

Final

Site Management Plan Fiscal Year 2009

Marine Corps Base Camp Lejeune
Jacksonville, North Carolina



Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic**

Contract No. N62470-02-D-3052
CTO-0171

September 2008

Prepared by

CH2MHILL

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Contract Task Order 171

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Under the

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Charlotte, North Carolina

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Acronyms and Abbreviations

AFVR	aggressive fluid vapor recovery
AM	Action Memorandum
amsl	above mean sea level
AMTRAC	amphibious tractor
AOC	area of concern
AST	aboveground storage tank
bgs	below ground surface
BOQ	Bachelor Officers Quarters
BRA	Baseline Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAIS	chemical agent identification sets
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Community Involvement Plan
COC	contaminant of concern
COPC	contaminant of potential concern
CN	2-chloroacetophenone
CS	2-chlorobenzalmalononitrile
CSI	Confirmatory Site Investigation
CSM	conceptual site model
CSS	Chemical Safety Submission
CWM	chemical warfare material
°F	degrees Fahrenheit
DCE	dichloroethene
DD	Decision Document
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DLA	Defense Logistics Agency
DMM	discarded military munitions
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DRMO	Defense Reutilization Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EOD	explosive ordnance disposal
ERA	Ecological Risk Assessment
ERD	Enhanced Reductive Dechlorination

ERH	electrical resistance heating
ERS	ecological risk screening
ESD	explanation of significant differences
ESI	Expanded Site Investigation
EVO	emulsified vegetable oil
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft	feet, foot
ft ²	square feet
FY	Fiscal Year
HDD	horizontal directionally drilled
HHRA	Human Health Risk Assessment
HHRS	Human Health Risk Screening
HPIA	Hadnot Point Industrial Area
HQMC	Headquarters Marine Corps
HRC®	Hydrogen Release Compounds®
IAS	Initial Assessment Study
IR	Installation Restoration
IRP	Installation Restoration Program
IRA	Interim Removal/Remedial Action
IRACR	Interim Remedial Action Completion Report
IROD	Interim Record of Decision
ISCO	<i>In Situ</i> Chemical Oxidation
ISTD	<i>In Situ</i> Thermal Desorption
JP	jet propulsion
LNAPL	light non-aqueous phase liquid
LTM	long-term monitoring
LTTD	low temperature thermal desorption
LUC	land use control
LUCIP	Land Use Control Implementation Plan
µg/L	micrograms per liter
MC	munitions constituent
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MEC	munitions and explosives of concern
MEK	methyl ethyl ketone
MILCON	Military Construction
MIP	membrane interface probe
MMRP	Military Munitions Response Program
MNA	monitored natural attenuation
MRP	Munitions Response Program
MTBE	methyl tert-butyl ethylene

NACIP	Navy Assessment and Control of Installation Pollutants
NAE	Natural Attenuation Evaluation
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NBC	nuclear, biological, and chemical
NCDENR	North Carolina Department of Environment and Natural Resources
NCGWQS	North Carolina Groundwater Quality Standards
NCP	National Oil and Hazardous Substances Pollution Control Contingency Plan
NFA	No Further Action
NTCRA	Non-time-critical Removal Action
NPL	National Priorities List
O&G	oil and grease
ORC®	Oxygen Release Compounds®
OU	operable unit
OWS	oil-water separator
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
PCA	tetrachloroethane
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCP	pentachlorophenol
POL	petroleum, oil, lubricant
ppb	parts per billion
ppm	parts per million
PPV	Public-Private Venture
PRAP	Proposed Remedial Action Plan
PRB	permeable reactive barrier
PSA	Preliminary Site Assessment
PSI	Preliminary Site Investigation
RA	Remedial Action
RAB	Restoration Advisory Board
RABITT	Reductive Anaerobic Bioremediation <i>In Situ</i> Treatment Technology
RAC	Remedial Action Contract
RAO	Remedial Action Objective
RACR	Remedial Action Closeout Report
RASO	Radiological Affairs Service Office
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	nitroaromatic
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RIP	Remedy-in-Place
ROD	Record of Decision

SARA	Superfund Amendments and Reauthorization Act
SC	Site Closeout
SEAR	Surfactant Enhanced Aquifer Remediation
SGI	Supplemental Groundwater Investigation
SI	Site Investigation/Site Inspection
SMP	Site Management Plan
SSI	Supplemental Site Investigation
STP	sewage treatment plant
SVE	Soil Vapor Extraction
SWMU	Solid Waste Management Unit
SVOC	semivolatile organic compound
TCE	trichloroethene
TCRA	Time-critical Removal Action
TEU	Technical Escort Unit
TNT	trinitrotoluene
TPH	total petroleum hydrocarbon
U.S.	United States
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
WWII	World War II
ZVI	zero valent iron

Introduction

This document presents the Draft Fiscal Year (FY) 2009 Site Management Plan (SMP) for Marine Corps Base (MCB) Camp Lejeune, North Carolina. This SMP presents planned activities to be conducted at MCB Camp Lejeune during FY 2009 and provides projections for long-term progress in accordance with the Department of the Navy (Navy) Installation Restoration (IR) Program (IRP). This document has been prepared by CH2M HILL, Inc. for Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division and the MCB Camp Lejeune IRP. This document is submitted to representatives of the North Carolina Department of Environment and Natural Resources (NCDENR), the United States (U.S.) Environmental Protection Agency (USEPA) Region 4, and members of the MCB Camp Lejeune IR Restoration Advisory Board (RAB).

1.1 SMP Purpose

The FY 2009 SMP is a forward-looking management tool and one of the primary documents identified in the Federal Facilities Agreement (FFA) (MCB Camp Lejeune, 1991). The SMP includes proposed deadlines for completion of deliverables, as specified in the FFA, to be submitted during FY 2009. The prioritization of activities and the conceptual schedules were developed by the MCB Camp Lejeune IRP Partnering Team, which includes representatives from NAVFAC, MCB Camp Lejeune, USEPA, and NCDENR. The SMP is a working document that is updated yearly to maintain current documentation and summaries of environmental actions at MCB Camp Lejeune. This SMP updates and supersedes the FY 2008 SMP (CH2M HILL, 2007a).

In addition to the SMP, the second update to the Camp Lejeune Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review Plan, that provides the schedule for 5-year reviews at MCB Camp Lejeune, was completed in FY 2004 (initial version FY 1999) and the next update is scheduled for FY 2009. The third update to the Community Involvement Plan (CIP), that provides information on community participation, was completed in FY 2006 (initial versions in FY 1990 and FY 1994) and the next update is scheduled for FY 2010.

