, mirex (a pesticide), solvents, batteries, ordnance, and chemical training agents were reportedly disposed at Site 41. Based upon background information, the debris was burned and graded over with soil.

An RI/FS was initiated in December 1993 and completed in May 1995. Results of the RI indicated that the site contains a significant amount of buried construction debris. Analytical results indicated that surface soil in the central portion of the study area was contaminated with polynuclear aromatic hydrocarbon (PAH) compounds, most likely the result of previous burning activities. Groundwater samples obtained from Site 41 exhibited chromium, iron, lead, and manganese above North Carolina WQSs. The human health risk assessment concluded that there were no risks to human health because groundwater in this area is not used as a potable supply. The ecological risk assessment concluded that potential adverse impacts to ecological receptors were low due to the low levels of contamination in soil, sediment, and surface water.

2.4.1.1 Remedial Objectives

The selected remedy for Site 41 includes long-term groundwater, surface water, and sediment monitoring and deed restrictions prohibiting development of the site. Restoration of the groundwater resource is presumably being achieved through natural processes. The remediation goals are presented in the Final ROD for OU No. 4 (Baker, 1995) (See Table 3C, Attachment C). A groundwater reclassification and surface water variance were requested due to the nature of potential contamination that could not feasibly be remediated. In August 1997, a letter from NC DENR Wilmington Regional Office informed MCB, Camp Lejeune that, based on limited site contamination, the groundwater reclassification and surface water variance would not be required. Groundwater, surface water, and sediment monitoring will continue on a semiannual basis and will be reviewed every five years to determine whether the alternative is protective of human health and the environment.

2.4.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 41. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. The site remains heavily wooded and a six-foot cyclone fence limits vehicle access to the site.

2.4.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 41 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 41 or threaten human health and the environment.

2.4.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 41. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater, surface water, and sediment monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 41.

2.4.1.5 Recommendations

There are no additional remedial actions or monitoring activities required at Site 41; therefore, there are no additional recommendations to significantly modify the remedy. Several proactive recommendations concerning groundwater monitoring have been implemented during the past three years. Additional recommendations may be required based upon information presented in future monitoring reports. If any alterations to the remedy are necessary, the changes will be incorporated into the current program.

2.4.2 Site 74 (Mess Hall Grease Disposal Area)

Site 74 is located approximately one-half mile east of Holcomb Boulevard in the northeast section of MCB, Camp Lejeune just north of Henderson Pond. During the early 1950s through the early 1960s, grease from the mess hall was reportedly taken to the area and disposed in trenches. It was also reported that drums containing PCBs and "pesticide soaked bags" were taken to the site and buried. Chemical warfare materials (CWM), similar to the types documented at Site 69, also were reportedly taken to Site 74.

An RI was conducted at Site 74 in conjunction with Site 41. Historical aerial photographs of Site 74 depict extensive trenching operations. Results of the RI did not indicate widespread contamination. Some pesticides were detected in soil at the former pest control area, and one monitoring well exhibited low levels of a pesticide. Based on the results of the human health and ecological risk assessments, Site 74 poses no unacceptable risks.

2.4.2.1 Remedial Objectives

The selected remedy for Site 74 includes deed restrictions that prohibit the development of the site, restrictions on the use of the groundwater as a potable supply, and long-term groundwater monitoring. The decision to restrict development of the site is based on the potential presence of buried CWM near the former grease disposal area.

2.4.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 74. An eight-foot cyclone fence was installed around the perimeter of the site in 1995 to limit access. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.4.2.3 Statement on Protectiveness

Conditions at Site 74 are protective of human health and the environment. Monitoring activities at Site 74 were discontinued after four consecutive semiannual sampling initiatives. Groundwater monitoring results confirm the lack of significant contamination at Site 74.

2.4.2.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 74. The ARARs listed in Section 1.0 remain applicable to Site 74.

2.4.2.5 Recommendations

Based upon groundwater monitoring results obtained during four consecutive semiannual sampling initiatives, it is recommended that monitoring activities be permanently discontinued. In light of the evidence, it is recommended that a letter detailing the change in monitoring requirements be prepared and submitted to NC DENR and USEPA for approval.

2.5 Operable Unit No. 5 (Site 2)

Operable Unit No. 5 is comprised of Site 2 only. As depicted in Figure 1-1, OU No. 5 is located approximately one-half mile south of State Route 24 just inside the Main Gate. The final ROD for OU No. 5 was signed on 15 September 1994.

2.5.1 Site 2 (Former Nursery and Day Care Center)

Site 2 is located at the intersection of Holcomb and Brewster Boulevards. From 1945 to 1958 an on-site building was used for the storing, handling, and dispensing of pesticides. Building 712 was later used as a day care center for children. Chemicals known to have been used or stored at Site 2 include chlordane, DDT, diazinon, and 4,4'-dichlorodiphenyldichloroethane (DDD). Chemicals known to have been stored at this site include dieldrin, lindane, malathion, and silvex. A preliminary soil sampling investigation conducted in 1982 indicated the presence of pesticides. Based on these results, the day care activities were moved to another location. Building 712 is currently being used as a personnel office for non-appropriated funding personnel.

2.5.1.1 Remedial Objectives

An RI/FS was initiated in April 1993 and completed in September 1994. Based upon results of the RI/FS, elevated levels of pesticides were detected in soil near the former mixing pads. In addition, a plume consisting of low levels of ethylbenzene and toluene was present in the shallow aquifer. Contamination of site environmental media was believed to be the result of small spills, washout, and excess disposal. A TCRA was initiated in January 1994. The TCRA involved the excavation and off-site treatment of pesticide-contaminated soil and concrete. A total of 1,049 tons of pesticide contaminated soils were excavated and sent for off-site disposal.

Institutional controls, including groundwater monitoring, were implemented at Site 2 in 1995. Restoration of the groundwater resource is presumably being achieved through natural processes. Contaminant-specific ARARs and to be considered criteria for groundwater at this site are presented in the Final ROD (Baker, 1994) (See Table 4C, Attachment C). Groundwater monitoring was initiated in 1995 and has continued on a semiannual basis. Based upon findings of the monitoring program, the sampling frequency and analyses were modified in 1997.

2.5.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 2. The site visit was also performed to examine existing conditions and to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. The southern portion of Site 2 is currently being used to stage equipment and a small office trailer.

2.5.1.3 Statement on Protectiveness

Conditions at Site 2 remain protective of human health and the environment. Continued monitoring at Site 2 ensures that the remaining groundwater contaminants do not migrate from the site or pose a threat to human health and the environment.

2.5.1.4 Areas of Noncompliance

Aside from groundwater contamination, there were no other areas of noncompliance noted during this five-year review of Site 2. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable to Site 2 and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 2.

2.5.1.5 Recommendations

There are no additional remedial actions or monitoring activities required for Site 2; therefore, there are no additional recommendations to modify the remedy. Several proactive recommendations concerning groundwater monitoring at Site 2 have been implemented during the past three years. Additional recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the monitoring are necessary, the changes will be incorporated into the current program.

2.6 Operable Unit No. 6 (Sites 36, 43, 44, 54, and 86)

Operable Unit No. 6 is comprised of Sites 36, 43, 44, 54, and 86. As depicted in Figure 1-1, the five sites that comprise OU No. 6 are generally located in the Camp Geiger and MCAS New River portions of Camp Lejeune. The Final ROD for OU No. 6 will most likely be signed during 1999.

2.6.1 Site 36 (Camp Geiger Dump Area)

Site 36 is located approximately 1,000 feet east of Camp Geiger and 500 feet west of the New River, adjacent to the Camp Geiger Sewage Treatment Plant (STP). Camp Geiger is situated directly north of MCAS New River, approximately three miles southwest of Jacksonville, North Carolina. Site 36 was originally estimated to be approximately 1.5 acres in size. However, based upon a review of aerial photographs and observations recorded during the initial site visit, the size of the site was adjusted to include nearly 20 acres. Mixed industrial wastes including trash, waste

oils, solvents, and hydraulic fluids were reportedly disposed at Site 36. Most of the material was first burned and then buried; however, some unburned material was buried. The dump was active from the late 1940s to the late 1950s.

The RI field investigation at Site 36 was completed during February 1995 through May 1995. Additional monitoring wells were installed and a supplemental groundwater investigation was completed in July 1995. Additional soil borings and two sediment samples were collected in October of 1995. The RI indicated that organic compounds in groundwater were limited to the northern and western portions of the study area. The presence of volatile compounds was confirmed by results of the supplemental groundwater investigation. In addition, PCBs were detected among soil samples obtained from the western portion of the site. A limited number of volatile and pesticide compounds were also detected among surface water and sediment samples obtained from Brinson Creek.

Much of Site 36 and the surrounding areas have recently been graded in preparation for the U.S. Highway 17 Jacksonville bypass. A number of monitoring wells were also abandoned during the initial phase of the bypass construction.

2.6.1.1 Remedial Objectives

Removal of PCB-contaminated soil at Site 36 was completed during Fiscal Year 1998. Several cubic yards of soil contaminated with PCBs were excavated from the western portion of Site 36, adjacent to monitoring well IR36-GW15. The contaminated soil was transported to an off-site disposal facility.

During Fiscal Year 1999, approval of monitored natural attenuation for the groundwater at Site 36 is anticipated, pending final approval. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

At the present time, groundwater samples are being collected on a quarterly basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 36 will be used to support the proposed remedy, natural attenuation coupled with long-term monitoring.

2.6.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 36. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.6.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 36 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 36 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

2.6.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 36. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater, surface water, and sediment monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 36.

2.6.1.5 Recommendations

There are no additional remedial actions required at Site 36; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. It should be noted that the ROD for Site 36 has not yet been approved. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.6.2 Site 43 (Agan Street Dump)

Site 43 is comprised of approximately 11 acres and is located within the operations area of MCAS, New River, two miles west of the main entrance. The site is bordered to the north by Edwards Creek and to the east and south by Strawhorn Creek. The Agan Street Dump reportedly received inert material such as construction debris (i.e., fiberglass and lumber) and trash. Sludge from a former sewage disposal facility, located adjacent to the study area, was also dumped onto the ground surface at Site 43. The years during which disposal operations took place are not known.

The RI field investigation at Site 43 was completed during February 1995 through May 1995. Soil test borings were completed at two separate locations identified as having partially buried containers. Positive detections of semivolatile organic compounds (SVOCs) among soil samples obtained at Site 43 were primarily limited to a cleared portion of the study area adjacent to the gravel access road. In general, higher concentrations of pesticides were observed in samples obtained from a small portion of the study area with partially buried containers. No other organic compounds were detected among groundwater samples obtained from the shallow and deep aquifers. The concentrations of organic compounds detected among environmental samples at Site 43 do not pose a threat to human health or the environment, however.

2.6.2.1 Remedial Objectives

A removal action was performed during July 1995 to remove metallic debris from Site 43. Approximately 7.3 tons of metallic debris was recovered and then recycled. It is anticipated that no additional remedial action or monitoring will be required for Site 43. The ROD for Site 43 will be approved during Fiscal Year 1999.

2.6.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 43. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.6.2.3 Statement on Protectiveness

Conditions at Site 43 remain protective of human health and the environment. The RI/FS completed in 1995 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.6.2.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 43. The ARARs listed in Section 1.0 remain applicable to Site 43.

2.6.2.5 Recommendations

There are no remedial actions or monitoring activities required at the site; therefore, no recommendations to modify the proposed remedy are warranted. The ROD for Site 43 has not yet been approved, however.

2.6.3 Site 44 (Jones Street Dump)

Site 44 encompasses approximately 5 acres and is located at the northern terminus of Baxter Street, within the New River operations area. The site is bordered to the north and west by Edwards Creek, to the south by base housing units along Jones Street, and to the east by woods and an unnamed tributary to Edwards Creek. Edwards Creek flows east from the study area toward Site 43, which is located about 2,000 feet to the east. Site 44 was reportedly in operation during the 1950s. Although the quantity of waste is not known, debris, cloth, lumber, and paint cans were reportedly disposed of at the site.

The RI field investigation at Site 44 was completed during February 1995 through May 1995. A total of four semivolatile contaminants, including two PAH compounds, were identified during the soil investigation at Site 44. The pesticides 4,4'-dichlorodiphenyldichroethylene (DDE), DDD, and DDT were the most widely distributed compounds in the soil. Inorganics were the most prevalent and widely distributed constituents in groundwater at Site 44. Positive detections of organic compounds were limited to two monitoring wells. A total of 6 VOCs were detected among the 13 surface water samples obtained from Edwards Creek. The surface water contaminants were eventually traced to IR Site 89 and are being addressed as part of the Feasibility Study (FS) for OU No. 16. Organic compounds were not detected in any of the ten sediment samples obtained from Edwards Creek.

2.6.3.1 Remedial Objectives

The occurrence of VOCs among the limited groundwater and surface water samples obtained from the study area were traced to Sites 89 and 93, located upgradient of Site 44. It is anticipated that no additional remedial action or monitoring will be required for Site 44. The ROD for Site 44 will be approved during Fiscal Year 1999.

2.6.3.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 44. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, fallen trees have damaged a seven-foot cyclone fence that limits access to Site 44.

2.6.3.3 Statement on Protectiveness

Conditions at Site 44 remain protective of human health and the environment. The RI/FS completed in 1995 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.6.3.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 44. The ARARs listed in Section 1.0 remain applicable to Site 44.

2.6.3.5 Recommendations

There are no remedial actions or monitoring activities required at Site 44; therefore, no recommendations to modify the proposed remedy are warranted. The ROD for Site 44 has not yet been approved, however. It is recommended that the fencing that surrounds Site 44 should either be repaired or removed completely.

2.6.4 Site 54 (Crash Crew Fire Training Burn Pit)

Site 54 is located near the southwest end of runway 5-23, within the operations area of MCAS, New River. The burn pit is approximately 50 feet in diameter and is situated at the center of this 1.5-acre site. An 8,000-gallon UST lies to the northwest of the burn pit. Fire training exercises are conducted within the burn pit using JP-type fuel, which is stored in the nearby UST and water separator, located approximately 100 feet to the southeast of the burn pit. Site 54 has served as a fire training burn pit since the mid-1950s. In 1975 a lined burn pit was constructed. The same burn pit remains in operation today; however, only JP-type fuels are currently used during training exercises.

The RI field investigation at Site 54 was completed during February 1995 through May 1995. Soil borings were completed to assess the suspected impact of burn pit operations and were utilized for the installation of monitoring wells. Semivolatile compounds were identified in both surface and subsurface soil samples from the southern and southwestern portions of the study area. Positive detections of organic compounds were limited to portions of the study area immediately adjacent to the burn pit or UST and extending southwest of the burn pit. The presence of VOCs and SVOCs in samples obtained from this portion of the study area is consistent with current site operations.

2.6.4.1 Remedial Objectives

During Fiscal Year 1999, approval of monitored natural attenuation for the groundwater at Site 54 is anticipated. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

At the present time, groundwater samples are being collected on a quarterly basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 54 will be used to support the proposed remedy, natural attenuation coupled with long-term monitoring.

2.6.4.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 54. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.6.4.3 Statement on Protectiveness

Existing groundwater conditions at Site 54 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 54 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

In addition, the existing fire training pit will be replaced with a clean-burning apparatus during Fiscal Year 1999. The existing UST and oil and water separator will also be removed during upgrade of the training systems.

2.6.4.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 54. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 54.

2.6.4.5 Recommendations

There are no additional remedial actions required at Site 54; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 54 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.6.5 Site 86 (Tank Area AS419-AS421)

Site 86 is located on the southwest corner of the Foster and Campbell Street intersection, within the operations area of MCAS New River. The site is comprised of a lawn area surrounded by buildings, asphalt roads, and parking lots. Site 86 served as a storage area for petroleum products from 1954 to 1988. In 1954, three 25,000-gallon ASTs were installed within an earthen berm. The three tanks were reportedly used for No.6 fuel oil storage until 1979. From 1979 to 1988 the tanks were then used for temporary storage of waste oil. The three tanks were emptied in 1988 and were reportedly removed in 1992. Today, the former location of the tanks is grass-covered and only a very slight depression remains.

The RI field investigation at Site 86 commenced in February 1995 and continued through May 1995. Positive detections of VOCs and SVOCs were observed in both surface and subsurface soil samples. The majority of SVOCs detected in soil samples were PAH compounds. Based upon the initial results from the RI, additional wells were installed at Site 86 in 1997 and 1998. The groundwater monitoring wells were installed in locations to better define the limits of the identified plumes and to determine VOC contaminant migration.

2.6.5.1 Remedial Objectives

During Fiscal Year 1999, approval of monitored natural attenuation for the groundwater at Site 86 is anticipated. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

At the present time, groundwater samples are being collected on a quarterly basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 86 will be used to support the proposed remedy, natural attenuation coupled with long-term monitoring.

2.6.5.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 86. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.6.5.3 Statement on Protectiveness

Existing groundwater conditions at Site 86 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 86 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

2.6.5.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 86. Restoration of the groundwater resource is presumably being achieved through

natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 86.

2.6.5.5 Recommendations

There are no additional remedial actions required at Site 86; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 86 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.7 Operable Unit No. 7 (Sites 1, 28, and 30)

Operable Unit No. 7 is comprised of Sites 1, 28, and 30. As depicted in Figure 1-1, the three sites that comprise OU No. 7 are located south of HPIA, on the eastern side of the New River. The Final ROD for OU No. 7 was signed 16 May 1996.

2.7.1 Site 1 (French Creek Liquids Disposal Area)

Site 1 is located approximately one mile east of the New River and is situated along both the north and south sides of Main Service Road near the western edge of the Gun Park Area and Force Troops Complex. Site 1 had been used by several different mechanized, armored, and artillery units since the 1940s. Reportedly, liquid wastes generated from vehicle maintenance were routinely poured onto the ground surface. At times, holes were reportedly dug for waste acid disposal and then immediately backfilled. Thus, the disposal areas at Site 1 are suspected to contain POL and battery acid. The total extent of both the northern and southern disposal areas is estimated to be between seven and eight acres. The quantity of POL waste disposed at the areas is estimated to be between 5,000 and 20,000 gallons; the quantity of battery acid waste is estimated to be between 1,000 and 10,000 gallons. Site 1 continues to serve as a vehicle and equipment maintenance/staging area.

In 1994, an RI was conducted at Site 1. Volatile compounds were not found in surface soil but were detected among a limited number of subsurface soil samples. Positive detections of VOCs in groundwater were limited to the northern portion of the study area. TCE was detected in samples obtained from the shallow aquifer. Vinyl chloride was also detected at concentration exceeded the state and federal drinking water standards.

2.7.1.1 Remedial Objectives

As a result of the RI findings, institutional controls were required for Site 1. As such, a groundwater monitoring program for volatile organic compounds was established. Monitoring at Site 1 began in July 1996 and has continued on a semiannual basis.

2.7.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 1. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.7.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 1 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 1 or threaten human health and the environment. Concentrations of the contaminants at Site 1 have steadily decreased during the past fours. It is anticipated that groundwater monitoring at Site 1 will not required beyond Fiscal Year 2001.

2.7.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 1. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 1.

2.7.1.5 Recommendations

There are no additional remedial actions required at Site 1; therefore, no additional recommendations to significantly modify the remedy are warranted. Several proactive recommendations concerning groundwater monitoring have been implemented during the past four years. Additional recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the remedy are necessary, the changes will be incorporated into the current program.

2.7.2 Site 28 (Hadnot Point Burn Dump)

Site 28 is located along the eastern bank of the New River, south of the HPIA on the Mainside portion of MCB, Camp Lejeune. Site 28 is located adjacent to the Hadnot Point Sewage Treatment Plant, wooded and marshy areas lie to the east and south, and the New River borders Site 28 to the west. Cogdels Creek flows into the New River at Site 28 and forms a natural divide between the eastern and western portions of the site. A majority of the estimated 23 acres that constitute Site 28 are used for recreation and physical training exercises. Site 28 operated from 1946 to 1971 as a burn area for a variety of solid wastes generated on the Base. Reportedly, industrial waste, trash, oil-based paint, and construction debris were burned then covered with soil. In 1971, the burn dump ceased operations, and was graded and seeded with grass. The total volume of fill within the dump is estimated to be between 185,000 and 375,000 cubic yards. This estimate was based upon a surface area of 23 acres and a depth ranging from five to ten feet.