1.2 SMP Report Organization

The FY 2009 SMP for MCB Camp Lejeune consists of four sections, organized as follows:

- **Section 1** – SMP purpose and report organization
- **Section 2** – Description and environmental history of MCB Camp Lejeune

- **Section 3**—Descriptions of IRP sites, Munitions Response Program (MRP) sites, and sites requiring re-evaluation; schedule for conducting activities; and specific target submittal dates for FY 2009, FY 2010, and FY 2011 documents
- **Section 4**—References

MCB Camp Lejeune Description and Environmental History

2.1 Base Description

MCB Camp Lejeune was commissioned in 1942 as a training area to prepare Marines for combat. The MCB Camp Lejeune complex consists of six geographical locations under the jurisdiction of the Base command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Greater Sandy Run Area, and the Rifle Range Area. MCB Camp Lejeune is host to five Marine Corps commands and two Navy commands. All of the real estate and infrastructure are owned, operated, and maintained by the host command. MCB Camp Lejeune also provides support and training for the following tenant commands: Headquarters Nucleus, Second Marine Expeditionary Force; Second Marine Division; Second Marine Logistics Group; Second Marine Surveillance, Reconnaissance, and Intelligence Group; Sixth Marine Expeditionary Brigade; the Naval Hospital; and the Naval Dental Clinic.

MCB Camp Lejeune is located on 236 square miles of land in Onslow County, North Carolina, adjacent to the southern side of the City of Jacksonville (**Figure 2-1**). Jacksonville is the largest city near MCB Camp Lejeune and contains approximately half of the county's total population. Since 1990, much of the MCB Camp Lejeune complex has been part of Jacksonville. The Base is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction. The Base is bordered by the Atlantic Ocean to the east, U.S. Route 17 to the west, and State Route 24 to the north.

2.2 Facility-wide Demography and Land Use

MCB Camp Lejeune is home to an active duty, dependent, retiree, and civilian population of approximately 150,000. Approximately 47,000 military personnel are stationed at MCB Camp Lejeune, including 39,000 Marines for resident formal school training, and 8,000 Marines and Department of Defense (DoD) employees for job enhancement training. MCB Camp Lejeune provides housing, training facilities, logistical support, and administrative supplies for Fleet Marine Force units and other assigned units.

Training facilities at the Base include Camp Geiger, Camp Johnson, Stone Bay, Greater Sandy Run Training Area, and Marine Corps Air Station (MCAS) New River. Military training operations also include 78 live-fire ranges, 98 maneuver areas, 34 gun positions, 50 tactical landing zones, and a military operation in an urban terrain training facility. In addition, the 11 miles of beach frontage at the Base is capable of supporting amphibious operations.

Located within Onslow County, along the coastal plain of North Carolina, the Base covers more than 153,000 acres that consist of approximately 26,000 acres of water and 127,000

acres of terrestrial features. Elevation at the Base ranges from sea level to 70 feet (ft) above mean sea level (amsl), with much of the site topography traversed by swales, wetlands, streams, and creeks that drain into the New River. The Base encompasses a 92-mile perimeter, including approximately 14 miles along the Atlantic Ocean. The ocean frontage of the Base is composed of a fragile barrier island system that is separated from the mainland by salt marshes, small bays, and an intercoastal waterway.

Most of the land surrounding the facility is used for agriculture. Estuaries along the coast support commercial fishing and residential resort areas are located adjacent to the Base along the Atlantic Ocean.

2.3 Regional and Facility-wide Physiography, Climate, and Surface Water Hydrology

MCB Camp Lejeune lies within the outer part of the Atlantic Coastal Plain Physiographic Province in North Carolina. This physiographic province stretches from Georgia to Long Island, New York. The physiography of the area is typical of the Atlantic Coastal Plain, with stepped terraces consisting of wide, gently eastward-sloping plains separated by linear, steeper, northward and eastward-facing scarps. Low elevations and relatively low relief characterize topography across MCB Camp Lejeune. The surface elevations range from sea level to approximately 70 ft amsl, with most of MCB Camp Lejeune's elevation ranging from 20 to 40 ft amsl.

Mild winters and hot, humid summers generally characterize climatic conditions within southeastern North Carolina and at MCB Camp Lejeune. Winters are usually short and mild with occasional short, cold periods. Summers are long, hot, and humid, with an average humidity of 75 percent. Average annual net precipitation is approximately 54 inches. Ambient air temperatures generally range from 37 to 60 degrees Fahrenheit (°F) in the winter months and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer, and north-northwesterly in the winter (NOAA, 2002).

The land at MCB Camp Lejeune generally slopes toward the New River with a grade of about 0.5 percent. The relief between stream and interstream areas typically ranges from 20 to 30 ft.

2.4 Geology and Hydrogeology

2.4.1 General Regional Geologic and Hydrogeologic Framework

Southeastern North Carolina and MCB Camp Lejeune are within the Tidewater region of the Atlantic Coastal Plain Physiographic Province. The Tidewater region is of low relief, with elevations averaging about 20 ft amsl and is generally swampy. The MCB Camp Lejeune area is underlain by an eastward-thickening wedge of marine and non-marine sediments ranging in age from early Cretaceous to Holocene. The eastward-thickening wedge of sediment begins at the fall line (western boundary of Atlantic Coastal Plain physiographic province) and dips southeastward towards the coast. Along the coastline, several thousand feet of interlayered, unconsolidated sediment is present, consisting of

gravel, sand, silt, clay deposits, calcareous clays, shell beds, sandstone, and limestone, that was deposited over pre-Cretaceous crystalline basement rock. Minor amounts of detrital carbonate shells and secondary minerals, such as glauconite, siderite, and chlorite, often distinguish these sedimentary units.

Historical Coastal Plain sedimentation and deposition was controlled by fluctuations in sea level on a subsiding continental margin in marine and near-shore environments (Winner and Coble, 1989). Confining units associated with specific aquifers within the Coastal Plain region are composed of less permeable beds of clay and silt. Within the MCB Camp Lejeune area, approximately 1,500 ft of a sedimentary sequence that overlies the basement rock is composed of seven aquifers (the Surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and Upper and Lower Cape Fear aquifers) and their associated confining units (Cardinell, Berg, and Lloyd, 1993).

Recharge of aquifers within the Coastal Plain region generally occurs within interstream areas. Annual recharge to the aquifers has been estimated in the range of 5 to 21 inches of rainfall (Heath, 1989). Natural discharge of groundwater from the Coastal Plain aquifer system is generally into streams, swamps, and lakes. Evapotranspiration from the soil zone and upward leakage through confining units into streams, estuaries, swamps, and even the ocean also contribute to groundwater discharge. The New River estuary serves as the principal discharge area for groundwater from the Castle Hayne aquifer within the vicinity of MCB Camp Lejeune (Harned, Lloyd, and Treece, 1989).

2.4.2 Regional Water Usage

Potable water to MCB Camp Lejeune and the surrounding residential area is provided by water supply wells that pump groundwater from the Castle Hayne aquifer. Although fresh water is present within the Surficial, Castle Hayne, Beaufort, and Peedee aquifers, all of which are located below MCB Camp Lejeune, only the Castle Hayne aquifer is used by the Base as a water supply source (Cardinell, Berg, and Lloyd, 1993). Regionally in southeastern North Carolina, the Castle Hayne aquifer may be used as a potable source of domestic water supply and for watering lawns or filling swimming pools.

Based on the information provided in the Wellhead Protection Plan (AHEC, 2002), there are 67 active water supply wells on Base, which rely entirely on groundwater as the supply source. The supply wells are included in the Base's annual wellhead monitoring program to ensure compliance with drinking water standards (Geophex, 1991).

2.5 Environmental History

2.5.1 IRP History

MCB Camp Lejeune has been actively engaged in environmental investigations 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 of potentially hazardous sites at the Base conducted under NACIP. The IAS, which was conducted in 1983 (WAR, 1983) identified areas of concern (AOCs) that might cause threats to human health and the environment as a result of past storage, handling, and disposal of hazardous materials. Based on a review of historical records, field inspections,

and personal interviews, 76 AOCs were identified. The IAS conclusions stated that while none of the posed an immediate threat to human health or the environment, further investigations to assess the potential long-term impacts were warranted at 23 of these sites.

The Navy's IRP was initiated in 1986 following enactment of the Superfund Amendments and Reauthorization Act (SARA) legislation. IRP, which was implemented to follow the requirements of SARA, replaced NACIP. MCB Camp Lejeune was placed on the CERCLA National Priorities List (NPL) on October 4, 1989 (54 *Federal Register* 41015, October 4, 1989). Following that listing, a FFA between USEPA Region 4, North Carolina Department of Environment, Health, and Natural Resources (now NCDENR), and the Navy was signed in February 1991. The FFA was created under CERCLA Section 120 and 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, welfare, 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 National Oil and Hazardous Substances Pollution Control Contingency Plan (NCP), and relevant USEPA remediation policy
- To encourage public participation and to facilitate cooperation and exchange of information among parties associated with the investigation and remediation process

The original FFA pertained to 23 of the initial sites identified at MCB Camp Lejeune. The 23 sites have 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, 23 newly identified sites throughout MCB Camp Lejeune have been added to the original list of 23, bringing the total to 46 IR sites. Twenty additional sites were added to this SMP for re-evaluation in FY 2008 and may be added to the IRP. At present, there are no specific requirements to amend the FFA. If, however, amendments to the FFA are necessary, a summary of the changes will be outlined in this section of the SMP.

As part of the requirements established under CERCLA, an administrative record file has been established for the IRP at MCB Camp Lejeune. The administrative record is a compilation of all documents that the Navy used to select a remedial action or removal action for a site. Regardless of the nature of the site, an administrative record must be maintained. The administrative record will also serve as the basis for any future legal review of decisions made by the Navy concerning remedial action taken at a site. A copy of the MCB Camp Lejeune administrative record file is available for review at NAVFAC Mid-Atlantic in Norfolk, Virginia. The files can also be viewed online at: <http://lejeune.lantops-ir.org/>. Access to the website is available at the Onslow County Library.

2.5.2 MRP History

DoD established the Military Munitions Response Program (MMRP), which was shortened to MRP by the Navy. The MRP was established under the Defense Environmental

Restoration Program (DERP) in September 2001 to address military munitions and explosives of concern (MEC) (i.e., unexploded ordnance and waste military munitions) and munitions constituents (MC) (i.e., chemical residues of munitions) at locations that are not operational ranges. A requirement was established requiring identification, characterization, and tracking of data on military munitions and military munitions responses at these locations. By September 2002, all locations other than operational ranges requiring a military munitions response were inventoried. DoD set a goal for remedy-in-place (RIP) or response complete (RC) at all MRP sites by the end of FY 2020.

DoD and the Navy are establishing policy and guidance for munitions and response actions under the MRP; however, the key program drivers developed to date conclude that munitions response action will be conducted under the process outlined in NCP, as authorized by CERCLA. Therefore, the Navy and Marine Corps will work with the MCB Camp Lejeune IRP Partnering Team to follow the CERCLA process to address MRP sites identified at the Base. To date, seventeen MRP sites have been identified at MCB Camp Lejeune.

2.6 CERCLA Process

The objectives of the CERCLA process are to evaluate the nature and extent of contamination at a site, and to identify, develop, and implement appropriate remedial actions to protect human health and the environment. The major elements of the CERCLA process are:

- Preliminary Assessment/Site Investigation or Site Inspection (PA/SI)
- Remedial Investigation/Feasibility Study (RI/FS)
- Proposed Remedial Action Plan (PRAP) and Record of Decision (ROD)
- Remedial Design (RD) and Remedial Action (RA)
- RIP and RC

These elements are discussed in further detail in the subsections below. The documents prepared for the IRP are maintained in information repositories for public review. MCB Camp Lejeune has developed a CIP and established a RAB comprised of members of the community, local environment group members, and state and federal officials, who meet quarterly to maintain community involvement on IR issues at the Base.

2.6.1 Preliminary Assessment/Site Investigation

The IRP begins with concerns about a site, area, or potential contaminant source. The PA/SI phase of the CERCLA process evaluates potential sites to determine if the site should be eliminated from further consideration (i.e., no further action [NFA]), identified for an action to address actual or imminent threats to human health or the environment, or further evaluated through the performance of a RI/FS.

2.6.1.1 Preliminary Assessment

The PA is a limited-scope assessment designed to distinguish between sites that clearly pose little or no threat to human health or the environment and those that may pose a threat and require further investigation. This stage typically involves a review of historical documents and a visual site inspection. Environmental samples are rarely collected during a PA; rather,

a PA is intended to be a relatively quick, low-cost compilation of existing information about a site. The PA may result in a determination of NFA; completion of an SI if there is insufficient information to reach a NFA decision; a removal action if significant threat to human health or the environment exists; or an RI/FS if remediation is deemed necessary.

2.6.1.2 Site Investigation

The SI is the most common step after a PA is completed. The SI involves an onsite investigation intended to gather more information needed in determining whether there is a release or potential release, and to characterize the nature of the release and associated threats or potential threats to human health and the environment. SI typically includes the collection of environmental samples to identify what hazardous substances are present at a site and a screening risk assessment to determine if they have been released at levels posing an unacceptable risk to human health to the environment. The sites that do not require further investigation or response are designated as NFA. If there is insufficient information to reach a NFA decision a removal action or an RI/FS may be recommended.

2.6.2 Remedial Investigation/Feasibility Study

The purpose of the RI/FS is to determine the nature and extent of the threat presented by a release of a hazardous substance and, if sufficient need is documented by site sampling and a risk assessment, to evaluate proposed remedies. The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterization, thereby minimizing the collection of unnecessary data and maximizing data quality.

2.6.2.1 Remedial Investigation

The RI is the investigative phase of the response action designed to characterize site conditions, determine the nature and extent of contamination, assess the risk to human health and the environment posed by site contamination; and provide a basis for decisions on further response actions or NFA. The RI provides information to refine the conceptual site model (CSM) and forms the basis for the development of remedial action objectives (RAOs) and remedial strategies that will comprise the FS.

2.6.2.2 Feasibility Study

The FS is the mechanism for the development, screening, and detailed evaluation of alternative remedial actions. The overall objectives of an FS are to develop and evaluate potential remedies that permanently and significantly reduce the threat to public health, welfare, and the environment; select a cost-effective remedial action alternative that mitigates the threat(s); and achieve consensus regarding the selected response action.

2.6.2.3 Removal Action

A removal action is a response implemented in an expedited manner to address releases or threatened releases in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions include time-critical removal actions (TCRAs) and non-time-critical removal actions (NTCRAs).

Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as TCRA. The planning period for a TCRA is 6 months or less before field work is initiated. An Engineering Evaluation/Cost Analysis (EE/CA) is not required for a TCRA, although an appropriate Work Plan must be completed.

Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as NTCRA. For a NTCRA, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than on all contaminated substances at the site. A removal action can become the final remedial action if the risk assessment results indicate that NFA is required to protect human health and the environment.

A removal action can be either the final remedy or an interim action followed by a remedial action as the final remedy, based on the extent to which the threats are mitigated by the action. A removal action, when implemented as the final remedy, can be used for fast and significant reductions in risk and to mitigate long-term threats. In cases where the removal action is the final remedy, the removal action may lead to either RC or Site Closeout (SC). If the removal action was accomplished during the RI/FS phase, any final determination of RC and/or SC must be documented in the ROD. If the NCP nine criteria were not addressed as part of the EE/CA or Action Memorandum (AM), a focused FS would be needed, followed by a ROD.

2.6.2.4 Treatability Study

Treatability studies involve testing and evaluation of a treatment technology to determine the effectiveness of that technology at a particular site or to establish site-specific design parameters. The primary objectives of treatability testing are to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS, and to support the remedial design of a selected alternative. Treatability studies may be conducted at any time during the CERCLA process.

The need for a treatability study generally is identified during the FS. Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). For technologies that are well-developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process, and are designed to bridge the gap between bench-scale and full-scale operations.

Treatability studies may also be needed during the RD/RA phase to obtain more detailed information about the unit operations, performance, and cost for designing a full-scale treatment system. Generally, a pilot-scale system is deployed onsite to collect the required information.

2.6.3 Proposed Remedial Action Plan and Record of Decision

The remedy selection process involves identifying a preferred response action strategy from those alternatives evaluated in the FS. The preferred alternative is based first on each alternative's ability to satisfy the threshold criteria, and then on trade-offs among

alternatives considering the primary balancing criteria. Further, results of the risk assessment need to be factored into the selection of the remedy. The remedy selection process includes a PRAP and ROD.

2.6.3.1 Proposed Remedial Action Plan

A PRAP presents the remedial alternatives developed in the FS and recommends a preferred remedial method. The public has an opportunity to comment on the PRAP during an announced formal public comment period. Site information is compiled in an administrative record and placed in the general IRP information repositories established at local libraries for public review. A public meeting is also held to provide supporting information.

The ROD document is then issued, which describes the remedy selection process and the remedy selected. All parties directly involved in the IRP (Navy, USEPA, NCDENR, and public) must agree on the selected alternative. Any public comments received are addressed as part of the responsiveness summary in the ROD. A public notice is issued after the ROD is signed and available for public inspection. A public notice is also published for any significant post-ROD changes. Once the ROD has been signed, the RD/RA process is initiated.

2.6.3.2 Record of Decision

At the end of the PRAP public comment period, an appropriate remedial alternative is chosen to protect human health and the environment. The ROD document is then issued, which describes the remedy selection process and the remedy selected. All parties directly involved in the IRP, (Navy, USEPA, NCDENR, and public) must agree on the selected alternative. Any public comments received are addressed as part of the responsiveness summary in the ROD. A public notice is issued after the ROD is signed and available for public inspection. A public notice is also published for any significant post-ROD changes.

2.6.4 Remedial Design and Remedial Action

Following signature of the ROD, the RD and RA phases are implemented. The technical specifications for cleanup remedies and technologies are designed in the RD phase. The RA is the actual construction or implementation phase of the cleanup process.

2.6.4.1 Remedial Design

The purpose of the RD phase is to convert the conceptual design for the selected remedy from the FS into a full-scale detailed design for implementation. RD includes preparation of technical RD Work Plans, drawings, specifications, and RA Work Plans.

2.6.4.2 Remedial Action

Upon completion of the RD, implementation of the RA (the remedy selected in the ROD) begins. The RA start date is defined as the date the contractor has mobilized and begun substantial and continuous physical onsite remedial action. The start date is important because it triggers the beginning of the 5-year review cycle if one is required. The RA phase involves two main components, remedial action construction and remedial action operation.

Interim RAs (IRAs) are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, RAs may be implemented at any time during the process. Examples of IRAs include installing a pump-and-treat system for product recovery from groundwater or installing a fence to prevent direct contact with hazardous materials. For IRAs, a focused FS is prepared rather than the more-extensive FS. As with the removal action, an interim action may become the final RA if the results of the risk assessment indicate that NFA is required to protect human health and the environment.

2.6.5 Remedy-in-Place and Response Complete

2.6.5.1 Remedy-in-Place

For long-term remedies where it is anticipated that RAOs will be achieved over a long period, the RIP milestone signifies the completion of the RA construction phase, and that the remedy has been implemented and has been demonstrated to be functioning as designed (i.e., all testing has been accomplished and the remedy will function properly). Once RIP is completed for a site, an Interim Remedial Action Completion Report (IRACR) is prepared to document that the remedy is constructed and operating successfully.

2.6.5.2 Response Complete

At any point during the CERCLA process, a decision can be made that no further response action is required; properly documented (necessary regulatory notification or application for concurrence has occurred), these decisions constitute RC and/or site closeout. RC is the point at which the remedy has achieved the required reduction in risk to human health and the environment (cleanup goals/RAOs have been met). Once RC is completed for a site under a ROD, a Remedial Action Completion Report (RACR) is prepared to demonstrate that the remedy is complete and the RAOs are met. RC is followed by individual site closeout.

Once all RIPs and RCs have been documented for every site at the facility and the terms of the FFA have been met, site closeout and NPL deletion is requested.

2.6.5.3 Five-Year Reviews

Five-year reviews generally are required by CERCLA or program policy when hazardous substances remain on a site above levels that permit unlimited use and unrestricted exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy and whether it still protects human health and the environment. Generally, reviews are performed 5 years after the initiation of a CERCLA response action, and are repeated every 5 years as long as future uses remain restricted. USEPA or the lead agency for a site can perform these reviews, but USEPA is responsible for assessing the protectiveness of the remedy.

Site Descriptions

A total of 86 sites have been identified under the Base IRP and MMRP (**Figure 3-1**). Currently, 69 sites have been identified for further investigation under the Base IRP. The original FFA identified 23 sites while an additional 26 sites have been identified for further investigation since the FFA was signed. An additional 20 sites, previously identified in the 1983 Initial Assessment Study (IAS) for the Base, have been included for re-evaluation under the IRP. Of the 69 sites identified in the IRP, 29 sites are considered currently active (under investigation, remediation, long-term monitoring (LTM), or have land use controls [LUCs] implemented) (**Figure 3-2**), 2 sites have been transferred to the Base underground storage tank [UST] Program for further action (**Figure 3-3**), 16 sites have been formally closed (**Figure 3-4**), and the remaining 22 sites are currently under Preliminary Assessment (PA) to determine if any further action is warranted (**Figure 3-5**). There are currently 17 sites identified for further investigation under the Base MRP. Of the 17 sites, 16 are considered currently active (**Figure 3-6**) and 1 has been formally closed (**Figure 3-7**). The extent of each IR Site and MRP site are shown on **Figures 3-8** through **3-77**.