In 1994, an RI was conducted at Site 28. Volatile compounds were found in the surface soil and subsurface soil at very low concentrations. Based upon their wide dispersion, infrequent detection, and low concentration, the occurrence of VOCs in soils are not a significant problem resulting from previous disposal practices.

Semivolatile compounds appeared to be the most directly linked to past disposal practices. Several SVOCs were identified in both surface and subsurface soil samples, primarily from the western disposal area. Inorganics were detected in both surface and subsurface soil samples from the western portion of the study area at concentrations greater than one order of magnitude above Base-specific background levels. Inorganics were the most prevalent and widely distributed contaminants in groundwater at Site 28 and were found distributed throughout the site. Concentrations of inorganics, in samples obtained during both sampling rounds, were generally higher in shallow groundwater samples than in samples collected from the deeper aquifer.

2.7.2.1 Remedial Objectives

As a result of the RI findings, institutional controls were required for Site 28. A groundwater monitoring program for metals was then established. Monitoring at Site 28 began in July 1996 and has continued on a semiannual basis.

2.7.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 28. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.7.2.3 Statement on Protectiveness

Existing groundwater conditions at Site 28 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 28 or threaten human health and the environment. Concentrations of the contaminants at Site 28 have steadily decreased during the past fours. It is anticipated that groundwater monitoring at Site 28 will not be required beyond Fiscal Year 2001. However, surface water monitoring may be continued for several more years.

2.7.2.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 28. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater and surface water monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 28.

2.7.2.5 Recommendations

There are no additional remedial actions required at Site 28; therefore, no additional recommendations to significantly modify the remedy are warranted. Several proactive recommendations concerning groundwater monitoring have been implemented during the past four

years. Additional recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the remedy are necessary, the changes will be incorporated into the current program.

2.7.3 Site 30 (Sneads Ferry Road Fuel Tank Sludge Area)

Site 30 is situated along a tank trail that intersects Sneads Ferry Road from the west, approximately 1 mile south of the intersection with Marines Road, and roughly 4-1/2 miles south of the HPIA. The majority of the Site 30 area is wooded containing trees of less than three inches in diameter and dense understory. Site 30 was reportedly used by a private contractor as a cleaning area for emptied fuel storage tanks from other locations. The tanks were used to store leaded gasoline that contained tetraethyl lead and related compounds. Since fuel residuals remaining in the emptied tanks were reportedly washed out at Site 30, the disposal area is suspected to contain fuel sludge and wastewater from the washout of the tanks.

In 1994, an RI was conducted at Site 30. A very limited number of VOCs were detected among surface and subsurface soil samples. No significant detections of any other potentially hazardous compounds were noted during the RI.

2.7.3.1 Remedial Objectives

Due to the absence of contamination at Site 30, there were no remedial actions required.

2.7.3.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 30. The site visit was also performed to examine existing conditions and to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.7.3.3 Statement on Protectiveness

Conditions at Site 30 remain protective of human health and the environment. The RI/FS completed in 1994 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.7.3.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 30. The ARARs listed in Section 1.0 remain applicable to Site 30.

2.7.3.5 Recommendations

There are no remedial actions or monitoring activities required at Site 30; therefore, no recommendations to modify the remedy are warranted.

2.8 Operable Unit No. 8 (Site 16)

Operable Unit No. 8 is comprised of Site 16 only. As depicted in Figure 1-1, OU No. 8 is located adjacent to the New River and approximately 1.5 miles south of State Route 24. The final ROD for OU No. 8 was signed on 30 September 1996.

2.8.1 Site 16 (Former Montford Point Burn Dump)

Site 16 is located southwest of the intersection of Montford Landing Road and Wilson Drive in the Montford Point area of Camp Lejeune. The study area is approximately four acres in size and is bordered by wooded areas. Northeast Creek is approximately 400 feet southeast of the former burn dump. Limited information is available concerning the operational history of the burn dump. Trash from the surrounding housing area and buildings was reportedly burned and then covered with soil at Site 16. Records indicate that small amounts of waste oils were also disposed of at this site. Currently, the study area is being used for staging vehicles and for vehicle training exercises.

An RI/FS at Site 16 was initiated in June 1994 and was completed in November 1994. A second round of groundwater samples was collected in February 1995. A confirmatory soil investigation was conducted in December 1995. Several pesticide contaminants were detected among soil and sediment samples obtained from the site. The pesticide levels detected at Site 16 were similar to levels detected at other areas throughout MCB, Camp Lejeune. Surface soil contamination also consisted of PCBs. The detections of Aroclor 1254 and 1260 were from sampling locations across the site. PCBs were not found in the groundwater indicating that vertical migration to the water table had not occurred. Semivolatile compounds were infrequently encountered at low levels in the surface soil. Subsurface soil was relatively free of semivolatile contamination. The source of the SVOCs is believed to be due to historical open burning operations. Volatile contaminants benzene and ethylbenzene were detected in one groundwater sample collected during the first round of groundwater sampling. Volatile contaminants were absent in all groundwater samples collected as part of the second round.

2.8.1.1 Remedial Objectives

Although several contaminants were detected among the various environmental samples, the levels were not enough to warrant further action; however, institutional controls were established. Due to the absence of contamination at Site 16, there were no remedial actions required.

2.8.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 16. The site visit was also performed to examine existing conditions and to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, the site is being used to stage yard waste, construction debris, and barbed wire. Although the debris does not pose an imminent threat to human health or the environment, it is unsightly.

2.8.1.3 Statement on Protectiveness

Conditions at Site 16 remain protective of human health and the environment. The RI/FS completed in 1994 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.8.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 16. The ARARs listed in Section 1.0 remain applicable to Site 16.

2.8.1.5 Recommendations

There are no remedial actions or monitoring activities required at Site 16; therefore, no recommendations to modify the remedy are warranted.

2.9 Operable Unit No. 9 (Sites 65 and 73)

Operable Unit No. 9 is comprised of Sites 65 and 73. As depicted in Figure 1-1, the two sites that comprise OU No. 9 are located within the Courthouse Bay operations area, adjacent to the New River. The Final ROD for OU No. 9 will most likely be signed during Fiscal Year 2000.

2.9.1 Site 65 (Engineer Dump Area)

Site 65 is located in the Courthouse Bay operations area and is approximately five acres in size. Two separate disposal areas, a battery acid disposal area and a liquids disposal area, have been reported at Site 65. The types of liquids disposed were reportedly comprised of POL. In addition, the dump was used to burn construction debris. The dump was in operation from 1958 until 1972.

An RI was conducted at Site 65 in 1995. Findings from the RI indicated that there were no releases of hazardous substances within the disposal areas that would result in a risk to human health or the environment.

2.9.1.1 Remedial Objectives

It is anticipated that no additional remedial action or monitoring will be required for Site 65. The ROD for Site 65 is likely to be approved during Fiscal Year 2000.

2.9.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 65. The site visit was also performed to examine existing conditions and to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.9.1.3 Statement on Protectiveness

Conditions at Site 65 remain protective of human health and the environment. The RI/FS completed in 1995 addressed all relevant issues at the site and confirmed that conditions do not warrant further action. Therefore, conditions at Site 65 are protective of human health and the environment.

2.9.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 65. The ARARs listed in Section 1.0 remain applicable to Site 65.

2.9.1.5 Recommendations

There are no remedial actions or monitoring activities required at Site 65; therefore, no recommendations to modify the proposed remedy are warranted. The ROD for Site 65 has not yet been approved, however.

2.9.2 Site 73 (Courthouse Bay Liquids Disposal Area)

Site 73 is located within an active amphibious vehicle maintenance facility located along the northwest shore of Courthouse Bay. Available information indicates that disposal activities occurred within a 13-acre area from 1946 until 1977. An estimated 400,000 gallons of waste oil were disposed of in this area. The waste oil was generated during routine vehicle maintenance. The oil drained directly on the ground surface. In addition, approximately 20,000 gallons of waste battery acid were reportedly disposed in this area. Waste battery acid was poured into shallow hand-shoveled holes that were backfilled after disposal.

An RI was conducted at Site 73 in 1995. Findings from the RI indicated the presence of VOCs among a select number shallow and deep groundwater samples scattered across the study area. A follow-up Phase II RI was conducted in the spring of 1996 to further delineate the extent of groundwater contamination.

A natural attenuation evaluation of Site 73 is planned for the first quarter of Fiscal Year 1999. If natural attenuation of the VOCs in groundwater is shown to be a viable treatment option, it is anticipated that the Final ROD will be submitted for approval during Fiscal Year 2000. In addition to natural attenuation, air sparging will be employed to address an area of concentrated VOCs in the shallow aquifer. The air sparging system will be installed, if approved, in the southwest portion of the study area, adjacent to Courthouse Bay.

2.9.2.1 Remedial Objectives

During Fiscal Year 2000, approval of monitored natural attenuation for the groundwater at Site 73 is anticipated, pending final approval. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

Beginning in July 1999, groundwater samples will be collected on a quarterly basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 73 will be used to support the proposed remedy, natural attenuation coupled with long-term monitoring.

2.9.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 73. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.9.2.3 Statement on Protectiveness

Existing groundwater conditions at Site 73 do not meet state or federal water quality criteria. However, periodic monitoring will be initiated in July 1999 to ensure that contaminants do not migrate from Site 73 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

2.9.2.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 73. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 73.

2.9.2.5 Recommendations

There are no additional remedial actions required at Site 73; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 73 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.10 Operable Unit No. 10 (Site 35)

Operable Unit No. 10 is comprised of Site 35 only. As depicted in Figure 1-1, OU No. 10 is located within the Camp Geiger operations area. The Final ROD for OU No. 10 will most likely be signed during 2000.

2.10.1 Site 35 (Camp Geiger Area Fuel Farm)

Site 35 is located immediately north of the intersection of G and Fourth Streets, approximately 400 feet southwest of Brinson Creek. The Fuel Farm consisted of five 15,000-gallon ASTs and associated underground distribution lines, a pumphouse, a fueling pad, a distribution island, and an oil separator. The ASTs were erected in 1945 as part of the original Camp Geiger construction. The

Fuel Farm was active until it was decommissioned in the spring of 1995 to make way for the construction of a highway. During the active life of the Fuel Farm several releases of fuel occurred. During 1957 through 1958 approximately 1,000-gallons of fuel were released. To control the release, interceptor trenches were dug, and the fuel was ignited. There is also evidence of a fuel release from an abandoned underground distribution line that supplied No. 6 fuel oil to a UST that fueled a boiler at the Mess Hall Heating Plant, located adjacent to "D" Street between Third and Fourth Streets.

During 1993-94 an Interim RI and comprehensive RI were conducted at Site 35. The Interim RI identified elevated levels of petroleum hydrocarbon contamination in soils at three locations adjacent to the former fuel farm. The comprehensive RI began in March 1994 and was completed in July 1995. The comprehensive RI identified multiple plumes of fuel and solvent related groundwater contamination in the surficial aquifer. Surficial groundwater appears to discharge to Brinson Creek which serves as the site boundary to the northeast. To date, no significant levels of contaminants have been detected in surface water samples. The analytical results of sediment samples were masked, however, by the presence of high levels of Tentatively Identified Compounds (TICs), and consequently, few VOC detections were reported.

An Interim FS and ROD were prepared that focused on fuel impacted soils at the site. A soil removal was conducted in 1995 and completed in the spring of 1996. Due to poor site conditions, lack of access, and a lack of benzene, toluene, ethylbenzene, and total xylenes (BTEX) contamination in groundwater east of the proposed highway, it was recommended that an in-situ air sparging system be constructed along the western edge of the proposed right-of-way. It was further recommended that the in-situ air sparging system proposed be tested in a pilot phase prior to full-scale implementation.

2.10.1.1 Remedial Objectives

Monitored natural attenuation coupled with air sparging has preliminarily been identified as the preferred remedial alternative for Site 35. Pending approval of the preferred alternative, it is anticipated that the Final Proposed Remedial Action Plan (PRAP) and Final ROD will be submitted during Fiscal Year 2000. Implementation of the preferred alternative should occur in 2000.

Approval of monitored natural attenuation for the groundwater at Site 35 is anticipated, pending final approval. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants.

Much of Site 35 and the surrounding areas have recently been graded in preparation for the U.S. Highway 17 Jacksonville bypass. A number of monitoring wells were also abandoned during the initial phase of the bypass construction.

2.10.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 35. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed

vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.10.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 35 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 35 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

2.10.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 35. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater and surface water monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 35.

2.10.1.5 Recommendations

There are no additional remedial actions required at Site 35; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 35 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.11 Operable Unit No. 11 (Sites 7 and 80)

Operable Unit No. 11 is comprised of Sites 7 and 80. As depicted in Figure 1-1, OU No. 11 is located in the northeast portion of Camp Lejeune, adjacent to the Northeast Creek south of State Route 24. The final ROD for OU No. 11 was signed on 21 August 1997.

2.11.1 Site 7 (Tarawa Terrace Dump)

Site 7 is approximately 5 acres in size and is situated just south of the Tarawa Terrace community center between Tarawa Boulevard and Northeast Creek. Site 7 is a former dump that was used during the construction of the base housing located in Tarawa Terrace. Precise years of operation are unknown, but it has been reported that the dump was closed in 1972. Historical records do not indicate that hazardous materials were disposed of at this facility; only construction debris, water treatment plant filter media, and household trash are known to have been disposed.

The RI field program at Site 7 was conducted in 1994 and consisted of a site survey; a soil investigation which included drilling and sampling; a groundwater investigation that included monitoring well installation and sampling; a surface water and sediment investigation; a habitat evaluation; and an earthworm bioaccumulation study. The pesticides dieldrin, 4,4'-DDE, 4,4'-DDT, and 4,4'-DDD were the most prevalent pesticide contaminants among the soil and sediment samples. Semivolatile contamination was detected in the north and eastern portions of the study

area. Metals were the most prevalent and widely distributed contaminants in the groundwater. However, none of the contaminants detected were considered to pose a threat to human health or the environment.

2.11.1.1 Remedial Objectives

Due to the absence of contamination at Site 7, there were no remedial actions required.

2.11.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 7. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.11.1.3 Statement on Protectiveness

Conditions at Site 7 remain protective of human health and the environment. The RI/FS completed in 1994 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.11.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 7. The ARARs listed in Section 1.0 remain applicable to Site 7.

2.11.1.5 Recommendations

There are no remedial actions or monitoring activities required at Site 7; therefore, no recommendations to modify the remedy are warranted.

2.11.2 Site 80 (Paradise Point Golf Course Maintenance Area)

Site 80 is located northwest of Brewster Boulevard within the Paradise Point Golf Course, behind Building 1916. Information regarding past golf maintenance procedures is unknown; however, the facility is currently in operation.

The initial phase of the RI field investigation commenced in October 1994 and continued through December 1994. A subsequent soil and groundwater investigation at Site 80 commenced in June, 1995 and continued through July 1995. Based upon the results of the investigations, pesticides were the predominant contaminants at Site 80. Six of the eleven pesticides detected in soils at Site 80 were in 20 of the 55 samples analyzed. Based on the risk assessment presented in the RI report, a TCRA was performed to remove soil contaminated with pesticides. The TCRA was completed during 1996. Remedial action levels were based upon Region III Risk-Based Concentrations for industrial workers. This resulted in a ten-fold increase in the action levels for dieldrin and aldrin, the drivers of the remedial effort. Approximately 988 tons of contaminated soil were excavated from Site 80.

2.11.2.1 Remedial Objectives

After completion of the TCRA, a No Action Alternative was presented in the ROD and approved. No additional remedial action or monitoring is planned for Site 80. Due to the absence of additional contamination at Site 80, there were no remedial actions required.

2.11.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 80. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.11.2.3 Statement on Protectiveness

Conditions at Site 80 remain protective of human health and the environment. The RI/FS completed in 1994 addressed all relevant issues at the site and confirmed that conditions do not warrant further action.

2.11.2.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 80. The ARARs listed in Section 1.0 remain applicable to Site 80.

2.11.2.5 Recommendations

There are no remedial actions or monitoring activities required at Site 80; therefore, no recommendations to modify the remedy are warranted.

2.12 Operable Unit No. 12 (Site 3)

Operable Unit No. 12 is comprised of Site 3 only. As depicted in Figure 1-1, OU No. 12 is located approximately 1.2 miles south of State Route 24 and 2.5 miles east of the New River. The Final ROD for OU No. 12 was signed 3 April 1997.

2.12.1 Site 3 (Old Creosote Plant)

Site 3 is located on the mainside portion of MCB, Camp Lejeune, approximately one mile north of Wallace Creek along Holcomb Boulevard. Site 3 encompasses approximately 5 acres, is generally flat, and is intersected by a dirt access road. Remnants of a former creosote plant including the chimney, concrete pads, and train rails are present in the southern portion of Site 3. The creosote plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Camp Lejeune Railroad. The cleared area in the northern portion of the Site 3 was reported to be the location of the former sawmill, which supplied the cut timbers for creosote treatment. The treated lumber was used during construction of the Camp Lejeune Railroad.

The RI field investigation commenced in September 1994 and continued through December 1994. A follow-up phase of the RI field investigation was completed in June and July of 1995. Due to volatile and PAH contamination detected within the groundwater during the first round of sampling, additional monitoring wells were installed to further define the vertical and horizontal

extent of contamination. Naphthalene was the only PAH constituent detected above applicable standards in the groundwater. PAH constituents were also detected among soil samples obtained from the site. The highest concentrations of PAHs occurred in the central portion of the site, the former treatment area. Fuel constituents, such as ethylbenzene and xylene, were also detected in surface and subsurface soils at Site 3, primarily at the former treatment area in the central portion of the site.

2.12.1.1 Remedial Objectives

Based on the findings of the RI/FS, the recommended alternative presented in the ROD includes excavation of contaminated soil, on-site treatment of the soil, and groundwater monitoring. An Amended ROD dated July 1999 containing remediation goals for both soil and groundwater has been submitted for approval during the first quarter of Fiscal Year 1999 (See Tables 5C and 6C, Attachment C). The amended remedial action proposed that the excavated soil be taken off-site for disposal at a permitted facility in lieu of on-site treatment. Semiannual monitoring of groundwater conditions at Site 3 will continue through Fiscal Year 2000.

2.12.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 3. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.12.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 3 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 3 or threaten human health and the environment.

2.12.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 3. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 3.

2.12.1.5 Recommendations

Aside, from the planned removal action and continued groundwater monitoring program, there are no recommended actions for Site 3. The Amended ROD for Site 3 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.13 Operable Unit No. 13 (Site 63)

Operable Unit No. 13 is comprised of Site 63 only. As depicted in Figure 1-1, OU No. 13 is located in the Verona Loop operation area, approximately 1.3 miles east of Highway 17. The final ROD for OU No. 13 was signed on 3 April 1997.

2.13.1 Site 63 (Verona Loop Dump)

Site 63 is comprised of approximately five acres and is located nearly two miles south of the MCAS, New River operations area. Site 63 is bordered to the south by Verona Loop Road, to the east by an unnamed tributary to Mill Run, and to the west by a gravel access road. Much of the site is heavily vegetated with dense understory and trees greater than three inches in diameter. Very little information is known regarding the history or occurrence of waste disposal practices at Site 63. The study area reportedly received wastes generated during training exercises. The type of materials generated during these exercises are described only as bivouac wastes. Additional information suggests that no hazardous wastes were disposed of at Site 63. The years during which disposal operations may have taken place are not known. Training exercises, maneuvers, and recreational hunting are frequently conducted in the area.