The majority of the IR sites are grouped into Operable Units (OUs) based on geographic location of sites or specific site problems, as shown in **Table 3-1**. For figures illustrated in this SMP for which OU boundaries were developed prior to investigation completion, the site boundaries were developed based on suspected contamination and the land use control (LUC) boundaries were set based on final investigative data. For sites currently undergoing investigation (Sites 35, 73, 86, 88, and 89), the site boundaries reflect the extent of contamination derived from the most recently collected data. **Table 3-2** summarizes the previous investigations completed at each site. **Table 3-3** lists the current status of each site, and provides a list of primary documents and anticipated submittal dates for FY 2009, FY 2010, and FY 2011.

The following subsections provide a brief site description and history, summary of previous investigations, and planned CERCLA activities for FY 2009. The subsections are organized according to the site's current phase in the CERCLA process. Site-specific schedules are provided for active sites in **Tables 3-6** through **3-38**. These schedules are adjusted annually within the SMP or periodically throughout the FY.

For ease of reference to tables and figures, **Tables 3-6** through **3-38** and **Figures 3-8** through **3-77** have been organized numerically by site or OU, as appropriate, and not according to the order they are discussed in the text.

3.1 Preliminary Assessment/Site Investigation Sites

The following sections discuss the site history for the 24 IRP sites and 16 MRP sites which are in the PA/SI phase of the CERCLA process. PA/SI reports have been completed for three of these IR sites and future investigations are planned. PA/SIs will be implemented in the future at the remaining 35 sites.

3.1.1 IR Sites

3.1.1.1 MCAS New River (Buildings SAS113, AS116, and AS119)

The MCAS New River PA site includes Buildings SAS113, AS116, and AS119, located in the northwest portion of the Base (**Figure 3-8**).

Building SAS113 was constructed in 1986 when surrounding buildings were converted into automotive hobby shops. Currently, Building SAS113 primarily serves as an outside work and storage area for the automobile hobby shops. The chemicals used or stored in Building SAS113 are unknown; however, it is suspected that any number of automobile repair wastes are used or stored here and may include paints, paint thinners, waste oil, antifreeze, parts cleaning wastes (solvents and parts washers), automotive batteries, and shop cleaning wastes (floor cleaning wastes, absorbents used for spills or leaks and shop rags). The waste disposal practices are also unknown.

Building AS116 was constructed in 1954 to provide the Air Station with vehicle maintenance facilities. From 1979 to 1981, Building AS116 served as a hazardous and flammables storage area; and in the early 1980s, Building AS116 was converted into an automotive hobby shop. The chemicals used or stored in Building AS116 are unknown; however, it is suspected that any number of automobile repair wastes are used or stored here and may include waste oil, antifreeze, parts cleaning wastes (solvents and parts washers), automotive batteries, and shop cleaning wastes (floor cleaning wastes, absorbents used for spills or leaks and shop rags). Building AS116 is also listed as a paint shop and may include the following wastes associated with painting: paint thinners (mineral spirits, toluene, methyl ethyl ketone [MEK], or acetone) and waste paint.

Building AS119 was constructed in 1963 as an Automotive Vehicle Maintenance Facility, and in 1988, a fuel oil storage tank with a capacity of 250 gallons was installed on a concrete pad. The chemicals used or stored in Building AS119 are unknown; however, it is suspected that any number of automobile repair wastes are used or stored in this building and may include paint, paint thinners, waste oil, antifreeze, parts cleaning wastes (solvents and parts washers), automotive batteries, and shop cleaning wastes (floor cleaning wastes, absorbents used for spills or leaks and shop rags).

PA/SI (2001-2006)

A PA was conducted for Buildings SAS113, AS116, and AS119 in 2001, which included a literature review and field reconnaissance. A qualitative evaluation of the potential impact of the sites on human health and the environment was also performed. Because information was not known about the possible types and or extent of contamination at these sites, field investigation activities were recommended. As a result, an SI was completed in June 2004. Field activities included soil and groundwater investigations. Based on the analytical results, the Final PA/SI report (issued in February 2006) recommended further investigation of groundwater at Buildings SAS113, AS116, and AS119 due to the presence of metals and recommended further investigation of soils at Building AS119 due to the presence of semivolatile organic compounds (SVOCs), pesticides, and metals.

Future Activities

Based on the findings of the PA/SI, future investigations are planned for Buildings SAS113, AS116, and AS119.

3.1.1.2 Montford Point (Buildings M119 and M315)

The Montford Point PA site includes Buildings M119 and M315, located in the Montford Point portion of the Base (**Figure 3-9**). Building M119 was constructed in 1943 as a Gun Shed; most likely storing Howitzers. Over the years the building has been renovated, and has been used as a classroom and vehicle repair shop. There are a number of fuel oil tanks that are used for heating this building. Known chemicals/compounds that were used or stored in Building M119 include solvents, waste oils, gasoline, and vehicle repair related materials. Potential vehicle repair related materials used or stored at this building may include paint and paint thinners, parts cleaning wastes (solvents and parts washers), automotive batteries, automotive oils, and shop cleaning wastes (floor cleaning wastes, absorbents used for spills or leaks and shop rags). Building M315 was reportedly used as a laundry pick up facility until the 1980s; however, no records were found to indicate dry cleaner operations.

PA/SI (2001-2006)

A PA was conducted for Building M119 in 2001, which included a literature review and field reconnaissance. A qualitative evaluation of the potential impact of the site on human health and the environment was also performed. Based on the amount of potential contaminants that were used at Building M119, the PA recommended that this building be investigated further to determine if contamination exists from past operations. As a result, an SI was completed in June 2004. Building M315 was also included in the SI since it was thought that the facility operated as a dry cleaner. Field activities included soil and groundwater investigations. Based on the analytical results, the Final PA/SI report (issued in February 2006) recommended further investigation of groundwater at Buildings M119 and M315 due to the presence of metals and recommended further investigation of soil at Building M315 due to the presence of metals. Subsequent investigations regarding historic use of Building M315 revealed it was not utilized as a dry cleaning facility; so it has obtained NFA status.

Future Activities

Based on the findings of the PA/SI, future investigations are planned for Building M119.

3.1.1.3 IR Site 4—Sawmill Road Construction Debris Dump

Site 4, the Sawmill Road Construction Debris Dump, encompasses approximately 0.3 acres located on the Mainside of the Base (**Figure 3-11**). The dates of operation are unknown, but Site 4 was reportedly used for surface disposal of construction debris including asphalt, old bricks, and cement.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 4, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 4 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.4 IR Site 13—Golf Course Construction Dump Site

Site 13, the Golf Course Construction Dump Site, encompasses approximately 10 acres in the Paradise Point area of the Base (**Figure 3-14**). In 1944, Site 13 was reportedly used for surface disposal of construction debris including clippings, branches, and asphalt associated with golf course construction.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 13, and concluded that NFA was necessary since any wastes present at the site would be inert.

Limited Site Assessment (2008)

A Limited Site Assessment was conducted at Site 13 to substantiate the NFA status (Osage, 2008). Representative soil and groundwater samples were collected from across the site and analyzed for volatile organic compounds (VOCs), SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals. The soil and groundwater analytical results indicated no compounds detected above regulatory screening levels. No additional assessment was recommended for Site 13.