The RI field investigation of OU No. 13 was completed during November 1995. The RI field program at Site 63 consisted of a site survey; a soil investigation; a groundwater investigation; a surface water and sediment investigation; and a habitat evaluation. Positive detections of SVOCs, pesticides, and metals were observed in environmental samples obtained at Site 63. Pesticide concentrations in soil were low (i.e., less than 0.1 mg/kg) and primarily limited to within and adjacent to the suspected disposal portion of the study area. The presence of SVOCs and pesticides is most likely the result of former or ongoing activities at Site 63.

2.13.1.1 Remedial Objectives

Based upon the findings presented in the RI, there are no threats to human health and the environment from the contamination at Site 63. No additional remedial action or monitoring is required for Site 63.

2.13.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 63. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, three monitoring wells remain at the site and need to be abandoned.

2.13.1.3 Statement on Protectiveness

Conditions at Site 63 remain protective of human health and the environment. The RI/FS completed in 1995 addressed all relevant issues at Site 63 and confirmed that conditions do not warrant further action.

2.13.1.4 Areas of Noncompliance

There were no areas of noncompliance noted during the review of Site 63. The ARARs listed in Section 1.0 remain applicable to Site 63.

2.13.1.5 Recommendations

There are no remedial actions or monitoring activities required at Site 63; therefore, no recommendations to modify the remedy are warranted. However, it is recommended that the three monitoring wells that remain at Site 63 be abandoned.

2.14 Operable Unit No. 14 (Site 69)

Operable Unit No. 14 is comprised of Site 69 only. As depicted in Figure 1-1, OU No. 14 is located in the Rifle Range operations area. The Final ROD for OU No. 14 will most likely be signed during 1999.

2.14.1 Site 69 (Rifle Range Chemical Dump)

Site 69 is located approximately one-quarter mile west of the New River in the Rifle Range area of MCB, Camp Lejeune. The site includes approximately 14 acres and is situated in a topographically high area. The former disposal area slopes downward in all directions from the central portion of the study area. During the period between 1950 to 1976, the area was used to dispose chemical wastes including PCBs, solvents, pesticides, calcium hypochlorite, and drums of "gas" which possibly contain CN (i.e., tear gas) or other agents such as mustard gas. Based on background information, chemical agents may be buried at this site.

The RI/FS at Site 69 commenced in 1992 and, after a number of supplemental investigations, concluded in 1995. Results from the RI indicate that groundwater is contaminated with solvent constituents. The groundwater contamination is believed to be centered in the south-central portion of the site and has not migrated extensively from the disposal area. Surface soil has not been impacted by the former disposal activities; however, it is believed that the top two feet of soil may be cover material that was placed over the debris. No intrusive investigations were conducted due to the potential for encountering chemical agents. Geophysical investigations have indicated buried metallic objects near the groundwater source area. It is likely that the buried material consists of drums or canisters which contain solvents. Surface water and sediment collected from the New River, Everett Creek, and an unnamed tributary north of the site have not been impacted by the former disposal operations.

2.14.1.1 Remedial Objectives

A treatability study was initiated in March 1996 to assess the effectiveness of an innovative groundwater treatment technology, in-well aeration. After two years of operation and testing, in-well aeration was determined to be ineffective at reducing the number and concentration of contaminants in the groundwater aquifer. Approval of monitored natural attenuation as the most feasible treatment alternative for the groundwater aquifer is anticipated. Natural attenuation is a process that acts without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in affected soil or groundwater media. The in-situ processes include biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization or destruction of contaminants. Given the nature of reported CWM disposed at Site 69, natural attenuation appears to be the only viable alternative.

At the present time, groundwater samples are being collected on a semiannual basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 69 will be used to support the proposed remedy, natural attenuation coupled with long-term monitoring.

2.14.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 69. The site visit was also performed to ensure that site conditions do not pose a threat to public health or the environment. The site visit included examining the former study area for any signs of potential environmental impact such as stressed vegetation, staining, or dumping of debris. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection. However, fallen trees have damaged a seven-foot cyclone fence installed to limit access to Site 69.

2.14.1.3 Statement on Protectiveness

Existing groundwater conditions at Site 69 do not meet state or federal water quality criteria. However, periodic monitoring is being conducted to ensure that contaminants do not migrate from Site 69 or threaten human health and the environment. The monitoring data being collected will be used to support the proposed remedy, natural attenuation coupled with long-term groundwater monitoring.

2.14.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 69. Restoration of the groundwater resource is presumably being achieved through natural processes. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 69.

2.14.1.5 Recommendations

There are no additional remedial actions required at Site 69; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 69 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program. It is recommended that fencing surrounding Site 69 be repaired to limit site access.

2.15 Operable Unit No. 15 (Site 88)

Operable Unit No. 15 is comprised of Site 88 only. As depicted in Figure 1-1, OU No. 15 is located in the Hadnot Point operations area, approximately 0.7 miles east of the New River. The Final ROD for OU No. 15 may be signed sometime in the year 2000.

2.15.1 Site 88 (Base Dry Cleaners)

Site 88 is located at the Base dry cleaners (Building 25) within the Hadnot Point operations area of MCB, Camp Lejeune. Barracks, office buildings, and other occupied structures are located adjacent to Building 25.

The USTs at Site 88 were installed in the 1940s and were used for the storage of varsol and tetrachloroethene. The tanks were removed in July 1996. A Focused RI was completed which identified the limits of soil and groundwater contamination at the site. In general, contaminated soil appears to be concentrated beneath the building and the parking lot to the northwest near Building 43. Groundwater contamination extends to a depth 50 feet below ground surface and extends approximately 700 feet to the northwest. Isolated areas of free phase dense non-aqueous phase liquid (DNAPL) exist beneath Building 25 and areas immediately north of the building. To address the DNAPL situation at Site 88, a partial free phase liquid recovery has been completed in addition to a pre-surfactant remediation characterization and delineation study. These studies have established the nature and extent of residual phase of DNAPL. During Fiscal Year 1999 surfactant enhanced aquifer remediation (SEAR) will begin to remove the residual phase DNAPL and some free phase DNAPL.

Investigative work at Site 88 has included the completion of a Focused RI in 1998. This body of work identified VOCs in soil and groundwater. The Focused RI identified the nature and extent of contamination and provided the basis for the work currently underway at the site.

2.15.1.1 Remedial Objectives

At the present time, activities at Site 88 include semiannual groundwater monitoring and a technology demonstration project. The technology demonstration project is a joint effort between LANTDIV and the Naval Facilities Engineering Service Center (NFESC). The applied technology is termed SEAR. The technology removes residual phase DNAPL by mobilizing contaminants from soil particles and enhancing recovery. Prior to initiating the SEAR, a pre-surfactant remediation characterization and delineation study was completed. This portion of work established the nature and extent of residual phase DNAPL at Site 88.

Due to on-going operations involving the SEAR demonstration, and the extent to which the VOCs will be removed, applicable remedial alternatives or specific corrective actions have not yet been completed. The preparation of a ROD will also await the outcome of the SEAR, which is anticipated to end in September 1999. The SEAR demonstration will be followed by the preparation of an FS, which will evaluate the conditions after the technology demonstration. At that time, conditions will be evaluated and recommendations may be made for further remedial alternatives should they be deemed necessary.

2.15.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 88. Site 88 does not contain any materials that would lead to further degradation of existing conditions. Materials at the site include items related to on-going remedial actions. During the 1999 SEAR demonstration, material including alcohol and surfactant will be temporarily staged at Site 88. In accordance with the SEAR Health and Safety Plan, all materials will be stored in a safe, secure, and appropriate manner.

2.15.1.3 Statement on Protectiveness

Although a specific remedial alternative has not been prepared for Site 88, the SEAR demonstration project is anticipated to reduce contaminant concentrations within the aquifer. Upon completion of the SEAR project, further evaluation will be completed, including the preparation of an FS to

evaluate future remedial alternatives. Completion of the SEAR demonstration and further evaluation during the FS will ensure that the project continues on a path leading to site conditions that are protective of human health and the environment.

2.15.1.4 Areas of Noncompliance

Aside from groundwater, there were no other areas of noncompliance noted during this five-year review of Site 88. Restoration of the groundwater resource is presumably being achieved through natural processes coupled with source removal. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 88. The pending FS will establish applicable remedial alternatives to address the remaining contamination.

2.15.1.5 Recommendations

There are no additional remedial actions required at Site 88; therefore, no additional recommendations to significantly modify the proposed remedy are warranted. The ROD for Site 88 has not yet been approved, however. Recommendations may be required, based upon information presented in future monitoring reports. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.16 Operable Unit No. 16 (Sites 89 and 93)

Operable Unit No. 16 is comprised of Sites 89 and 93. As depicted in Figure 1-1, the two sites that comprise OU No. 16 are located in the Camp Geiger operations area, adjacent to one another. Sites 89 and 93 were initially investigated under the UST Program. However, due to the presence of chlorinated solvents detected during the UST investigations, the sites were further characterized by a remedial investigation under the IR Program. The investigation determined that groundwater was impacted at both sites. The majority of the groundwater contamination is present at Site 89 in the area of the Defense Reutilization and Marketing Office (DRMO). The Final ROD for OU No. 16 will most likely be signed during 2000.

2.16.1 Site 89 (STC 868)

The site is located near the intersection of G and 8th Streets in the Camp Geiger area of MCB, Camp Lejeune. A UST containing waste oil was installed in 1983 and removed in 1993. UST investigations detected elevated levels of total petroleum hydrocarbon (TPH), oil and grease, and chlorinated solvents in soil and groundwater samples. The remedial investigation was conducted in two phases in 1996 and in 1997. Activities under this investigation included the installation of temporary and permanent monitoring wells along with associated soil and groundwater sampling. In addition, surface water and sediment samples were collected from Edwards Creek, which borders the southern portion of the site.

The remedial investigation at Site 89 identified impact by chlorinated solvents to the soil and groundwater at the site. The contaminant plume extends to approximately 50 feet below ground surface and extends approximately 1,200 feet east of the DRMO. Groundwater at the site moves

south and provides base flow to Edwards Creek, therefore, chlorinated solvents have impacted this stream. The hydrogeologic investigation completed during the RI confirmed that groundwater contributes base flow to Edwards Creek; therefore, detected chlorinated solvents in Edwards Creek are a result of the migration of contaminants downgradient from the DRMO. At the present time, an Interim FS is underway to evaluate remedial alternatives for Site 89 and Edwards Creek. An Interim ROD is scheduled for completion following the FS.

2.16.1.1 Remedial Objectives

An Interim FS has been initiated to address various remedial alternatives. To date, some of the proposed alternatives to be evaluated include in-situ technologies to reduce contamination at the source area. Practical application of technologies to address sediment contamination in Edwards Creek are limited; however, appropriate technologies will be evaluated. After the source area of contamination and the impact to Edwards Creek is addressed, consideration will be given to the dissolved phase groundwater contamination at Site 89.

At the present time, groundwater samples are being collected on a semiannual basis to establish a baseline of chemical parameters and site conditions. Analytical data obtained during the monitoring program at Site 89 will be used to support the proposed remedy.

2.16.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 89. The majority of the groundwater contamination at Site 89 is located within the boundary of the DRMO. This area is in daily operation and may present logistical difficulties during remedial efforts. In addition, thick vegetation in the area of Edwards Creek limits access and will have to be addressed during any remedial actions in this portion of the site. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.16.1.3 Statement on Protectiveness

The Interim FS is intended to minimize impact to human health and environment by addressing the source area and impact to Edwards Creek. In addition, Site 89 has been included as part the groundwater monitoring program. Groundwater samples will be collected semi-annually and analyzed for VOCs and natural attenuation parameters. The monitoring data being collected will be used to support the proposed remedy

2.16.1.4 Areas of Noncompliance

Existing groundwater conditions at Site 89 do not meet state or federal water quality criteria. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 89.

2.16.1.5 Recommendations

Site 89 requires immediate action. This is being accomplished through the completion of the Interim FS. An Interim ROD is scheduled for completion following the FS. At the present time, there are no known conditions at Site 89 that require additional actions than what has already been implemented. If any alterations to the proposed remedy are necessary, the changes will be incorporated into the current program.

2.16.2 Site 93 (TC 942)

Site 93 is located at located northwest of E and 10th Streets at Camp Geiger. The site consisted of one UST that was used to store oil. The UST was removed and subsequent investigations detected both chlorinated solvents, and oil and grease compounds at the site. The remedial investigation completed for both Sites 89 and 93 identified shallow groundwater contamination in the area near the former UST. The contaminant concentrations, the depth and horizontal extent of contamination are all much less at Site 93 than at Site 89. An Interim FS is being implemented at the present time that will address all concerns at Site 93. Groundwater conditions will be monitored semiannually for VOCs and natural attenuation parameters.

2.16.2.1 Remedial Objectives

An Interim FS has been initiated to address various remedial alternatives. To date, some of the proposed alternatives to be evaluated include in-situ technologies to reduce contamination at the source area. Practical application of technologies to address sediment contamination in Edwards Creek are limited; however, appropriate technologies will be evaluated. After the source area of contamination and the impact to Edwards Creek is addressed, consideration will be given to the dissolved phase groundwater contamination at Site 93.

2.16.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 93. No readily apparent signs or conditions that might pose a threat to public health and the environment were noted during the inspection.

2.16.2.3 Statement on Protectiveness

Although a final remedial alternative has not been prepared for Site 93, the Draft FS identifies various alternatives to address the groundwater contamination. Protection of public health and the environment will be insured through monitoring the VOC contamination and natural attenuation parameters. If any significant changes in groundwater contamination or flow patterns occur, they will be identified and addressed through the monitoring program, which is currently in place.

2.16.2.4 Areas of Noncompliance

Groundwater contaminant levels at Site 93 slightly exceed both state and federal requirements. The ARARs listed in Section 1.0 remain applicable and provide the basis for continued groundwater monitoring. In addition, no areas of concern or relevant site issues considered immediately harmful to public health and the environment were noted during the visual inspection of Site 93.

2.16.2.5 Recommendations

There are no known conditions at Site 93 that require immediate remedial actions beyond ongoing FS development and future groundwater sampling for VOCs and natural attenuation parameters. The ROD for Site 93 has not yet been approved. At the present time, there are no known conditions at Site 93 that require additional actions than what has already been implemented.

2.17 Operable Unit No. 17 (Sites 90, 91, and 92)

Operable Unit No. 17 is comprised of Sites 90, 91, and 92. As depicted in Figure 1-1, the three sites that comprise OU No. 17 are located within the Courthouse Bay operations area, adjacent to the New River. Sites 90, 91, and 92 are all former UST Program sites that have been placed on the IR Program list due to the detection of contaminants not typically related to petroleum UST sites. Each of the sites were investigated under the IR Program by a Focused RI completed in April 1997. As a result of the findings of the Focused RI, each of the sites are anticipated to receive a No Action PRAP. The Final ROD for OU No. 17 may be signed sometime in the year 2000.

2.17.1 Site 90 (BB 9)

Site 90 contained three 1,000 gallon USTs that contained heating oil for a nearby steam plant. The tanks were permanently closed by removal in March 1993. The former UST basin is located along Peach Street between Clinton and Middle Streets. Following the UST closure, subsequent investigations confirmed the presence of soil and groundwater contamination. The New River is located approximately 800 feet southwest of the site.

The Focused RI field activities conducted in 1997 detected toluene in the soil samples. Observations made during the field investigation did not identify any existing site practices that would be a source of toluene contamination. The contamination detected in the soil may be a result of runoff from a nearby parking lot. Groundwater samples were collected from existing and newly installed temporary monitoring wells. The laboratory analysis of these samples detected chloroform and tetrachloroethene (PCE); however, chloroform is not considered to be a site related compound. PCE was detected in the groundwater at concentrations which exceeded both the Federal MCL and the NC WQS. The detections of PCE may be site related as Building BB16 was at one time an active dry cleaning facility. The human health risk assessment determined that it was unlikely that exposure to groundwater would result in adverse human health effects. In addition, the shallow groundwater is not used as a drinking water source.

2.17.1.1 Remedial Objectives

The Focused RI completed at Site 90 identified minimal soil and groundwater contamination. There are no remedial objectives required to address site concerns. The remedial objective includes preparation of a No Action ROD.

2.17.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 90. There were no items identified that would lead to further degradation of existing conditions.

2.17.1.3 Statement on Protectiveness

The Focused RI completed at the site demonstrates that there is no significant impact to the environment, and conditions at the site are protective of human health and the environment.

2.17.1.4 Areas of Noncompliance

Although investigations at the site have identified soil and groundwater contamination, the impact to the environment is minimal. There are no areas of noncompliance at Site 90 that require further investigations or remedial actions.

2.17.1.5 Recommendations

There are no known conditions at Site 90 that require any remedial actions. Therefore, a No Action ROD has been recommended.

2.17.2 Site 91 (BB 51)

Site 91 included two 300-gallon USTs that were used to store waste oil. The tanks were permanently closed by removal in August 1992. The former UST basin is approximately 3,000 feet southwest of the New River. At the time of the UST closure, TPH contamination was detected in the soil samples. The groundwater samples collected during the Focused RI detected PCE; however, the concentrations were below state and federal standards.

2.17.2.1 Remedial Objectives

There are no remedial objectives required to address site contamination. The site does not require any further action other than preparation of a No Action ROD.

2.17.2.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 91. There were no items identified during the inspection that would lead to further degradation of existing conditions.

2.17.2.3 Statement on Protectiveness

The Focused RI completed at the site demonstrates that there is no significant impact to the environment, and the existing conditions at the site are protective of human health and the environment.

2.17.2.4 Areas of Noncompliance

There are no areas of noncompliance noted at Site 91.

2.17.2.5 Recommendations

There are no known conditions at Site 91 that require remedial actions. A No Action ROD is planned for submittal in 2000.

2.17.3 Site 92 (BB 46)

Site 92 included one 1,000 gallon UST that was installed in 1990 and used to store gasoline. The tank was located at the end of Front Street, immediately northwest of Building BB-246. The tank was part of the Marina facility at Courthouse Bay. The Marina was located several feet from the shoreline of Courthouse Bay. The UST was deactivated in 1989, and removed in January 1994. A subsequent site investigation identified the presence of chlorinated hydrocarbons in the groundwater. Soil and groundwater samples were collected from existing and newly installed temporary monitoring wells as part of the Focused RI. There were no volatile organic compounds detected in the soil samples. Only chloroform was detected in the groundwater samples. This compound is not considered to be site related.

2.17.3.1 Remedial Objectives

The Focused RI completed at the site did not identify any VOCs related to previous site operations; therefore, no remedial actions are required and no further investigations at planned at the site. A No Action ROD is scheduled to be completed for Site 92.

2.17.3.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 92. There were no items identified that would lead to further degradation of existing conditions.

2.17.3.3 Statement on Protectiveness

Conditions at Site 92 demonstrate there is no significant impact to the environment, and conditions at the site are protective of human health and the environment.

2.17.3.4 Areas of Noncompliance

The Focused RI confirmed that there are no areas of noncompliance noted at Site 92.

2.17.3.5 Recommendations

A No Action ROD is recommended for Site 92.

2.18 Operable Unit No. 18 (Site 94)

Operable Unit No. 18 is comprised of Site 94 only. As depicted in Figure 1-1, OU No. 18 is located in the main portion of MCB, Camp Lejeune, along Holcomb Boulevard at the Hadnot Point operations area. There have been no IR Program investigations at Site 94. However, investigations have been completed at this site under the UST Program. Project Plans and a remedial investigation are scheduled for Operable Unit No. 18 during 1999. Additional work will depend upon the results of the remedial investigation.

2.18.1 Site 94 (PCX Service Station)

Site 94 is located within the HPIA. Four gasoline USTs were reportedly installed during the 1950s northeast of Building 1613. The tanks supplied various grades of gasoline to the service station. All of the USTs were removed on January 13, 1995. Hydrocarbon contamination of the subsurface soil was confirmed at the site during the UST removal. Further investigations at the site have identified free phase hydrocarbons and chlorinated solvent related contaminants.

Dissolved purgeable aromatic constituents were identified and delineated in the area of the former UST basin and the free product plume areas. Dissolved purgeable halocarbon compounds were identified at concentrations exceeding NC WQSs in three isolated areas, suggesting multiple sources. In addition, the vertical extent of purgeable halocarbons is at least 50 feet below ground surface.