3.1.1.5 IR Site 15 (SWMU 46)—Montford Point Burn Landfill Area

Site 15, the former Montford Point Burn Landfill Area operated between 1948 and 1958 was used for the disposal of sewage treatment sludge and other materials including litter, metal, asphalt, and sand. Surface wastes in this area were investigated under the RCRA program as Solid Waste Management Unit (SWMU) 46. Upon remediation of surface wastes, Site 15 was transferred to the IRP on December 28, 2007.

Confirmatory Site Investigation (1997)

A Confirmatory Site Investigation (CSI) was conducted in 1997 and a Phase II CSI was conducted in 2002 at the site after it became evident that additional waste had been deposited on the site. The CSI included soil sampling for metals and SVOCs, groundwater sampling for metals, and a geophysical survey to identify the location of the buried waste.

RFI (2004)

An RFI was conducted at the site in 2004 to further identify the waste locations and evaluate potential contamination. The RFI consisted of additional geophysical testing, test pit trenching, surface and subsurface soil sampling, installation of one monitoring well, and groundwater sampling. The trenches exposed landfill material such as glass, metal pieces (car parts, bedsprings, cable, conduit), ceramic, ash, and other burned debris. The soil samples were analyzed for VOCs, SVOCs, metals, and pesticides. The groundwater was analyzed for metals only.

The RFI concluded that surface soil had high metals content, particularly in one area, and that soil within the landfill trenches contained high concentrations of metals and pesticides. The groundwater did not contain high metals concentrations. It was recommended that surface mounds and contaminated surface soil should be managed as RCRA waste, and the landfill waste within the disposal site should be managed as CERCLA waste as part of IR Site 15.

Site Reconnaissance and Soil Sampling (2006)

Mound and surface soil sampling was conducted in 2006, the soil samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and RCRA metals. VOCs, SVOCs, and PCBs were either not detected or concentrations were lower than the screening criteria. Surface soil and mounds with pesticides and metals that exceeded screening criteria were identified for Interim Measures removal.

Interim Measures (2007)

The Interim Measure removal action was completed in March 2007 and included the removal of three mounds and a surface soil area to a depth of one ft bgs, resulting in a total of 1,039 tons of soil and debris removed. Confirmation soil sampling around the excavated areas indicated pesticide and metal concentrations below screening criteria (Shaw, 2007).

Future Activities

Because the surface waste was remediated, SWMU 46 was transferred to the IRP on December 28, 2007. Future investigations are planned to verify the subsurface presence or absence of hazardous wastes due to the site's history. PA/SI field activities are scheduled for FY 2009 and FY 2010.

3.1.1.6 IR Site 18—Watkins Village (E) Site

Site 18, Watkins Village (E) Site, includes approximately 0.5 to one acre in the Paradise Point area of the Base (**Figure 3-16**). From 1976 to 1978, construction materials and debris were reportedly buried at Site 18.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 18, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 18 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.7 IR Site 19—Naval Research Lab Dump

Site 19, the Naval Research Lab Dump, is approximately two to three acres located on the Mainside of the Base (**Figure 3-17**). From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop (Building PT-37). Activities at the laboratory included using radionuclides (Iodine 131) for metabolic studies on small animals. From 1956 to 1960, approximately 100 dogs were disposed of in a small area near Building PT-37. Because Iodine 131 has a half-life of only 8 days, potential for residual radiological contamination was considered to be negligible. In November 1980, Strontium-90 beta buttons were found while grading a parking lot near Building PT-37. The area was surveyed, and contaminated items were recovered. Soil samples were obtained and the site was cleaned of radioactive substances. Five 55-gallon drums of soil and animal residues were collected along with 499 beta buttons and appropriately disposed offsite.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 19 was insignificant and did not warrant further investigation.

Focused SI (2008)

An archives search and soil and groundwater sampling was conducted in 2007 in support of a potential Military Construction (MILCON) project at Sites 19, 20, and 25. Potential site-related impacts were identified in soil (CH2M HILL, 2008a). Based on potential radiological concerns, the Radiological Affairs Service Office (RASO) is assessing the sites. RASO completed a radiological survey and collected concrete and soil samples. No radiation exposure hazard was identified for personnel working in the areas. A detailed subsurface radiological evaluation of the former burial site was recommended.

Future Activities

Future investigations are planned to verify and delineate soil contamination within the MILCON area. Information gathered from fieldwork will be used to complete a Human Health Risk Assessment (HHRA) for Site 19, which is expected to be completed in FY 2009.

3.1.1.8 IR Site 20—Naval Research Lab Incinerator

Site 20, the Naval Research Lab Dump, encompasses less than 0.5 acres located on the Mainside of the Base (**Figure 3-18**). From 1947 to 1976, the Naval Research Laboratory was located in the area of the Pest Control Shop (Building PT-37). Activities at the laboratory included using radionuclides (Iodine 131) for metabolic studies on small animals. From 1956 to 1960, Site 20 was used for the incineration of burnable wastes.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 20, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Focused SI (2008)

An archives search and soil and groundwater sampling was conducted in 2007 in support of a potential MILCON project at Sites 19, 20, and 25. Potential site-related impacts were identified in soil (CH2M HILL, 2008a). Based on potential radiological concerns, the RASO is assessing the sites. RASO completed a radiological survey and collected concrete and soil samples in 2007. No radiation exposure hazard was identified for personnel working in the areas.

Future Activities

Future investigations are planned to verify and delineate soil contamination within the MILCON area. Information gathered from fieldwork will be used to complete a HHRA for Site 20, which is expected to be completed in FY 2009.

3.1.1.9 IR Site 23—Roads and Grounds Building 1105

Site 23, the Roads and Grounds Building 1105, is located in the Hadnot Point Industrial Area (HPIA), within the boundaries of IR Site 78 (**Figure 3-19**). In 1958, the Pest Control Shop, moved its activities from Building 712 (IR Site 2) to Building 1105 at Site 23. From 1958 until 1977, Building 1105 was used for storage of insecticides and herbicides, while mixing of the chemicals was performed at Lot 140 (IR Site 21). Storage and handling procedures at Building 1105 were reportedly adequate to prevent any large spills and to ensure a current safe working environment. Chemicals reportedly stored in Building 1105 included chlorinated hydrocarbons such as dichlordiphenyltrichloroethane (DDT) and chlordane as

well as diazinon, malathion, lindane, mirex, 2,4-D, dalapon, and dursban. Building 1105 currently houses the Roads and Grounds Department.

IAS (1983)

The IAS (WAR, 1983) reported that although the site had been listed as a potential hazardous waste sites, no spills or disposal of materials had occurred at Site 23 and concluded that no further assessment was necessary.

Future Activities

Future investigations are planned at Site 23 to verify the presence or absence of hazardous wastes due to the site's history as a storage facility for insecticides and herbicides.

3.1.1.10 IR Site 25—Base Incinerator

Site 25, the Base Incinerator, encompasses less than 0.5 acres on the Mainside of the Base (**Figure 3-20**). From 1940 to 1960, Site 25 operated as the Base Incinerator, burning trash and classified materials. Potential materials present at the site include burned trash and melted glass.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 25, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Focused SI (2008)

An archives search and soil and groundwater sampling was conducted in 2007 in support of a potential MILCON project at Sites 19, 20, and 25. Potential site-related impacts were identified in soil (CH2M HILL, 2008a).