2.18.1.1 Remedial Objectives

To date, there are no remedial objectives identified at Site 94 because the site has not been fully characterized. Further investigative activities are planned that will identify appropriate remedial objectives. Groundwater contamination associated with the former UST investigation is being addressed through active remediation at Site 94.

2.18.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 94. There were no items identified that would lead to further degradation of existing conditions.

2.18.1.3 Statement on Protectiveness

A remedial investigation will be completed to identify any negative impacts to the environment or human exposure.

2.18.1.4 Areas of Noncompliance

The areas of noncompliance noted at Site 94 are related to the exceedance of state and federal groundwater quality standards.

2.18.1.5 Recommendations

Site 94 will require the completion of a remedial investigation. Once the RI study is completed and the site is characterized, further recommendations may be made.

2.19 Pre-Remedial Investigation Sites

This section discusses sites that have been assessed through Pre-RIs. It is important to note that these Pre-RI sites are not required to adhere to the same reporting requirements as defined in the Camp Lejeune FFA for RI/FS sites. If these sites warrant further investigation based on the Pre-RI results, the sites will be added to the FFA list of RI/FS sites.

2.19.1 Site 10 (Original Base Dump)

Site 10 covers approximately 5 to 10 acres. It was operated prior to 1950 and was primarily used for disposal of construction debris and as a burn dump. It is located to the west of Open Storage Lot 203 along Holcomb Boulevard. This site was recently added to the IR Program when it was reported that two Marines obtained skin rashes by contacting a heavy oily material that may have been at the site. Project plan development for this site was completed in September 1997. This site was investigated through the completion of a Site Investigation (SI) in 1998. Results of the SI indicated minimal impact to soil, sediment, surface water and groundwater at the site. Therefore, a No Further Remedial Action Plan (NFRAP) Decision Document will be prepared in 1999.

2.19.1.1 Remedial Objectives

There are no remedial objectives identified for Site 10. The site has been fully characterized during the 1998 Site Investigation. A NFRAP Decision Document will be prepared in 1999 and will include institutional controls to prohibit intrusive activities.

2.19.1.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 10. There were no items identified that would lead to further degradation of existing conditions.

2.19.1.3 Statement of Protectiveness

The Site Investigation has confirmed that there are no negative impacts to the environment or any contaminants that cause significant adverse human health effects.

2.19.1. 4 Areas of Noncompliance

There are no areas of noncompliance noted at Site 10.

2.19.1.5 Recommendations

A NFRAP Decision Document is recommended for Site 10 that includes institutional controls to prohibit intrusive activities. This document is scheduled for completion in 1999.

2.19.2 Site 12 (Explosive Ordnance Disposal)

Site 12 covers approximately 8 to 10 acres. During the early 1960s, ordnance was disposed by burning or exploding when it was found to be inert, unserviceable, or defective. Materials disposed of included ordnance, colored smokes, and white phosphorous. Any undestroyed residues were typically less than one pound. Baker conducted soil and groundwater sampling activities in January and February of 1996. Results of the study indicated that neither soil nor groundwater was significantly impacted by site activities. Accordingly, a NFRAP Decision Document has been completed for this site.

2.19.2.1 Objectives

There are no remedial objectives identified for Site 12. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document will be issued as final in 1999.

2.19.2.2 Summary of Site Visit

There were no items noticed at Site 12 that would suggest that any further environmental degradation is occurring.

2.19.2.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that there are no negative impacts to the environment or any significant negative human health effects.

2.19.2.4 Areas of Noncompliance

There are no areas of noncompliance at Site 12.

2.19.2.5 Recommendations

A draft NFRAP Decision Document has been prepared for Site 12. The document is currently undergoing review by all of the agencies involved. Once all comments on the draft document have been received, they will be incorporated into the final. The final document is scheduled for completion in 1999.

2.19.3 Site 68 (Rifle Range Dump)

The Rifle Range Dump is located west of Range Road approximately 2,000 feet west of the Rifle Range water treatment plant and 800 feet east of Stone Creek. This three to four acre area was used as a disposal site for various types of wastes, including garbage, building debris, waste treatment sludge, and solvents. The site was utilized as a disposal facility from 1942 to 1972. The depth of the fill area is approximately 10 feet, and the amount of material deposited has been estimated to be 100,000 cubic yards.

Organic compounds were identified in potable supply wells RR-45 and RR-97 located near the site. Although these wells are located upgradient from the site, it was suspected that continuous pumping may have drawn contaminants to the wells. Baker conducted soil, groundwater, surface water, and sediment sampling activities in January and February of 1996 with additional groundwater samples collected in March 1998.

Results indicated that none of the media sampled have been significantly impacted by site activities.

Accordingly, a draft NFRAP Decision Document has been prepared for this site.

2.19.3.1 Objectives

There are no remedial objectives identified for Site 68. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document is scheduled to be issued as final in 1999.

2.19.3.2 Summary of Site Visit

Site 68 remains wooded with jogging trails throughout the area. It is used as an area of physical training. There are no hazardous materials used or stored at Site 68. There were no items identified that would lead to further degradation of existing conditions.

2.19.3.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that there are no negative impacts to the environment or any significant negative human health effects.

2.19.3.4 Areas of Noncompliance

There are no areas of noncompliance at Site 68.

2.19.3.5 Recommendations

A draft NFRAP Decision Document has been prepared for Site 68. The document is currently under the review process. Once all comments on the draft document have been received, they will be incorporated into the final. The final document is scheduled for completion in 1999.

2.19.4 Site 75 (MCAS Basketball Court Site)

The MCAS Basketball Court Site is located along the north side of Curtis Road. This site was reportedly a drum burial area that was used on at least one occasion in the early 1950s. The excavation as seen in an aerial photograph was an oval shaped pit approximately 90 feet long by 70 feet wide and was sufficiently deep to have encountered the water table. It has been estimated that seventy-five to one-hundred 55-gallon drums were placed in this pit. The drums reportedly contained a chloroacetophenone tear gas solution used for training. Additional organic chemicals, such as chloroform, carbon tetrachloride, benzene, and chloropicrin, may have been present in the solution. Degradation of the drums could have resulted in the release of the suspected materials into the groundwater. This was of particular concern due to the proximity of several water supply wells in the area, two of them being within 500 feet of the alleged disposal site. Baker completed a comprehensive geophysical survey to locate the alleged disposal pit. The geophysical survey did not identify any major subsurface anomalies that could be related to a drum burial site. In addition, soil and groundwater sampling activities were completed in January and February of 1996. The study did not detect any contaminants that indicated either soil or groundwater had been significantly impacted. Accordingly, a NFRAP Decision Document is being considered for this site.

2.19.4.1 Objectives

There are no remedial objectives identified for Site 75. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document is scheduled to be issued as final in 1999.

2.19.4.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 75. The area surrounding Site 75 is still maintained as a housing area. A portion of the site is used by subcontractors to position trailers and storage containers. The site did not contain any materials that would lead to degradation of existing conditions.

2.19.4.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that there are no negative impacts to the environment or any significant negative human health effects at the site.

2.19.4.4 Areas of Noncompliance

There are no areas of noncompliance at Site 75.

2.19.4.5 Recommendations

A draft NFRAP Decision Document has been prepared for Site 75. The document is currently under the review process. Once all comments on the draft document have been received, they will be incorporated into the final. The final document is scheduled for completion in 1999.

2.19.5 Site 76 (MCAS Curtis Road Site)

The MCAS Curtis Road Site is located along the north side of Curtis Road. The precise location of the site is unknown; although two possible locations were identified based on interviews and aerial photography. This alleged dump site was reportedly used as a drum disposal area on two occasions in 1949. The estimated area of the disposal pit is ¼-acre and approximately twenty-five to seventy-five 55-gallon drums were allegedly involved. It is believed that the drums contained a chloroacetophenone tear gas agent similar to that allegedly buried at the MCAS Basketball Court Site (Site 75). Potential contaminants are chloroform, carbon tetrachloride, benzene, and chloropicrin. Baker conducted soil and groundwater sampling activities in January and February of 1996. Additional groundwater data was collected in March of 1998. In addition to the soil and groundwater investigation, a comprehensive geophysical survey was also performed. The geophysical survey did not indicate any major subsurface anomalies that could have been the suspected drums. Further, there were no contaminants identified in soil or groundwater that indicated significant negative impact to human health or the environment. Accordingly, a NFRAP Decision Document is being prepared for this site and will be completed in 1999.

2.19.5.1 Objectives

There are no remedial objectives identified for Site 76. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document is scheduled to be issued as final in 1999.

2.19.5.2 Summary of Site Visit

Site 76 is located within a housing area of MCAS New River. Site conditions have remained relatively unchanged. There are no operations or storage of hazardous materials that would degrade environmental conditions.

2.19.5.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that there are no negative impacts to the environment or any significant negative human health effects at Site 76.

2.19.5.4 Areas of Noncompliance

There are no areas of noncompliance noted at Site 76.

2.19.5.5 Recommendations

There are no further actions recommended at Site 76. Accordingly, a draft NFRAP Decision Document has been prepared for the site. The draft NFRAP Decision Document is currently being reviewed by each of the parties included as part of the review process. Once all comments on the draft document have been received, they will be incorporated into the final. The final document is scheduled for completion in 1999.

2.19.6 Site 84 (Building 45 Area)

Site 84 is located approximately 200 yards south of Highway 24 on the main side of MCB, Camp Lejeune, one mile west of the main gate entrance. The study area is bordered by Building 45, an electrical substation, to the east and Northeast Creek to the west. The area is wooded and vegetated with a small lagoon within the study area. The lagoon is roughly circular in shape and measures approximately 25 feet in diameter and approximately 6 feet deep. The lagoon is suspected to have been created at the site to accept water discharged from Building 45. There are no direct access roads; however, access to the site is unrestricted.

This site is in proximity of a former electrical substation. Transformers reportedly containing PCBs were used in this area and possibly stored at the substation. A transformer was discovered in the wooded area, east of the substation, during an UST Investigation. Additional transformers (approximately 20) potentially containing PCB transformer oil were discovered and removed from the pond.

Baker conducted soil, groundwater, surface water, and sediment sampling activities in October 1995 as part of a SI. Additional soil sampling for PCBs has been performed in March 1998 and April 1999. The investigations indicate that the site has been adversely impacted by PCB contamination. PCBs have been detected at levels above 500 parts per billion (ppb) in soil

collected from around the lagoon, and in surface water and sediment (above 1,000 ppb) collected from within the lagoon. Characterization of the site was presented in the Pre-RI Screening Study. A draft Engineering Evaluation/Cost Analysis (EE/CA) has been completed. Further soil sampling in April of 1999 will be incorporated into the final EE/CA and design of the remedial action at Site 84. It is anticipated that remediation of PCBs in the lagoon and nearby soils will be recommended as a TCRA.

2.19.6.1 Objectives

The completion of an EE/CA and remedial design is required at Site 84. These documents are scheduled for submittal in 1999. The remedial action will involve dewatering and removing sediments from the lagoon and treatment of surrounding soils for PCB contamination.

2.19.6.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 84. There were no items identified that would lead to further degradation of existing conditions.

2.19.6.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that PCBs at Site 84 have impacted both the lagoon and the surrounding soils. Further investigations at the site have delineated the horizontal and vertical extent of PCB contamination. These data have been used to prepare an EE/CA which focuses on the remedial efforts in specific "hot-spot" areas. A TCRA is planned to remediate the lagoon and nearby soils at Site 84 to levels that are protective of human health and the environment.

2.19.6.4 Areas of Noncompliance

Concentrations of PCBs in the lagoon and surficial soils at Site 84 exceed appropriate action levels. The removal action will address the PCB contamination at Site 84 to ensure compliance.

2.19.6.5 Recommendations

A removal action to address the PCB contamination at Site 84 will be completed in 1999. Upon completion of the removal action, confirmatory sampling will be completed to ensure all site soils have been remediated to appropriate levels.

2.19.7 Site 85 (Camp Johnson Battery Dump)

The Camp Johnson Battery Dump is located off Wilson Drive in the Montford Point Area. The battery dump was initially discovered during road repairs. Decomposed batteries, which were used in military communication equipment during the Korean era, were unearthed as a roadway was being widened. Military personnel utilizing this area also discovered discarded charcoal canisters from old air purifying respirators. The discarded battery packs and charcoal canisters were observed in piles, randomly located throughout a 2 to 3 acre area.

Baker conducted soil and groundwater sampling activities in August 1995. Results indicated that soil had been impacted by metals leaching from the battery piles. Removal of the soil and battery packs was recommended as part of a TCRA. Based upon comments by the USEPA (Region IV) an EE/CA was completed prior to finalizing the design of the removal action. A draft work plan describing the removal action has been prepared and the work is scheduled for completion in 1999.

2.19.7.1 Objectives

Site 85 will undergo a removal action to address the battery piles. The final workplan and removal action will be completed in 1999.

2.19.7.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 85. There were no items identified that would lead to further degradation of existing conditions.

2.19.7.3 Statement of Protectiveness

The Pre-RI Screening Study confirmed that metals have negatively impacted the environment. This will be addressed through the completion of a removal action in 1999.

2.19.7.4 Areas of Noncompliance

Metals leaching from the battery piles at Site 85 have impacted soils. The removal action at the site will address this issue and eliminate the source contamination at Site 85.

2.19.7.5 Recommendations

A removal action is recommended for Site 85. The removal action will address the battery piles and soils immediately below the waste material. Upon completion of the removal action, confirmatory sampling will be performed to ensure that all waste material has been removed and the concentrations of metals in the soil have been reduced to appropriate levels.

2.19.8 Site 87 (MCAS Officer's Housing Area)

The MCAS Officers' Housing Area site (formerly Site A) is located on the west bank of the New River. This area was identified during the second round of sampling as part of the IAS conducted in 1986. Waste was identified eroding out of the stream bank along the New River in the vicinity of an Officers' housing area. The materials were tentatively identified as hospital wastes. Various hospital waste materials were noted, including hypodermic needles and vials of white powder that were believed to contain a chlorine-based substance. No information was available regarding the volume of the waste or the mode of disposal. Baker conducted soil, groundwater, surface water, sediment, and test pit sampling activities in October 1995 (groundwater, soil, surface water, and sediment) and February 1996 (test pits). The test pits did not encounter any buried waste materials. The soils appeared to be natural material without the presence of any fill. There was nothing noted in any of the test pit activity that would be indicative of buried debris being present. Sampling results have indicated that none of the media have been significantly impacted by site activities. Accordingly, a NFRAP Decision Document has been completed for Site 87.

2.19.8.1 Objectives

There are no remedial objectives identified for Site 87. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document is scheduled to be issued as final in 1999.

2.19.8.2 Summary of Site Visit

A visual inspection was performed during December 1998 to confirm that no hazardous materials were being used or stored improperly at Site 87. There were no items identified that would lead to further degradation of existing conditions.

2.19.8.3 Statement of Protectiveness

The Pre-RI Screening Study completed at Site 87 did not identify any waste materials or site contamination. Conditions at the site remain protective of human health and the environment.

2.19.8.4 Areas of Noncompliance

There are no areas of noncompliance at Site 87.

2.19.8.5 Recommendations

There are no recommendations for Site 87 other than the completion of a NFRAP Decision Document. The site has been fully characterized as part of the 1996 Pre-RI Screening Study. A draft NFRAP Decision Document has been prepared for this site. The document is scheduled to be issued as final in 1999.

3.0 REFERENCES

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TABLES

TABLE 1-1

INSTALLATION RESTORATION PROGRAM SITES
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

Site No.	Site Description
1	French Creek Liquids Disposal Area
2	Former Nursery/Day-Care Center
3	Old Creosote Site
6	Storage Lots 201 and 203
7	Tarawa Terrace Dump
9	Fire Fighting Training Pit at Piney Green Road
10[1]	Original Base Dump
12[1]	Explosive Ordnance Disposal (EOD-1, formerly known as G-4A)
16	Montford Point Burn Dump
21	Transformer Storage Lot 140
24	Industrial Area Fly Ash Dump
28	Hadnot Point Burn Dump
30	Sneads Ferry Road - Fuel Tank Sludge Area
35	Camp Geiger Area Fuel Farm
36	Camp Geiger Area Dump near Sewage Treatment Plant
41	Camp Geiger Dump near Former Trailer Park
43	Agan Street Dump
44	Jones Street Dump
48	MCAS New River Mercury Dump Site
54	Crash Crew Fire Training Burn Pit
63	Verona Loop Dump
65	Engineer Area Dump
68[1]	Rifle Range Dump
69	Rifle Range Chemical Dump
73	Courthouse Bay Liquids Disposal Area
74	Mess Hall Grease Pit Area
75[1]	MCAS Basketball Court Site
76[1]	MCAS Curtis Road Site
78	Hadnot Point Industrial Area
80	Paradise Point (Golf Course Maintenance Area)
82	VOC Disposal Area at Piney Green Road
84[1]	Building 45 Area
85[1]	Camp Johnson Battery Dump
86	Tank Area AS419-AS421 at MCAS
87[1]	MCAS Officer's Housing Area (formerly Site A)
88	Building 25
89	STC-868
90	Building BB-9
91	Building BB-51
92	Building BB-46
93	TC-942
94	Building 1613

Notes:

Additional sites may be added if the need to perform an RI/FS is identified and a corresponding modification to the Federal Facilities Agreement is approved.

[1] Pre-Remedial Investigation Site (investigations used to determine if an RI/FS was required).

TABLE 1-2

CHEMICAL-SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
Safe Drinking Water Act a. Maximum Contaminant Levels (MCLs) b. Maximum Contaminant Levels Goals (MCLGs)	40 CFR 141.11-141.16 40 CFR 141.50-141.51	Standards for protection of drinking water sources serving at least 25 persons. MCLs consider health factors, as well as economic feasibility of removing a contaminant; MCLGs do not consider the technical feasibility of contaminant removal. For a given contaminant, the more stringent of MCLs or MCLGs is applicable unless the MCLG is zero, in which case the MCL applies. Relevant and appropriate in developing remediation levels for contaminated groundwater used as a potable water supply.
Reference Dose (RfDs)	EPA Office of Research and Development	Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to characterize risks due to exposure to noncarcinogens. To Be Considered (TBC) requirement for the public health risk assessment.
Carcinogenic Slope Factors (CSFs)	Environmental Criteria and Assessment Office: EPA Carcinogen Assessment Group	Presents non-enforceable toxicity data for specific chemicals use in public health assessments to compute the individual incremental cancer risk resulting from exposure to carcinogens. TBC requirement for the public health risk assessment.
Health Advisories	EPA Office of Drinking Water	Non-enforceable guidelines for chemicals that may intermittently be encountered in public waters supply systems. Available for short- or long-term exposure for a child or adult. TBC requirement for the public health risk assessment.
National Emission Standards for Hazardous Pollutants	40 CFR Part 61	Standards promulgated under the Clean Air Act for significant sources of hazardous pollutants, such as vinyl chloride, benzene, trichloroethylene, dichlorobenzene, asbestos, and other hazardous substances. Considered for any source that has the potential to emit 10 tons of any hazardous air pollutant or 25 tons of a combination of hazardous air pollutants per year. Remedial actions (e.g., air stripping) may result in release of hazardous air pollutants. The treatment design may elect to control equipment air emissions using the same or similar methods.

TABLE 1-2 (Continued)

CHEMICAL-SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
National Ambient Air Quality Standards	40 CFR Part 50	Standards for the following six criteria pollutants: particulate matter; sulfur dioxide; carbon monoxide; ozone; nitrogen dioxide; and lead. The attainment and maintenance of these standards are required to protect the public health and welfare. Relevant and appropriate requirements for remedial actions requiring discharge to the atmosphere.
EPA Ambient Water Quality Criteria	Clean Water Act Section 304 (a)	Non-enforceable criterion for water quality for the protection of human health from exposure to contaminants in drinking water and from ingestion of aquatic biota and for the protection of fresh-water and salt-water aquatic life. TBC requirement for groundwater treatment.
Classification and Water Quality Standards Applicable to Surface Waters of North Carolina	15A North Carolina Administrative Code (NCAC) Chapter 2, Subchapter 2B.0200	Surface water quality standards based on water use and criteria class of surface water. Relevant and appropriate for remedial actions requiring discharge to surface water.
North Carolina Groundwater Standards	15A NCAC Chapter 2, Subchapter 2L	Establishes maximum contaminant concentrations to protect groundwater. These standards are mandatory and applicable statewide. Relevant and appropriate for remedial actions involving the protection of groundwater.
North Carolina Regulations for Hazardous and Solid Waste	15A NCAC Chapter 2, Subchapters 13A and 13B	Standards and requirements for management and disposal of hazardous and solid waste. Potentially relevant and appropriate for remedial actions requiring management and disposal of hazardous and/or solid waste.
North Carolina Toxic Air Pollutant Rule	G.S. 143-215.107 (a)(1), (3),(4),(5); 143-B-282	A facility shall not emit any toxic air pollutants (as listed in Rule .1104) that may cause or contribute beyond the premises (contiguous property boundary) to any significant ambient air concentration that may adversly affect human health. Potentially relevant and appropriate for remedial actions requiring discharge to the atmosphere.
North Carolina Anti-Degradation Policy for Surface Water	15A NCAC Chapter 2, Subchapter 2B	Provides for an anti-degradation policy for surface water quality. Pursuant to this policy, the requirements of 40 CFR 131.12 are adopted by reference in accordance with General Statute 150B-14(b). This policy is a TBC requirement for remedial actions requiring discharge to surface water.

TABLE 1-2 (Continued)

CHEMICAL-SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
North Carolina Pollution Control Regulations	15A NCAC 2D, 2H .0600, 2Q	Establishes air quality standards for hazardous air pollutants and regulates ambient air quality. May be applicable if onsite treatment or excavation is part of the Remedial Action.
North Carolina Drinking Water Act	North Carolina General Statute 130A 311-327	Regulates water systems with the State that supply drinking water that may affect public health.

TABLE 1-3

LOCATION-SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
Fish and Wildlife Coordination Act	16 U.S. Code 661-666	This ARAR requires protection of fish and wildlife from actions modifying streams or areas affecting streams.
Federal Endangered Species Act	16 U.S. Code 1531, 50 CFR Part 200, and 50 CFR Part 402	Requires action to avoid jeopardizing the continued existence of listed endangered species or modification of their habitat. Many protected species have been cited near or on MCB, Camp Lejeune.
North Carolina Endangered Species Act	North Carolina General Statute 113-337	Per the North Carolina Wildlife Resources Commission. This ARAR is similar to the Federal Endangered Species Act. But also includes state special concern species, state significantly rare species, and the state watch list. Protected species which have been cited near or on MCB, Camp Lejeune include the American alligator, the Bachmans sparrow, the Black skimmer, the Green turtle, the Loggerhead turtle, the Piping Plover, the Red-cockaded woodpecker, and the rough-leaf loosestrife.
Executive Order 11990 on Protection of Wetlands	Executive Order Number 11990, and 40 CFR Part 6	Establishes special requirements for Federal agencies to avoid the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists. Wetland inventory maps must be examined to determine if a site is located in or near a wetland.
Executive Order 11988 on Floodplain Management	Executive Order Number 11988, and 40 CFR Part 6	Establishes special requirements for Federal agencies to evaluate the adverse impacts associated with direct and indirect development of a floodplain. This ARAR is evaluated using Federal Emergency Management Agency's Flood Insurance Rate Maps.
Resource Conservation and Recovery Act (RCRA) Location Requirements	40 CFR Part 264.18	Limitations on where on-site storage, treatment, or disposal of RCRA hazardous waste may occur. These requirements are applicable if any remedial actions include on-site storage, treatment, or disposal of RCRA hazardous waste.
National Historic Preservation Act of 1966	16 USC 470, 40 CFR Part 6.301(b), and 40 CFR Part 800	Requires action to take into account effects on properties included in or eligible for the National Register or Historic Places and to minimize harm to National Historic Landmarks.
Archeological and Historic Preservation Act	16 USC 469 and 40 CFR Part 6.301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain.

TABLE 1-3 (Continued)

LOCATION-SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
Historic Sites, Buildings and Antiquities Act	16 USC 461467 and 40 CFR Part 6.301 (a)	Requires action to avoid undesirable impacts on landmarks on the National Registry of Natural Landmarks.
Rivers and Harbors Act of 1899	33 USC 403 (Section 10 Permit)	Requires permit for structures or work in navigable waters.
Wilderness Act	16 USC 1131 and 50 CFR Part 35.1	Requires that federally owned wilderness areas are not impacted. Establishes nondegradation, maximum restoration, and protection of wilderness areas as primary management principles.
National Wildlife Refuge System	16 USC 668 and 50 CFR Part 27	Restricts activities within a National Wildlife Refuge.
Scenic Rivers Act	16 USC 1271 and 40 CFR Part 6.302 (e)	Requires action to avoid adverse effects on designated wild or scenic rivers.
Coastal Zone Management	16 USC 1451	Requires activities affecting land or water uses in a coastal zone to certify noninterference with coastal zone management.
Clean Water Act	33 USC 404 (Section 404)	Prohibits discharge of dredged or fill material into wetlands without a permit.
North Carolina Hazardous Waste Management Rules	15A NCAC 13A .0009 & .0012	Location requirements and land disposal restrictions for hazardous waste excavated, stored, and treated onsite.
North Carolina Solid Waste Management Rules	15A NCAC 13B .1600	Siting requirements for solid waste landfill facilities.
North Carolina Recordation of Inactive Hazardous Substance or Waste Disposal Sites Statute	North Carolina General Statute 130A-310.8	State requirement for recordation of inactive hazardous sites.
North Carolina Coastal Management	15A NCAC 7H	State guidelines for areas of environmental concern.

TABLE 1-4

ACTION SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
Occupation Safety and Health Administration (OSHA) Regulations for Hazardous Waste Operations	29 CFR Parts 1910.120 and 1926.65	Regulations provide occupational safety and health requirements applicable to workers engaged in on-site field activities. Required for site workers during construction and operation of remedial activities. Applicable to all actions at the site.
Department of Transportation (DOT) Rules for Hazardous Materials Transportation	49 CFR Parts 107 and 171.1-500	Regulates the transport of hazardous waste materials including packaging, shipping, and placarding. Applicable for any action requiring off-site transportation of hazardous materials.
RCRA Subtitle C a. Identification and Listing of Hazardous Waste. b. Treatment, Storage, and Disposal of Hazardous Waste.	40 CFR Part 261 40 CFR Parts 262-265, and 266	Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing. Regulates the treatment, storage, and disposal of hazardous waste. Primary site contaminants are not considered to be listed wastes. However, contaminated media may be considered hazardous by characteristic. During remediation operations, treatment, storage, and disposal activities occur. Materials may be classified as hazardous wastes.
RCRA Subtitle D	RCRA Guidance	Regulates the treatment, storage, and disposal of solid waste and materials designated by the State as special waste. Applicable to remedial actions involving treatment, storage, or disposal of materials classified as solid and/or special wastes.
RCRA Land Disposal Restrictions (LDRs) Requirements	40 CFR Part 268	Restricts certain listed or characteristic hazardous waste from placement or disposal on land (includes injection wells) without treatment. Provides treatment standards and Best Demonstrated Available Technology (BAT). LDRs may prohibit or govern the implementation of certain remedial alternatives. Extraction and treatment and/or movement of RCRA hazardous waste may trigger LDR requirements for the waste. Reinjection of treated groundwater into or above an underground source of drinking water may be exempt from LDRs given the treatment of the groundwater meets exemption requirements.

TABLE 1-4 (Continued)

ACTION SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites	OSWER Directive 9355.0-28	Guidance that establishes criteria as the whether air emission controls are necessary for air strippers. A maximum 3 lbs./hr. or 15 lbs./day or 10 tons/yr. of VOC emissions is allowable: air pollution controls are recommended for any emissions in excess of these quantities. TBC requirement for remedial actions that include air stripping.
General Pretreatment Regulations for Existing and New Sources of Pollutants	40 CFR Part 403	Regulations promulgated under the Clean Water Act. Includes provisions for effluent discharge to Publicly Owned Treatment Works (POTW). Discharge of pollutants that pass through or interfere with the POTW, contaminant sludge, or endanger health/safety of POTW workers is prohibited. These regulations should be used in conjunction with local POTW pretreatment program requirements. Applicable for remedial actions involving discharge to a sanitary sewer.
Toxic Substances Control Act (TSCA)	40 CFR Part 761	Establishes regulations for handling Polychlorinated Biphenyls (PCBs)
North Carolina Water Pollution Control Regulations	Title 15, Chapter 2, Section .0100.	Regulates point-source discharges through the North Carolina permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system, and completion of regular discharge monitoring records.
Protection of Archaeological Resources	32 CFR Parts 229 and 229.4; 43 CFR Parts 107 and 171.1-5.	Develops procedures for the protection of archaeological resources. Applicable to any excavation on site. If archaeological resources are encountered during soil excavation, they must be reviewed by Federal and State archaeologists.
North Carolina Sedimentation Pollution Control Act of 1973	Chapter 113A	Regulates stormwater management and erosion or sedimentation control practices that must be followed during land disturbing activities.
North Carolina Groundwater Corrective Action	15A NCAC 2L .0106	Regulations for cleanup of contaminated groundwater.
NC 15A NCAC 2L Implementation Guidance	Division of Water Quality Guidance Document	Guidance for implementation of corrective action at groundwater contamination sites TBC.
North Carolina Well Construction and Abandonment Standards	15A NCAC 2C .0100	Construction and abandonment requirements for water wells.

TABLE 1-4 (Continued)

ACTION SPECIFIC ARARs
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

ARAR	General Citation	Requirement Description
North Carolina Injection Well Construction Standards	15A NCAC 2C .0200	Construction requirements for injection wells.
North Carolina Water Quality Discharge Requirements	15A NCAC 2H .0100 & .0200	Requirements for waste water discharges and infiltration galleries.
North Carolina Sedimentation Control Rules	15A NCAC 2H .1000	Establishes requirements for stormwater management and erosion control.
North Carolina Hazardous Waste Management Rules	15A NCAC 13A	Design, treatment, and monitoring requirements for hazardous waste TSDs.
North Carolina Solid Waste Management Rules	15A NCAC 13B	Design and monitoring requirements for solid waste disposal sites.
North Carolina Air Pollution Control Requirements	15A NCAC 2D, 2H .0600, 2Q	Regulates emission of hazardous substances into the air.

TABLE 2-1

INSTALLATION RESTORATION PROGRAM OPERABLE UNITS
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

OU No.	Site No.	Site Name	Reason for Grouping
1	21	Transformer Storage Lot 140	Geographic Proximity
	24	Industrial Area Fly Ash Dump	
	78	Hadnot Point Industrial Area	
2	6	Storage Lots 201 and 203	Geographic Proximity
	9	Fire Fighting Training Pit at Piney Green Road	
	82	VOC Disposal Area at Piney Green Road	
3	48	MCAS New River Mercury Dump Site	Contaminant Type
4	41	Camp Geiger Dump near Former Trailer Park	Contaminant Types
	74	Mess Hall Grease Pit Area	
5	2	Former Nursery/Day-Care Center	Contaminant Type
6	36	Camp Geiger Area Dump near Sewage Treatment Plant	Geographic Proximity
	43	Agan Street Dump	
	44	Jones Street Dump	
	54	Crash Crew Fire Training Burn Pit	
	86	Tank Area AS419-AS421 at MCAS	
7	1	French Creek Liquids Disposal Area	Geographic Proximity and Contaminant Types
	28	Hadnot Point Burn Dump	
	30	Sneads Ferry Road - Fuel Tank Sludge Area	
8	16	Montford Point Burn Dump	Location
9	65	Engineer Area Dump	Geographic Proximity
	73	Courthouse Bay Liquids Disposal Area	
10	35	Camp Gieger Area Fuel Farm	Accelerated Cleanup Schedule
11	7	Tarawa Terrace Dump	Geographic Proximity
	80	Paradise Point (Golf Course Maintenance Area)	
12	3	Old Creosote Site	Contaminant Type
13	63	Verona Loop Dump	Location and Contaminant Type
14	69	Rifle Range Chemical Dump	Location and Contaminant Type
15	88	Building 25	Contaminant Type
16	89	STC-868	Contaminant Type and Geographic Proximity
	93	TC-942	
17	90	Building BB-9	Geographic Proximity
	91	Building BB-51	
	92	Building BB-46	
18	94	Building 1613	Location and Contaminant Type

TABLE 2-1 (Continued)

INSTALLATION RESTORATION PROGRAM ACTIVITIES
FIVE-YEAR REVIEW, CTO-0099
MCB, CAMP LEJEUNE, NORTH CAROLINA

OU No.	Site No.	Site Name	Reason for Grouping
Pre-RI Sites	10	Original Base Dump	Type of Sites
	12	Explosive Ordnance Disposal (EOD-1, formerly G-4A)	
	68	Rifle Range Dump	
	75	MCAS Basketball Court Site	
	76	MCAS Curtis Road Site	
	84	Building 45 Area	
	85	Camp Johnson Battery Dump	
	87	MCAS Officers Housing Area (formerly Site A)	