Future Activities

Investigations are planned at Site 25 to verify the presence or absence of hazardous wastes due to the site's history as an incinerator. Information gathered from fieldwork will be used to complete a HHRA for Site 25, which is expected to be completed in FY 2009.

3.1.1.11 IR Site 37—Camp Geiger Area Surface Dump

Site 37, the Camp Geiger Area Surface Dump, encompasses approximately four acres in the Camp Geiger area of the Base (**Figure 3-21**). Between 1950 and 1951, Site 37 was used for the surface disposal of wastes including motor parts, garbage and wood.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 37, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 37 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.12 IR Site 38—Camp Geiger Construction Dump

Site 38, the Camp Geiger Area Surface Dump, encompasses approximately four acres in the Camp Geiger area of the Base (**Figure 3-22**). The dates of operation are unknown, but Site 38 was reportedly used for surface disposal of construction debris and branches. During the IAS, dumping activities were observed.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 38, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 38 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.13 IR Site 40—Camp Geiger Area Borrow Pit

Site 40, the Camp Geiger Area Borrow Pit, encompasses approximately 22 acres of undeveloped wooded land, situated at an elevation of approximately 22 ft amsl. Site 40 is in the Camp Geiger area of the Base (**Figure 3-23**). Starting in 1969, Site 40 was reportedly used for disposal of auto parts and metal.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 40, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Based on potential MILCON projects in the vicinity of Site 40, a PA/SI is being conducted. PA/SI field activities, including soil and groundwater sampling and test pitting to delineate the former dump area, were conducted in May 2008. The PA/SI report is expected to be completed in FY 2009. **Table 3-12** provides a proposed schedule of activities at Site 40.

3.1.1.14 IR Site 42—Building 705 BOQ Dump

Site 42, the Building 705 Bachelor Officers Quarters (BOQ) Dump, encompasses several acres located in the MCAS New River portion of the Base (**Figure 3-24**). From 1950 to 1960, Site 42 was reportedly used for surface disposal of debris including trees, tree stumps, and boards.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 42, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 42 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.15 IR Site 46—MCAS Main Gate Dump

Site 46, the MCAS Main Gate Dump, encompasses less than one acre in MCAS New River, in the northwest portion of the Base (**Figure 3-25**). From 1958 to 1962, Site 46 was reportedly used for disposal of construction and demolition debris.

IAS (1983)

The IAS (WAR, 1983) reported that there was no current evidence of a dump site and no hazardous wastes were disposed at Site 46, so it concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 46 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.16 IR Site 49—MCAS Suspected Minor Dump

Site 49, the MCAS Suspected Minor Dump, is located within MCAS New River, in the northwest portion of the Base (**Figure 3-26**). The dates of operation are unknown, but Site 49 is suspected of having been used for the disposal of paint cans.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 49 was insignificant and did not warrant further investigation.

Future Activities

Future investigations are planned at Site 49 to verify the presence or absence of hazardous wastes due to the site's potential history as a dump.

3.1.1.17 IR Site 51—MCAS Football Field

Site 51, the MCAS Football Field, encompasses approximately 20 to 30 acres in MCAS New River, in the northwest portion of the Base (**Figure 3-27**). Site 51 was reportedly the site of empty container disposal between approximately 1967 and 1968. Paint cans and hydraulic fluid cans were reportedly disposed.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 51 was insignificant and did not warrant further investigation.

Future Activities

Future investigations are planned at Site 51 to verify the presence or absence of hazardous wastes due to the site's potential history as a dump.

3.1.1.18 IR Site 53—MCAS Warehouse Building 3525 Area

Site 53, the MCAS Warehouse Building 3525 Area, encompasses approximately three miles of roadway in MCAS New River, in the northwest portion of the Base (**Figure 3-28**). From 1970 to 1975, liquid wastes were sprayed on the unimproved dirt roads in the vicinity of Site

53 to control dust. The liquid waste mixture reportedly contained crankcase waste oil, jet propulsion (JP) fuels, and paint thinners.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 53 was insignificant and did not warrant further investigation.

Future Activities

Future investigations are planned at Site 53 to verify the presence or absence of hazardous wastes due to the site's potential history.

3.1.1.19 IR Site 55—Air Station East Perimeter Dump

Site 55, the Air Station East Perimeter Dump, encompasses several acres in MCAS New River, in the northwest portion of the Base (**Figure 3-29**). From the 1950s to the 1960s, Site 55 was reportedly used as a disposal area for barrels, tires, trash, metal planking, and telephone poles. The area is currently used as a marina and recreation area by the Air Station.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 55, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 55 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.20 IR Site 61—Rhodes Point Road Dump

Site 61, the Rhodes Point Road Dump, encompasses approximately eight to 10 acres, located nearly five miles south of the MCAS New River operations area (**Figure 3-30**). The exact dates of operation are unknown; however, it was reported that Site 61 has been used as a disposal area for wastes generated during bivouac exercises. The site is currently used for war games, so site access/use is restricted.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 61, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 61 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.21 IR Site 62—Race Course Area Dump

Site 62, the Race Course Area Dump, encompasses approximately one to two acres, nearly two miles south of the MCAS New River operations area (**Figure 3-31**). The exact dates of operation are unknown; however, it was reported that Site 62 has been used as a disposal area for wastes generated during bivouac exercises. The site is currently used for war games, so site access/use is restricted.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 62, and concluded that no further assessment was necessary since any wastes present at the site would be inert.

Future Activities

Future investigations are planned at Site 62 to verify the presence or absence of hazardous wastes due to the site's history as a dump.

3.1.1.22 IR Site 66—AMTRAC Landing Site and Storage Area

Site 66, the Amphibious Tractors (AMTRAC) Landing Site and Storage area, encompasses approximately one square mile in the Courthouse Bay area of the Base (**Figure 3-32**). Beginning in the 1950s, Site 66 was utilized for vehicle maintenance during training activities. Exact operations are unknown; however, it is likely that vehicle maintenance operations resulted in release of oil, petroleum, lubricant (POL), and battery acid.

IAS (1983)

The IAS (WAR, 1983) concluded that although spills of POL had likely occurred at Site 66, the quantity was insignificant and did not warrant further investigation.

Future Activities

Future investigations are planned at Site 66 to verify the presence or absence of hazardous wastes due to the site's history.

3.1.1.23 IR Site 67—Engineer's TNT Burn Site

Site 67, Engineer's Trinitrotoluene (TNT) Burn Site, is located in the Courthouse Bay area of the Base (**Figure 3-33**). In 1951, Site 67 was reportedly used for TNT disposal. Deep pits (2-ft to 3-ft) were dug and unwanted TNT was opened and burned. Complete consumption of all TNT was reported during these procedures.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 67 was insignificant and did not warrant further investigation.

Future Activities

Future investigations are planned at Site 67 to verify the presence or absence of hazardous wastes due to the site's history.