FIGURES

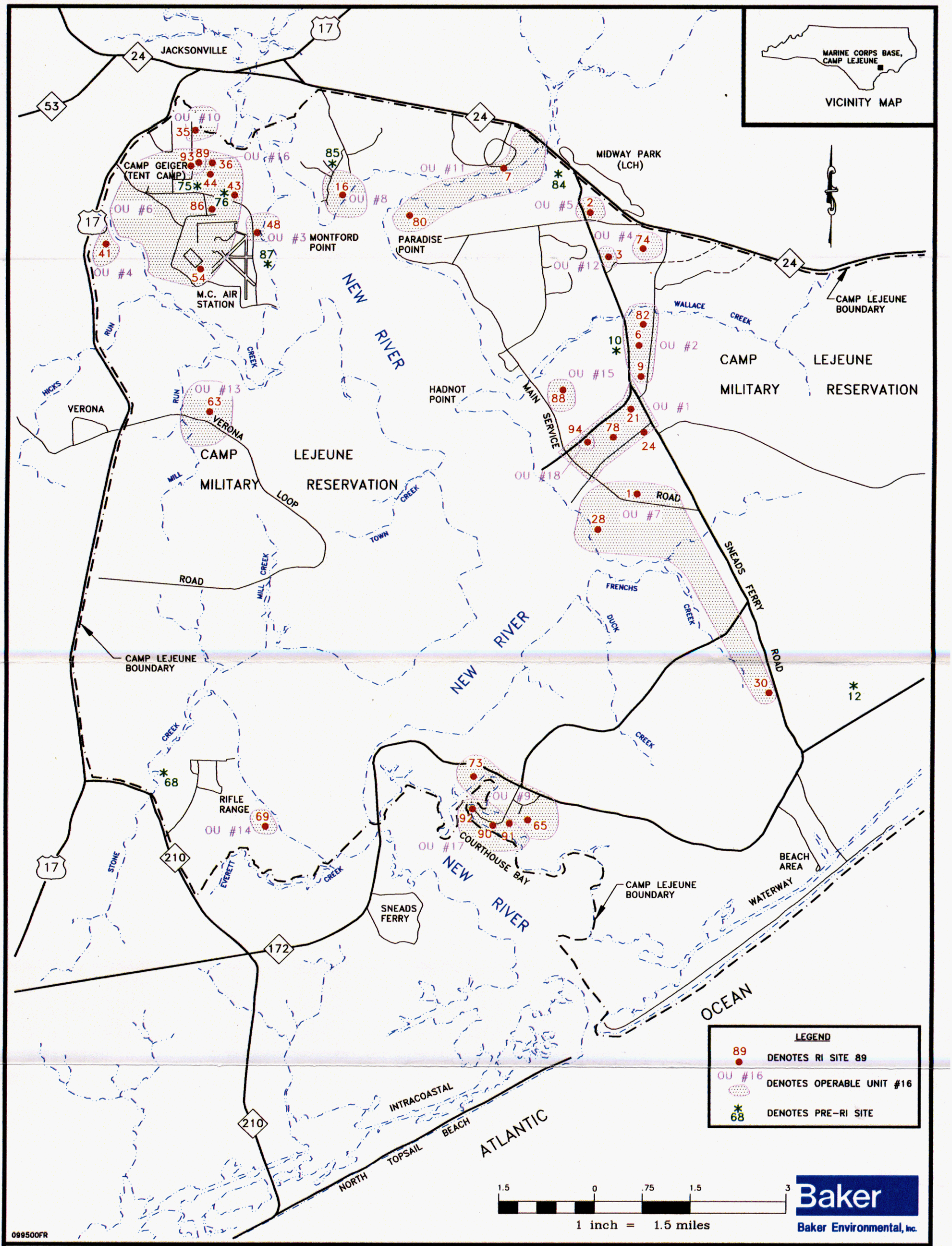

FIGURE 1-1
OPERABLE UNIT AND SITE LOCATION MAP
FIVE-YEAR REVIEW
CTO - 0099

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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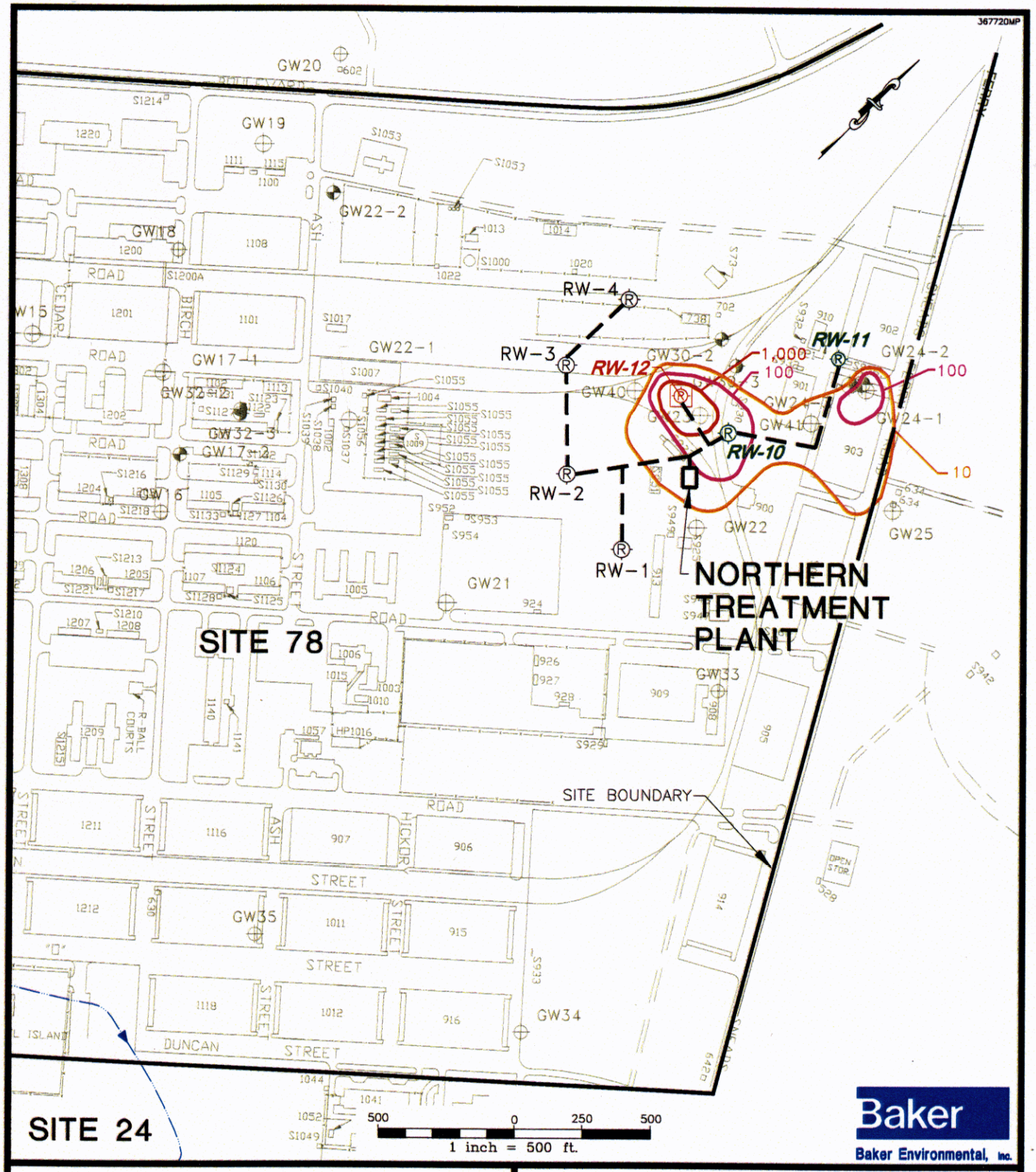
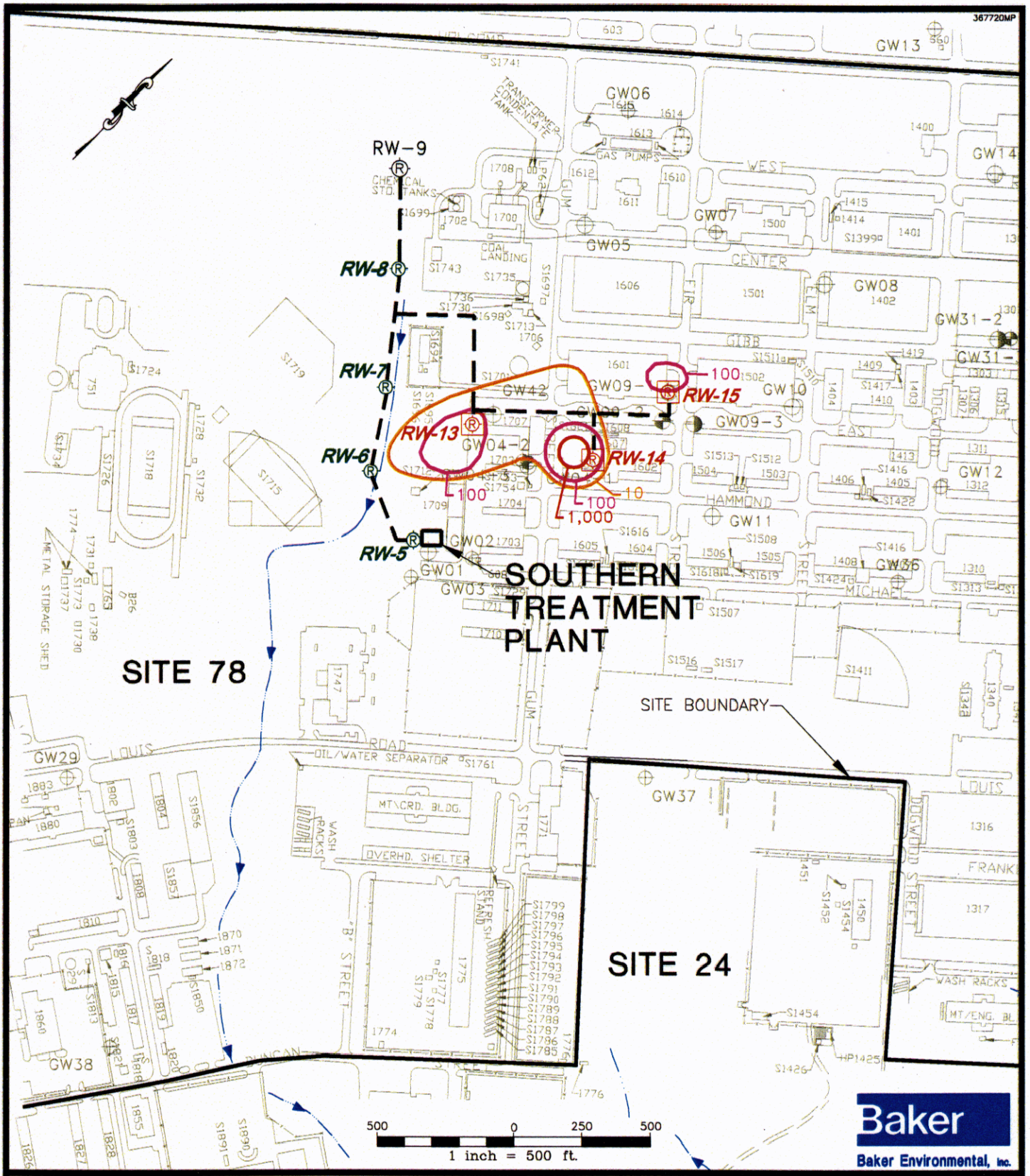


LEGEND

- OFF-LINE RECOVERY WELL
- ON-LINE RECOVERY WELL
- NEWLY INSTALLED RECOVERY WELL
- APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATIONS (parts per billion)

FIGURE 2-1

NORTHERN TREATMENT PLANT-SITE 78
FIVE-YEAR REVIEW, CTO-0099
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

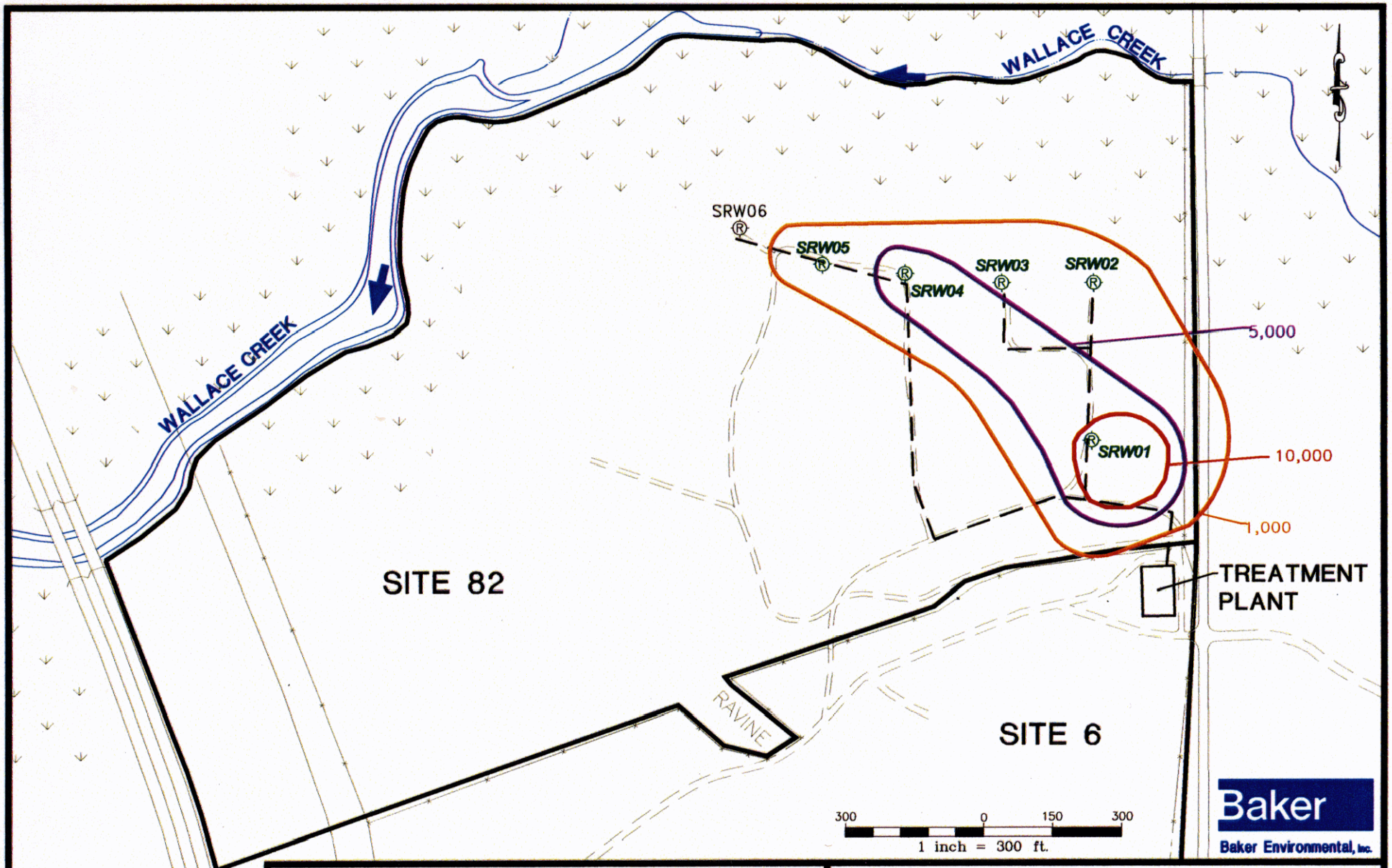


LEGEND

- OFF-LINE RECOVERY WELL
- ON-LINE RECOVERY WELL
- NEWLY INSTALLED RECOVERY WELL
- APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATIONS (parts per billion)

FIGURE 2-2

SOUTHERN TREATMENT PLANT-SITE 78
FIVE-YEAR REVIEW, CTO-0099
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



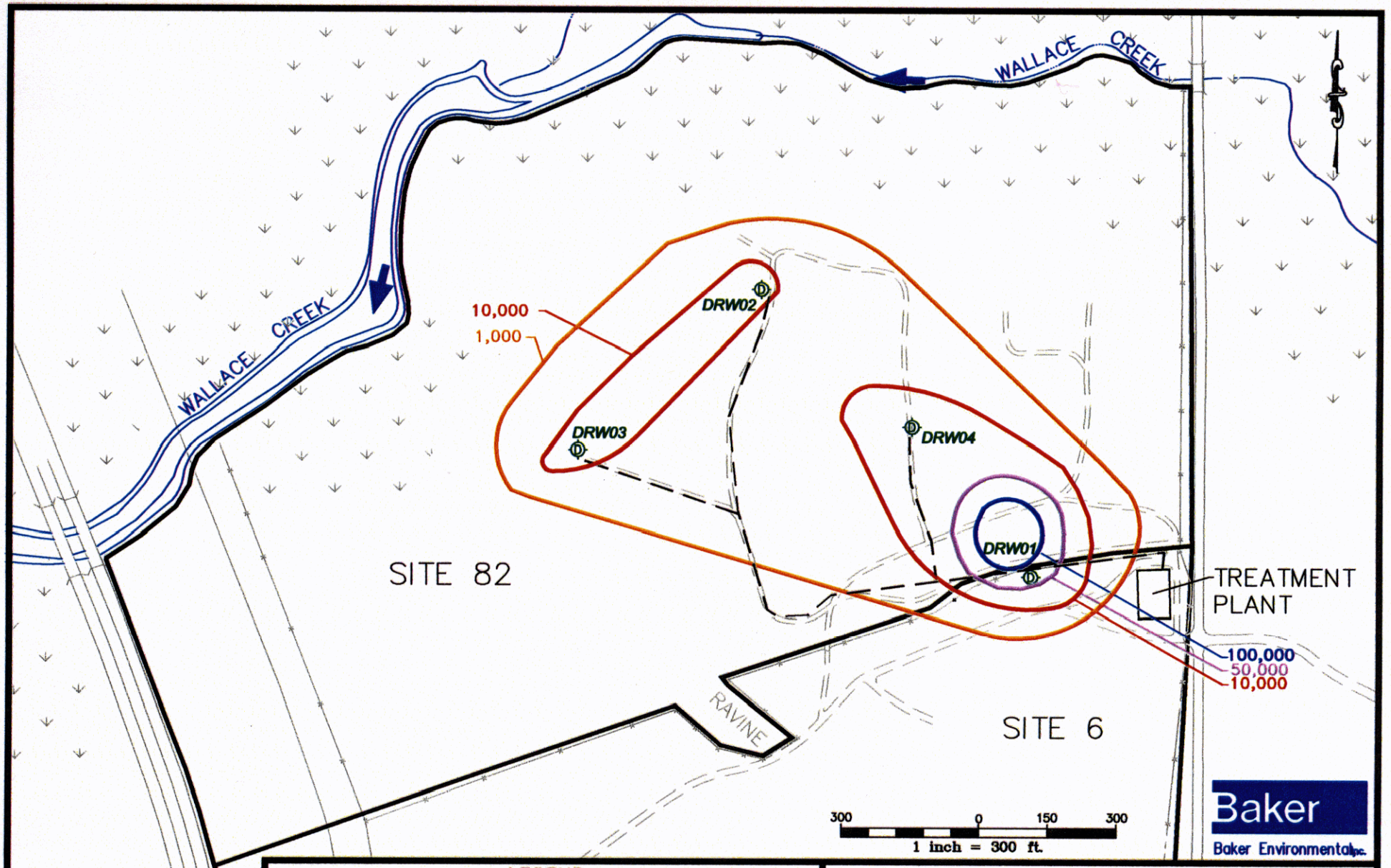
LEGEND

- OFF-LINE SHALLOW RECOVERY WELL
- ON-LINE SHALLOW RECOVERY WELL
- APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATIONS (parts per billion)
- SITE BOUNDARY

FIGURE 2-3

SHALLOW GROUNDWATER TREATMENT SYSTEM – SITES 6 and 82
FIVE-YEAR REVIEW, CTO – 0099
MONITORING and O&M SUPPORT, CTO-0099
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

367562WP



LEGEND

- ON-LINE SHALLOW RECOVERY WELL
- APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATIONS (parts per billion)
- SITE BOUNDARY

FIGURE 2-4

DEEP GROUNDWATER TREATMENT SYSTEM – SITES 6 and 82
FIVE-YEAR REVIEW, CTO – 0099
MONITORING and O&M SUPPORT, CTO-0099
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

367563WP

ATTACHMENT A
FIELD LOG BOOK

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12/4/98

Five-Year Review Site Visit

0740 Stop at Lot 203 trailer to load over booties and camera supplies. Meeting w/ Mick Senus of EMD to discuss site visit.

0800 Met w/ Mick Senus to discuss site visit for nearly 1 hr. Reminded us that we will need to access motor pool areas today (e.g. Sites 1, 73 & 89). Will talk to any personnel that we can at each of the sites regarding use and storage of hazardous materials. Also, inspect tanks used during tracer test at Site 88.

0915 Site 88 - Work continues at site, soon aquifer remediation. Tanks not secured w/ mechanical fasteners (valves). Need to be obviously labled. Better placarding in general.

12/4/98

Site 88 (continued) May need to recontour dike so that rain water drains away or off completely. Will replace caution tape around dike system. Monitoring wells are intact and look to be in good condition. Extraction / Injection apparatus next to Bldg. 25 may need to be better secured from tampering.
3 photographs taken of injection and extraction area. An additional photograph from cross street toward Bldg. 25. The use of the site remains a laundry facility.
A recently contructed volleyball court that may interfere with placement of tanker truck during aquifer remediation.
* 4 Photographs taken (Roll #1)

(Site 1) North side of site remains a motor pool. A soil collection area has been added to the fenced portion of the site (photo)

12/4/98

Soil drying area most probably from oil/water separater adjacent to drying area 7' cyclone fence 36' x 36'.
South side of site remains area for staging equipment and vehicles.
Two/Three buildings have been demolished that were located along Main Service Road near gate entrance to southern portion of site.
HP-638 bldg. still located on site.
Wells are intact and, except for GW15,
A new stormwater retention has been constructed on the northern side of the site, adjacent to Bldg. FC-134.
Approximately 7-8' deep and 150' in length, overflow at 4' to the north.
Original pond was approx 150' in length, total now 300+ and varying depth.
Collection of runoff from parking area.
* 5 Photographs taken

(Site 28) Aeration pond adjacent to Orde Pond not in operation any longer.
Rec. area in operation. Large soil mound and debris pile on western

12/4/98

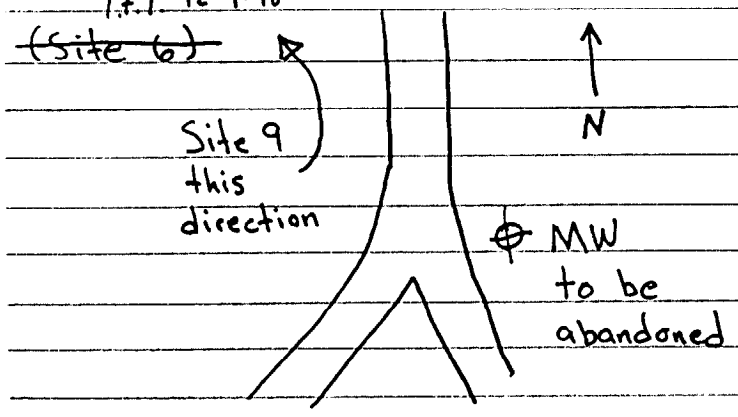
(Site 28 cont.) portion of site. Soil pile covering 28-GWØ8 completely. Tree debris also and concrete debris located adjacent to soil mound. Site remains as STP and rec. area.

* 4 Photographs taken

(Site 9) Monitoring wells have been abandoned at the site proper, however one MW remains to the south along Piney Green Road. Site now fenced w/ 7' cyclone and barbed wire. No other significant changes apparent, except for removal and addition of gas tank.

* 2 Photographs taken (Roll #1)

777 12-4-98



12/4/98

(Site 6) Site 6 is now used as a wood recycling / composting area in addition to its original use. Bldg. 601 (grease trap) has been added. Also added a storm water retention pond and large storage lot between Lots 201 and 203. Correction, 100'x250' stormwater pond, large raised area with gravel. 06-GW18 may be abandoned. Raised area adjacent to Lot 201 to the east. Construction south of the raised area taking place at time of visit. New base landfill across Piney Green from Site 6 to east. Raised area is 10' above grade 200'x 400', protected by six foot fence. 06-GW06 may be abandoned also. 06-GW17 will be abandoned during construction project. Many of the wells on the southern portion of the site may be abandoned. Site is mixed-use now

12/4/98

(Site 6 cont.) Site used a office area for contractors Baker, OHM & Jones Site 6 also has GW treatment plant for Site 82. Site 6 also used to bioremediate soil in the northern portion, adjacent to TP.
6 Photos (Roll #1)
4 Photo (Roll #2)

(Site 82) Deep and Shallow plumes in groundwater. Also used as a staging area for OHM construction material. Site Remains heavily wooded w/ recovery well huts.
1 Photo (Roll #2)

(Site 3) Northern portion of site used to stage 96 hurricane debris. As a result, MWs 03-MW03 and 03-MM08 were destroyed. Northern area cleared. Chimney remains and concrete pads remain at site. A temperary bridge is staged. Soil removal

12/4/98

(Site 3 cont.) is scheduled to begin early 1999. No other significant changes to the site were noted.
3 Photographs (Roll #2)

(Site 74) Site now fenced w/ 6' cyclone fencing on north side of road. Fence divided to allow access via improved road. No other significant changes to site noted.
* 1 Photograph (Roll #2)

(Site 2) No significant changes noted at site. Wells have been abandoned w/in the last two years Part of monitoring program. Contractor using a staging area for small trailer and equipment
* 2 Photographs (Roll #2)

(Site 80) No significant changes to site noted. Area used for golf course maintenance and staging. Clearing north of site may be used to burn wood debris
* 2 Photographs (Roll #2)

12/4/98

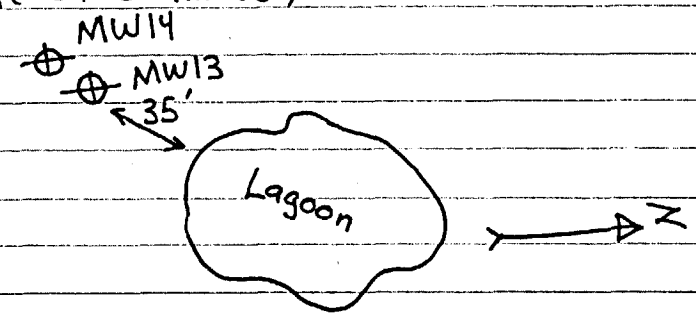
(Site 84) Petroleum odor noted near lagoon. Lagoon beginning to close in from debris falling into it. Heavily wooded site beyond lagoon area. Lagoon is approximately 40' x 25' and shrinking. Lagoon located 300' from New River. Several depressions and small excavations noted during site visit. No determination as to whether storm drains in Bldg. 45 discharge to the lagoon. No significant alterations to the site were noted.

18 Photographs (Rolls #2 & 3)

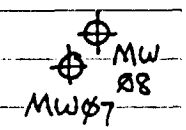
T.T.T. 12-4-98

12/4/98

(Site 84 continued)



MW14 installed Dec. 91
Screen 17 to 27' bgs
Sand 15 to 27' bgs
2" diameter
Bentonite 13 to 15' bgs



MW13 installed Dec. 91
Screen 2 to 12' bgs
Sand 1 to 12' bgs
2" diameter
bentonite 0.5' to 1' bgs

T.T.T. 12/4/98

12/4/98

(Site 7) Sewage treatment plant has been demolished and construction is going on to either reconfigure or completely demolish STP. Evaporation pits/rus remain adjacent to New River. Area no longer fenced. A sewage pumping station has been constructed behind the location of the original STP. Area being used a contractor staging next to former treatment plant. Former STP graded and reseeded. An unnumbered MW remaians east of TT44 and SE corner of sidewalk. Majority of site heavily wooded and on floodplain.

* 3 Photographs (Roll #2)

(Site 85) Areas scheduled for removal have been flagged for soil removal. Battery piles remain and will be removed during 1st Quarter 1999. Area has sustained damage from Hurricanes, trees down.

* 4 Photographs (Roll #2)

12/4/98

(Site 16) cleared portion of site is now being used to store wood debris and, what appears to be, yard waste. Monitoring wells have been abandoned. Also metal debris including barbed wire and construction debris. Area not fenced, but may need to be.

* 2 Photographs (Roll #2)

T.T.T.
12/4/98

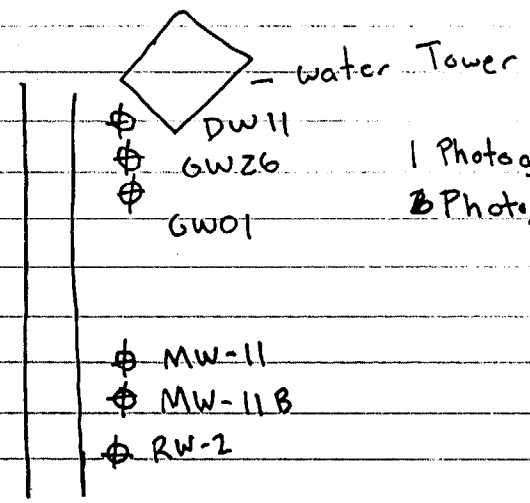
12/5/98

(Site 68) Area used as excercise and jogging trails. Some personnel entrenchments exist. Wells remain No significant alterations noted Wells remain at site. 1 Photo (Roll #3)

(Site 69) Several large trees have fallen across the fence and have breached the security of the site. A in-well aeration system was recently removed from the 69-GW15 cluster only the power conduits remain. All refuse and debris from the treatment system, including a large polyethylene tank, was removed. Power cables that ran to the treatment system are still conected to the power panel. Many of the wells assoc. with the treatment system have not been located on maps or figures. Some cleanup work required to demobe system.
8 Photographs (Roll # 3)

12/5/98

(Site 73) Site used for amphibious training and amphibious vehicle staging area. Site has remained a training area. A construction project is slated for the area immediately west of the site in areas where investigations have occurred. No significant changes have been noted recently. work is continuing at site. Two to three weeks ago several temporary well locations were installed immediately adjacent to building A-47.



1 Photograph (Roll #3)
8 Photographs (Roll #4)

12/5/98

(Site 92) Boat marina still used as such. No significant changes or alterations to site noted. Three flush mount well at site. 3 Photographs. (Roll #4) New fuel storage unit east of 246.

(Site 90) No significant changes or alterations were noted. Flush mount wells remain at site. Oil/water separator appears active, three large ASTs still in use adjacent to bldgs. BB-9 and BB-16. Overpack drum marked "oil rags" by BB-9. 4 Photographs (Roll #4). Unsecured stickup well NE of BB-16

(Site 12) Area used to detonate unexploded ordnance. Wells remain at site. No significant changes to the site or surrounding area noted during site visit. Ø Photographs (w/in restricted area)

12/5/98

(Site 30) No changes or alterations of the site. Wells abandoned. Nothing remains except tank trails and personnel entrenchments. Area near compat town and is used for training
* 1 Photograph (Roll #4)

(Site 91) Monitoring wells are intact. Area used to stage boats and light-duty equipment. Bldgs. that appear on 1996 figures remain accurate. No significant changes or alterations to the site
* 5 Photographs (Roll #4)

(Site 65) Site remains as in the 1995 Figures. ~~&~~ No significant changes or alterations noted. Some new jogging trails and paths have been added west of the site. Wells remain at the site and will be ready to abandon

12/5/98

(Site 94) Hadnot Point gas station. New treatment system for groundwater added during 1998 to north end of site. Use of the site has not changed. No significant findings at Site
* 6 Photographs taken

(Site 78) Muti-use site that comprises a large area w/in Hadnot Point. GW treatment systems (North & South) remain operational. Area too large to account for all possible sources of contamination. New recovery wells were recently added to the site by OHM. The recovery wells were not finished at the time of this site visit, however, the PVC pipe had been installed (see picture). Two corregated steel bldgs. were added to the storage lot adjacent to 78-GW01. North treatment

12/5/98

(Site 78 continued) added 1 new Recovery well and retrofitted two recovery wells. (See photos)
* 5 Photographs (Roll #5)

(Site 24) No changes to site noted Building a pad or storage bldg. along border of Sites 24 & 78. Access to the site may be restricted in the future. Construction SE side of Bldg. 1323. Wells ready
3 Photographs (Roll #5) to abandon.

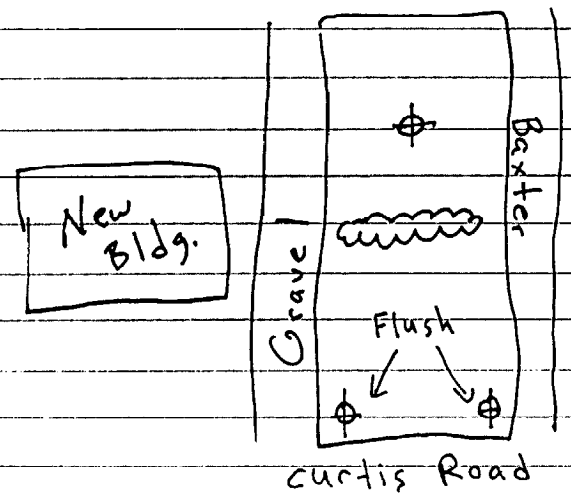
(Site 21) Two wells remain at site that are being utilized by the forme HP Fuel Farm investigation. New fencing being added to the northern portion of the site. Wells remain. Electric cable on spools being stored at site. Lot 140 is being used as a staging area for drums, one dozen ±, Other lots being used for storage of equipment and various material
5 photographs (Roll #5

12/5/98

(Site 10) No changes to site noted during visit.

(Site 63) Did not abandon wells at site, although reported so. Several trees down blocking access to site. Temporary wells remain.
2 Photos (Roll #5)

(Site 75) Wells converted to flush mounts. New bldg. NW of site. New fenced portion northern end of site for equipment staging by contractors.



12/5/98

(Site 44) Fence has been breached near housing (Photo). No lock on gate leading into site. Monitoring wells remain at site. Site security is obviously not maintained.
* 2 Photographs (Roll #5)

(Site 76) No changes noted during site visit. Green area separating Curtis Road from Housing.
* 3 Photos (Rolls #5 & 6)

(Site 43) Mini-Scout lodge built south of site. wells remain at site. No changes to site noted. A gate at entrance from Agan Street would keep trespassers

(Site 48) Old Photo lab building AS-804 now Nuclear, Biological, chemical defense section. New diesel generator behind building. No other changes at site noted.
2 Photographs (Roll #6

12/5/98

(Site 87) No significant changes near housing. However erosion has backcut to well. No waste material evident eroding from bank.

(Site 89) Fence from Site 44 very damaged along Edwards Creek. New wells added recently (Photo)
* 2 Photos (Roll 6). Highway Construct

(Site 93) Sites 89 & 93 are near in relation to one another. A building for troop housing is being constructed to the west of the site. no significant changes noted during site visit.
* 2 Photographs (Roll #6)

(Site 89 continued) Operations at the DRMO storage lot have remained nearly the same since time of initial investigation. Hwy 17 bypass being constructed at eastern edge of site. No other significant construction activity noted during site visit.

12/5/98

(Site 36) Road construction, Hwy 17 bypass, has completely changed the appearance and access to Site 36. Much of the site is now cleared and roads are reconfigured. Heavy equipment and excavation may possibly impact the direction of groundwater flow and therefore contaminant disbursal. Several of the monitoring wells were abandoned during the construction.
4 Photographs (Roll #7)

(Site 35) Similar conditions and concerns as the adjacent site 36; Road construction and excavation. No significant or readily apparent signs of potential contamination or threat observed. Several monitoring wells at this site were also abandoned to make way for the Hwy. 17 bypass. Access to the site will be restricted to that portion east of the right-of-way. Recently, a thin layer of suspected petroleum product was noted in a monitoring well. This lead to addn'l subsurface investigations. Roll #7

12/6/98

(Site 54) Site remains as a training area for crash crew personnel. During 1999 plans will be initiated that will demolish the existing fire pit and oil/water seperator. A clean-burning natural gas simulator will be installed at the site. No other significant changes are expected or were noted during the visual site ispection.

* 5 Photographs (Roll #7)

(Site 41) Fences have been installed where once vehicle access to the site was obtained. Due to the number of trees that have fallen during recent hurricanes, access to the site is quite limited. No signs of any changes to the site or activity that would suggest environmental concern were noted.

* 2 Photographs (Roll #7)

ATTACHMENT B
SITE VISIT PHOTOGRAPHS

1998. Site 1 The southern portion of Site 1 remains a motor pool and equipment staging area. Two buildings that were located along Main Service Road near the gate entrance to the southern portion of the site have been demolished.

1998. Site 1 A new stormwater retention basin has been constructed in the northern portion of the site, adjacent to Building FC-134.

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1998. Site 2 Site 2 is located along the eastern side of Holcomb Boulevard near the main gate entrance to Marine Corps Base Camp Lejeune.

1998. Site 2 Four monitoring wells at Site 2 were abandoned in 1997 as part of the monitoring program. A contractor is using the southern portion of the site as a staging area for a small trailer and miscellaneous equipment.

1998. Site 3 Remaining structures at Site 3 include concrete pads and a brick chimney. Excavation of contaminated soils is scheduled to begin in 1999. The proposed excavation is located near the monitoring wells pictured to the right and in the background.

1998. Site 3 The northern portion of Site 3 was used to store hurricane debris during 1996 and 1997. As a result, monitoring wells 03-MW03 and 03-MW08 were destroyed. The site has recently been graded and reseeded.

1998. Site 6 Building 601, Grease Trap, a recent addition to Site 6 was constructed during 1998. Clearing operations are pictured in the background.

1998. Site 6 A newly constructed storm water retention pond at Site 6.

1998. Site 6 View from new recycling area east of Lot 201, toward Lot 203.

1998. Site 6 Photograph from Piney Green Road west, toward Lot 201.

1998. Site 7 The sewage treatment plant at Site 7 has been demolished. The area has been graded and reseeded.

1998. Site 7 A new sewage pumping station has been constructed behind the location of the former Sewage Treatment Plant.

1998. Site 9 Site 9 is now enclosed with a seven-foot cyclone fence with barbed wire.

1998. Site 9 Monitoring wells at Site 9 have been abandoned, however, one monitoring well remains to the south along Piney Green Road.

1998. Site 10 The open portion of Site 10 is pictured here.

1998. Site 16 The monitoring wells at Site 16 have been abandoned. The cleared portion of the site is now being used to store wood debris and yard waste.

1998. Site 16 Metal debris, including barbed wire and construction debris is now present at Site 16. The area is not fenced, however fencing may be required.

1998. Site 21 Lot 140 at Site 21 is being used as a staging area for drums. At the time of the site visit, approximately one dozen drums were noted.

1998. Site 21 New fencing has been added to Site 21.

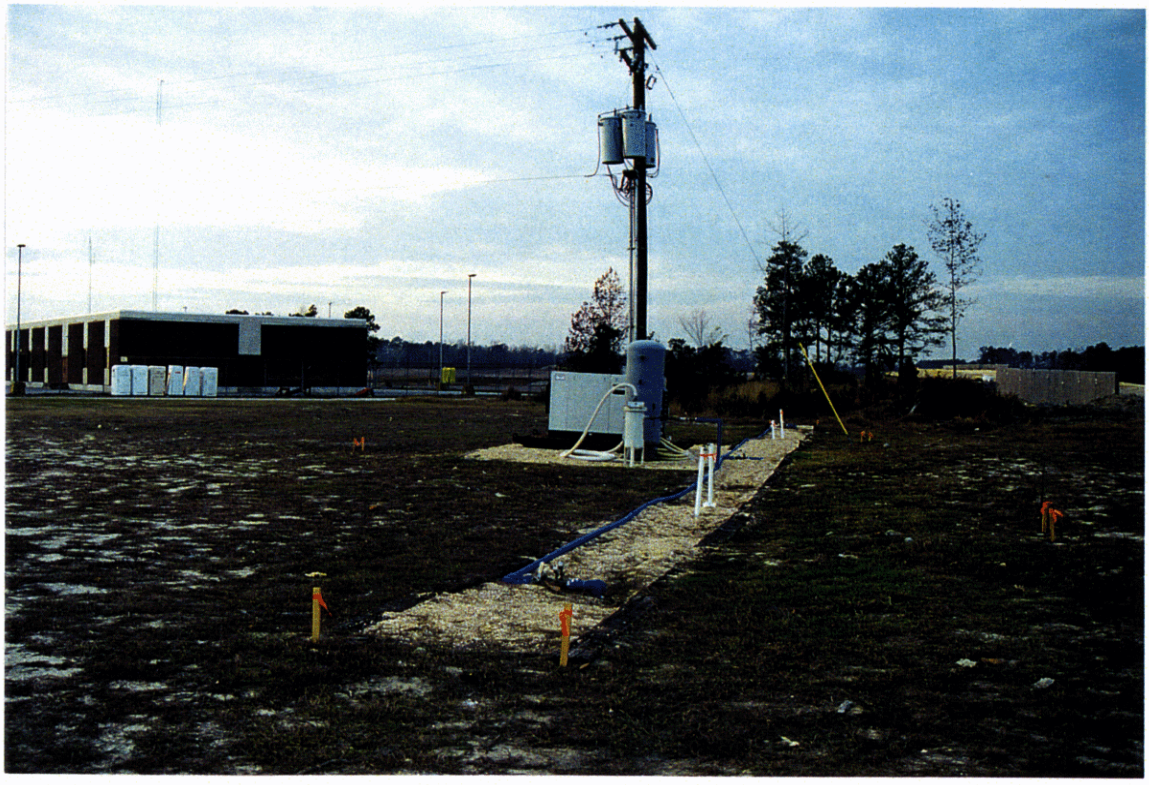
1998. Site 24 No significant changes were noted at Site 24. Monitoring wells at the site are ready to be abandoned.

1998. Site 24 A concrete pad is being constructed along the border of Sites 24 and 78. Access to the site may be restricted in the future. Construction is taking place on the southeast side of Building 1323.

1998. Site 28 The areation pond seen in the left portion of the photograph is no longer in operation at Site 28. The pond was part of the Hadnot Point sewage treatment plant.

1998. Site 28 A large mound of soil in the western portion of site 28 completely covers monitoring well 28-GW08.

1998. Site 30 Photograph taken facing Site 30 southwest from Sneads Ferry Road.



1998. Site 35 Air sparging is currently taking place at Site 35. The air sparging trench, pictured here, will remain operational after the U.S. Highway 17 bypass is complete.

1998. Site 35 Construction activities related to the Highway 17 bypass have resulted in the clearing of trees and grading of soil at Site 35.

1998. Site 35 Construction activities related to the Highway 17 bypass at Site 35.

1998. Site 35 Construction activities related to the Highway 17 bypass at Site 35.

1998. Site 36 Concrete construction debris at Site 36, the result of construction activities in advance of the U.S. Highway 17 bypass.

1998. Site 36 U.S. Highway 17 bypass construction at site 36 has completely changed the appearance and access to Site 36.

1998. Site 36 On-going operation of heavy equipment at Site 36 limits access.

1998. Site 36 The majority of Site 36 has been cleared and roads have been reconfigured as part of the highway construction project.

1998. Site 41 Warning signs are posted at Site 41. Due to the number of trees that have fallen during recent hurricanes, access to the site is quite limited.

1998. Site 41 Fences have been installed at Site 41 where at one time, vehicle access to the site was available.

1998. Site 43 Photograph taken facing northeast from Agan Street at Site 43.

1998. Site 43 A monitoring well at Site 43. Photograph depicts the surrounding wooded area within the site.

1998. Site 44 There is no lock on the gate restricting access to site 44.

1998. Site 44 The fence at Site 44 has been breached by a fallen tree near the housing area. Site security is not being maintained as a result.

1998. Site 48 A new diesel generator has been installed behind Building AS-804 at Site 48.

1998. Site 48 The old photo lab, Building AS-804, is now occupied by the Nuclear Biological, Chemical Defense Section.

1998. Site 54 Site 54 remains a training area for Crash Crew Personnel.

1998. Site 54 During 1999, plans will be initiated to demolish the existing fire pit and oil/water separator at Site 54. A clean burning natural gas fire simulator will be constructed.

1998. Site 63 Downed trees at Site 63 block access. Although it has been reported the wells at Site 63 have been abandoned, they remain.

1998. Site 63 Many downed trees at Site 63 restrict access.

1998. Site 65 There are no major changes noted at Site 65. Some new jogging trails and paths have been added west of the site.

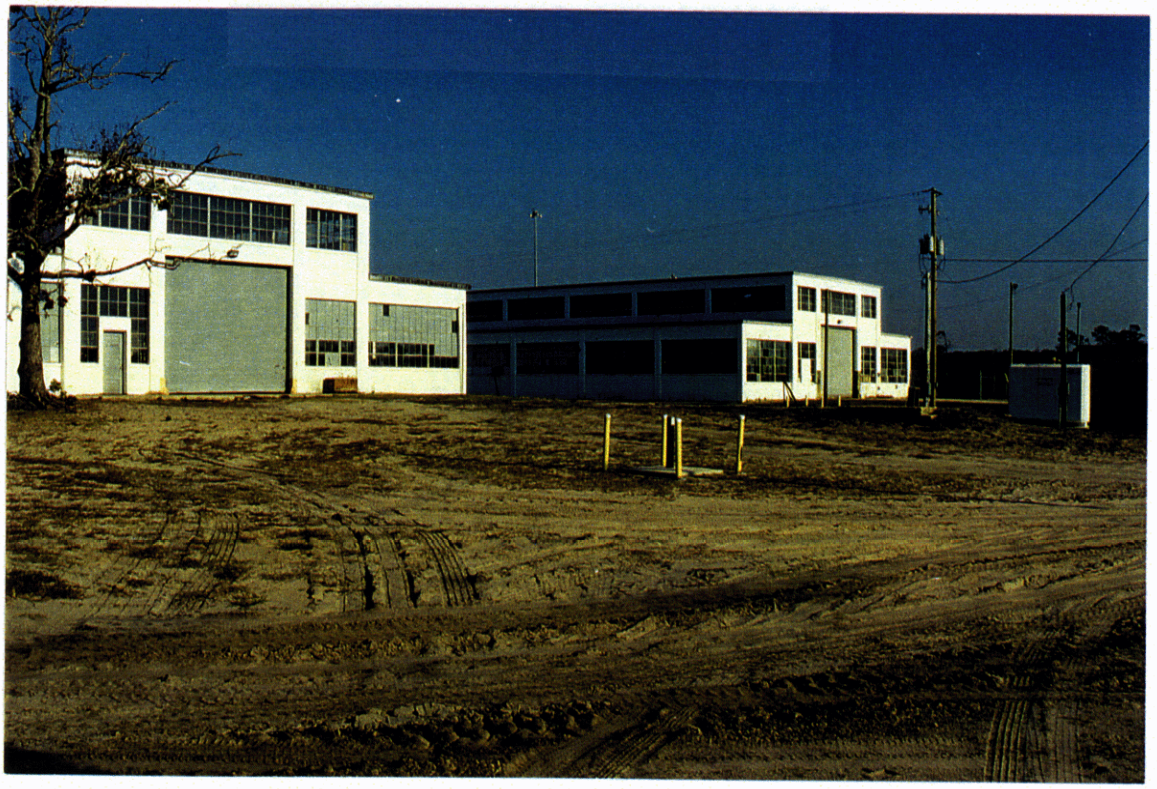
1998. Site 65 Monitoring wells remain at the site and are ready to be abandoned.

1998. Site 68 Site 68 is wooded and primarily used as exercise and jogging trails.

1998. Site 69 Several large trees at Site 69 have fallen across the fence and breached the security of the site.

1998. Site 69 An in-well aeration system was recently removed from the 69-GW15 well cluster shown above. Some general site clean-up is still required to completely demobe the system.

1998. Site 69 Power cables that ran to the treatment system are still connected to the power panel outside the fence at Site 69.



1998. Site 73 Site 73 is used for amphibious training and amphibious vehicle staging. A construction project is planned for the area immediately west of the site where investigations have occurred.

1998. Site 73 No significant changes have been noted at Site 73. Permanent monitoring wells remain at the site.

1998. Site 74 A fence has been installed at Site 74 to limit access.

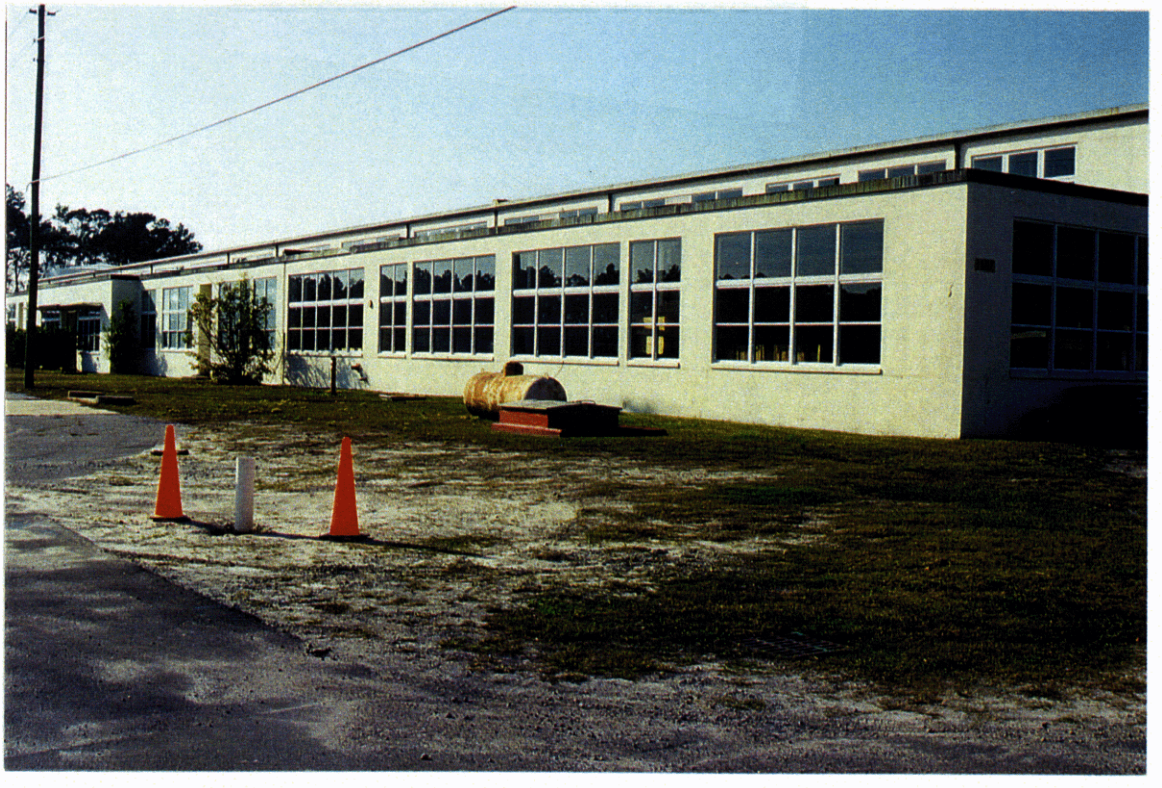
1998. Site 75 Site 75 is located at Marine Corps Air Station New River. A flush mount monitoring well is located in the foreground of this photograph.

1998. Site 75 Recreational areas and housing within site 75.

1998. Site 76 Site 76 is located within Marine Corps Air Station New River. The site is bordered by Curtis Road and McAvoy Street, both shown in this photograph .

1998. Site 76 Looking east at the intersection of Baxter Street and Curtis Road, Site 76.

1998. Site 78 This photograph depicts the location of groundwater contamination in the northern portion of Site 78.



1998. Site 78 The Hadnot Industrial Area (HPIA) at Site 78 is comprised of many buildings used for maintenance and storage.

1998. Site 78 The southern groundwater treatment facility at the Hadnot Point Industrial Area.

1998. Site 78 The northern groundwater treatment facility at the Hadnot Point Industrial Area.

1998. Site 80 This area was used for golf course maintenance. The area shown in the foreground is the location where contaminated soils were excavated from the site.

1998. Site 80 A small clearing to the north of Site 80 may have been used to burn wood debris.

1998. Site 82 The groundwater treatment plant at Site 82.

1998. Site 82 Recovery wells at Site 82 are enclosed in pump houses, as the one pictured above.

1998. Site 84 The lagoon at Site 84 is approximately 40' x 23' and 7' deep. Petroleum odors are evident near the lagoon and petroleum product can be seen as a film on the surface of the water.

1998. Site 84 Building 45, as it appeared in December 1998. The building is schedule to be demolished during 1999.

1998. Site 85 Discarded battery packs are present at Site 85. These debris piles will be removed during 1999.

1998. Site 85 The locations of the debris piles at Site 85 were flagged prior to the removal action.

1998. Site 86 The central portion of Site 86 at Marine Corps Air Station New River. Groundwater contamination has migrated from the site to beneath the building in the background and toward the water tower.

1998. Site 86 Photograph facing west along Campbell Street toward Site 86.

1998. Site 87 Site 87 is located along the New River within the Officer's Housing Area of Marine Corps Air Station New River.

1998. Site 87 Erosion along the back of the New River is undercutting the bank near monitoring well GW02 at Site 87.

1999. Site 88 Building 25. The location of the Surfactant Enhanced Aquifer Remediation Demonstration Project.

1999. Site 88 Storage Tanks used as part of the Demonstration Project at Site 88.

1998. Site 89 Edwards Creek is located in the southern portion of Site 89, the area is heavily vegetated.

1998. Site 89 Monitoring well cluster 89 - MW04, located in the wooded portion of Site 89, east of the Defense Reauthorization and Marketing Office storage lot.

1998. Site 90 Site 90 at the Courthouse Bay Area.

1998. Site 91 Site 91 at the Courthouse Bay Area.

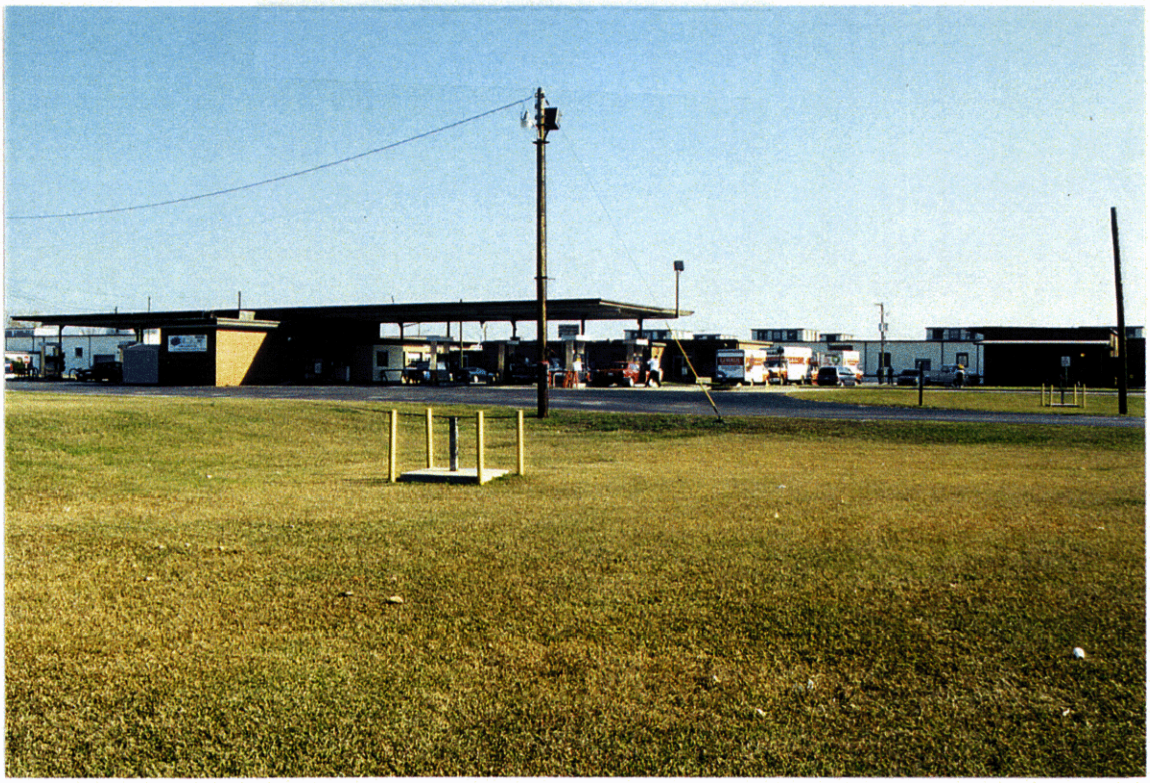
1998. Site 92 The marina area at Courthouse Bay. Three flush mounted monitoring wells are pictured

1998. Site 92 The marina area at Courthouse Bay.

1998. Site 93 A shallow, intermediate, and deep monitoring well cluster at Site 93. Building TC-942 is pictured in the background, to the right.

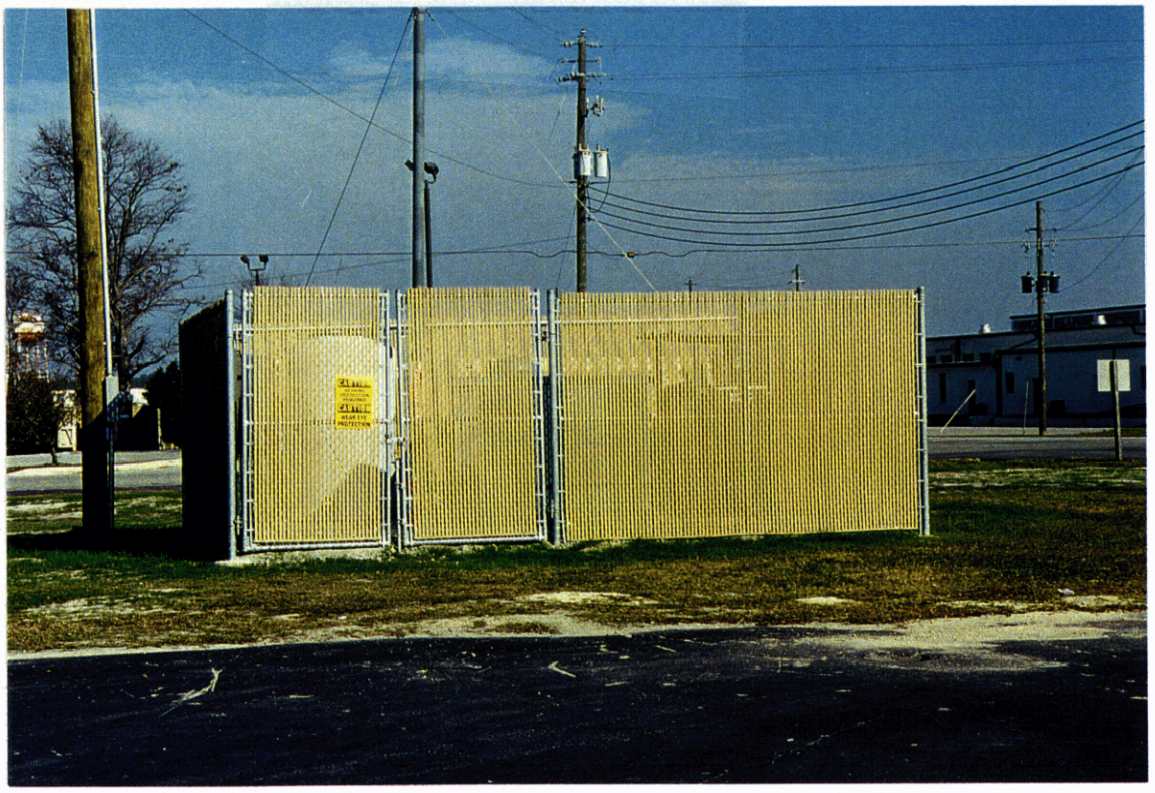
1998. Site 93 Flush mount monitoring well MW01 is shown in the foreground of the photograph.

1998. Site 94 Pump island and fuel dispensers at the Hadnot Point Gasoline Station.



1998. Site 94 Monitoring wells at the Hadnot Point Gasoline Station.

1998. Site 94 New Aboveground Station Tanks used to store fuel at Site 94.



1998. Site 94 Groundwater treatment system at Site 94.

ATTACHMENT C
SITE-SPECIFIC REMEDIATION LEVELS

TABLE 1C

REMEDIATION LEVELS FOR GROUNDWATER CONTAMINANTS OF CONCERN [1]
OPERABLE UNIT NO. 1
SITE 78 – HADNOT POINT INDUSTRIAL AREA
MCB CAMP LJEUNE, NORTH CAROLINA

Contaminant of Concern	RL[2]
Benzene	1.0
1,2-Dichloroethene (total)	70
Ethylbenzene	29
Heptachlor Epoxide	0.2
Tetrachloroethene	0.7
Toluene	1,000
Trichloroethene	2.8
Vinyl Chloride	0.015
Xylenes (total)	400
Arsenic	50
Barium	1,000
Beryllium	4
Chromium	50
Maganese	50
Vanadium	110

(1) Reference: Final Record of Decision for OU No. 1, CTO-0177 (Baker, 1994)

(2) RL = Remediation Level (μg/L)

TABLE 2C

REMEDIATION LEVELS FOR GROUNDWATER CONTAMINANTS OF CONCERN [1]
OPERABLE UNIT NO. 2
SITE 6 – STORAGE LOTS 201 AND 203
SITE 82 - PINEY GREEN ROAD VOC AREA
MCB CAMP LJEUNE, NORTH CAROLINA

Contaminant of Concern	RL[2]
1,2-Dichloroethane	0.38
Trans-1,2-Dichloroethene	70
Ethylbenzene	29
Tetrachloroethene	0.7
Trichloroethene	2.8
Vinyl Chloride	0.015
Arsenic	50
Barium	1,000
Beryllium	4
Chromium	50
Lead	15
Maganese	50
Mercury	1.1
Vanadium	80

(1) Reference: Final Record of Decision for OU No. 2, CTO-0133 (Baker, 1993)

(2) RL = Remediation Level (μg/L)

TABLE 3C

REMEDIATION LEVELS FOR GROUNDWATER CONTAMINANTS OF CONCERN [1]
OPERABLE UNIT NO. 4
SITE 41 – CAMP GEIGER DUMP NEAR FORMER TRAILER PARK
MCB CAMP LJEUNE, NORTH CAROLINA

Contaminant of Concern	RL[2]
Arsenic	50
Beryllium	4
Cadmium	5
Chromium	50
Lead	15
Nickel	100

(1) Reference: Final Record of Decision for OU No. 4, CTO-0212 (Baker, 1995)

(2) RL = Remediation Level (µg/L)

TABLE 4C

CONTAMINANT-SPECIFIC ARARs AND TO BE CONSIDERED CRITERIA[5]
OPERABLE UNIT NO. 5
SITE 2 – FORMER NURSERY AND DAY CARE CENTER
MCB CAMP LEJEUNE, NORTH CAROLINA

Groundwater Contaminant of Concern	MCL(1) (µg/L	NCWQS[2] (µg/L)	Federal Health Advisories[3] (µg/L)	
			For a 10 kg Child Longer Term	For a 70 kg Adult Lifetime
Acenaphthene	--	--	--	--
Arsenic	50	50	--	2[4]
Barium	2,000	2,000	--	200
Beryllium	--	4	400	0.8[4]
4,4'-DDD	--	--	--	--
4,4'-DDT	--	--	--	--
2,4-Dimethylphenol	--	--	--	--
Ethylbenzene	700	29	1,000	700
Lead	15	15	--	--
2-Methylnaphthalene	--	--	--	--
Naphthalene	--	--	400	20
Phenol	--	--	6,000	400
Trichloroethene	5	2.8	--	300[4]
Vanadium	--	--	--	--
Xylene (total)	10,000	530	40,000	10,000

Notes:

(1) MCL = Safe Drinking Water Act Maximum Contaminant Level (MCL for lead is an Action Level)
(2) NCWQS = North Carolina Water Quality Standards for Class GA groundwater
(3) Health Advisories – to be considered criteria
(4) Level at 1E-4 cancer risk
(5) Reference: Final Record of Decision for OU No. 5, CTO-0174 (Baker, 1994)

-- No ARAR available or established

TABLE 5C

REMEDIATION LEVELS FOR SOIL CONTAMINANTS OF CONCERN[1]
OPERABLE UNIT NO. 12
SITE 3 – OLD CREOSOTE PLANT
MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant of Concern	RL	Basis of Goal
Naphthalene	584	NCDENR
2-Methylnaphthalene	4,900	NCDENR
Carbazole	273	NCDENR
Benzo(a)anthracene	343	NCDENR
Chrysene	1,000	SSL

Notes:

RL = Remediation Level in microgram per kilogram (mg/kg)
SSL = USEPA Region III Soil Screening Level (USEPA, 1995) (Note that USEPA Region IV has no Soil Screening Level criteria)
NC DENR = North Carolina Department of Environment and Natural Resources Soil to Groundwater (S3:G1)

[1] Reference: Final Record of Decision for OU No. 12, CTO-0274 (Baker, 1997)

TABLE 6C

REMEDIATION LEVELS FOR GROUNDWATER CONTAMINANTS OF CONCERN[1]
OPERABLE UNIT NO. 12
SITE 3 – OLD CREOSOTE PLANT
MCB CAMP LJEUNE, NORTH CAROLINA

Contaminant of Concern	RL[2]
Benzene	1
Phenol	300
2-Methylphenol	78
2,4-Dimethylphenol	31
Naphthalene	21
2-Methylnaphthalene	63
Dibenzofuran	6
Phenanthrene	210
Benzo(a)anthracene	0.05
Chrysene	5
Chloroform	0.19
Carbazole	4
Benzo(b)fluoranthene	0.12
Benzo(k)fluoranthene	1
Benzo(a)pyrene	2
Iron	300
Aluminum	50

(1) Reference: Final Record of Decision for OU No. 12, CTO-0274 (Baker, 1997)

(2) RL = Remediation Level (μg/L)