3.1.1.24 IR Site 95 (OU 22)—Dipping Vat Sites

Site 95, the Dipping Vat sites, consists of three separate areas, which are identified by their locations (Jaybird Road, Magnolia Road, and Lyman Road), shown on **Figure 3-60**. The Site 95 dipping vats were in operation from approximately 1906 through 1961 and were used to submerge livestock in a pesticide solution consisting of arsenic and synthetic pesticides, such as DDT and toxaphene. Various petroleum products were used as carriers for the pesticides. The dipping vats were approximately 25 to 30 ft long, 4 to 5 ft deep, and 2.5 to 3.5 ft wide, each able to hold approximately 1,500 to 2,000 gallons of dipping solution. A drip pad, approximately 12-ft by 15-ft, was constructed at the exit of each vat. Holding pens, approximately 50-ft by 50-ft, were also associated with the dipping vats.

Initial Assessment (1983)

The vats were initially identified during an archaeological investigation of the Base. Following their discovery, an initial assessment was performed in 2004 on two of the three dipping vat sites (Jaybird Road and Magnolia Road), which included soil and groundwater sampling. At the Jaybird Road site, soil samples exceeded screening criteria for arsenic, chromium, and mercury. At the Magnolia Road site, soil samples exceeded screening criteria for 4,4'-dichlorodiphenyldichloroethane (4,4'-DDD), 4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE), 4,4'-DDT, arsenic, and mercury. As a result, additional assessment was recommended. The third site (Lyman Road) was identified after the initial investigation.

SI (2006-2007)

In 2006, an SI field investigation was completed for all three sites. Field activities included soil and groundwater sampling. A Human Health Risk Screening (HHRS) was completed as part of the SI to determine if site-related compounds are present at levels that could pose a risk to exposed human receptors. The Final SI report (CH2M HILL, 2007b), submitted in June 2007, did not identify unacceptable risks to humans exposed to constituents in groundwater, surface soil, or subsurface soil at the Jaybird Road and Lyman Road Sites; therefore, NFA was recommended at these two locations. The Final SI report also concluded that arsenic concentrations in surface and subsurface soil at Magnolia Road present an unacceptable risk to human health; therefore, a removal action was recommended.

Future Activities

Based on the findings of the SI, approximately 370 cubic yards of soil are to be excavated at the Magnolia Road site. An EE/CA and NTCRA are expected to be completed in FY 2009. **Table 3-22** provides a proposed schedule of activities at Site 95.

3.1.2 MRP Sites

3.1.2.1 MRP Site UXO-01—Former Live Hand Grenade Range, Gas Chamber (2D MAR DIV), D-6 50-Foot Indoor Rifle and Pistol Range, and B-3 Gas Chamber

Former Live Hand Grenade Range

The Former Live Hand Grenade Range, encompasses approximately 10 acres on the Mainside of the Base (**Figure 3-61**). The Live Hand Grenade Course was established under Camp Training Order Number 7-1945, dated March 19, 1945, and was disestablished in March 1946 and no longer used for the firing of live ammunition. During operation of the site, munitions used included fragmentation, offensive, and practice grenades. Based on a review of historical aerial photographs and site reconnaissance, the site has never been developed.

Future Activities

PA/SI field activities including soil, groundwater, and surface water sampling and digital geophysical mapping (DGM) are currently being conducted. The objectives of the field investigation are to identify the presence and nature of any MC contamination that may exist in the project area and provide geophysical data for future MEC intrusive investigations. The PA/SI report is expected to be completed in FY 2009. **Table 3-23** provides a schedule of activities proposed for the Former Live Hand Grenade Range.

Gas Chamber (2D MAR DIV)

The Former Tear Gas Chamber 2nd Marine Division site was used as a gas chamber in the 1970s. Based on the operational history of the site, chemical warfare training agents (tear gas) would have been used. Other chemical training items, including war gas identification sets and riot control hand grenades, may have been used in the area surrounding the gas chamber.

Focused Site Inspection (2007)

A Focused Site Inspection was conducted in 2007. Surface and subsurface samples and shallow groundwater samples were analyzed for VOCs, SVOCs, metals, and tear gas constituents (2-chloroacetophenone (CN) and 2-chlorobenzalmalononitrile (CS)). Analytical results indicated no exceedances of screening criteria.

Future Activities

Additional investigation activities, including DGM are planned for FY 2009. The objective of the investigation is to provide geophysical data for future MEC intrusive investigations.

Table 3-23 provides a schedule of activities proposed for the Former Tear Gas Chamber 2nd Marine Division.

D-6 50-Foot Indoor Rifle and Pistol Range

The D-6 50-Foot Indoor Rifle and Pistol Range is identified as a former .22 Caliber indoor range located in Building 451, as shown on **Figure 3-61**, which included eight manually operated targets. The range has been used since before 1954, but exact dates are not known.

Future Activities

Future investigations are planned at the D-6 50-Foot Indoor Rifle and Pistol Range in order to properly close the range in accordance with DoD and HQMC guidance.

B-3 Gas Chamber

The B-3 Gas Chamber is located in the northern area between Nawkins Boulevard and Church Street, as shown on **Figure 3-61**. The site encompasses approximately 14 acres. The B-3 Gas Chamber facility was used between 1953 and 1958. During operation, chemical warfare training agents, such as tear gas, would have been used at this training facility. There is no evidence that chemical warfare material (CWM) munitions would have been used during training activities; however, the area surrounding gas chambers is often used for other chemical training. Therefore, war gas identification sets and riot control hand grenades may have been used in this area.

Future Activities

PA/SI field activities including soil, groundwater, and surface water sampling and DGM were conducted in FY 2008. The objectives of the field investigation are to identify the presence and nature of any MC contamination that may exist in the project area and provide geophysical data for future MEC intrusive investigations. The PA/SI report is expected to be completed in FY 2009. **Table 3-23** provides a schedule of activities proposed for UXO-01.

3.1.2.2 MRP Site UXO-02—Unnamed Explosive Range

Site UXO-02, the Unnamed Explosive Range, encompasses approximately 127 acres along the west bank of the New River in the Rifle Range Area of the Base (**Figure 3-62**). UXO-02

encompasses IR Site 69 (Section 3.2.2). UXO-02 was used as an explosive range from 1973 to 2002; however, the type of munitions employed at this range is unknown.

Based on the reported history that Site 69 (a portion of UXO-02) was a suspected radioactive waste disposal site, a radiation survey and soil sampling were conducted from 1980 to 1981. Radioactivity was not detected at higher than average natural concentrations and soil sample results indicated naturally-occurring radioactivity. In 2007, RASO conducted a radiation survey which confirmed the 1980 to 1981 findings.

Future Activities

Future investigations are planned at UXO-02 in order to properly close the range in accordance with DoD and HQMC guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-24** provides a schedule of activities proposed for UXO-02.

3.1.2.3 MRP Site UXO-03—Practice Hand Grenade Course

Site UXO-03, the Practice Hand Grenade Course, encompasses approximately four acres on the Mainside of the Base (**Figure 3-63**). UXO-03 was used as a practice hand grenade course from 1953 to approximately 1959. Based on an archives review, no structure was built on the site until recent construction of the Hobby Shop Complex.

Future Activities

PA/SI field activities including soil, groundwater, and surface water sampling and DGM are currently being conducted. The objectives of the field investigation are to identify the presence and nature of any MC contamination that may exist in the project area and provide geophysical data for future MEC intrusive investigations. The PA/SI report is expected to be completed in FY 2009. **Table 3-25** provides a schedule of activities proposed for UXO-03.

3.1.2.4 MRP Site UXO-04—Knox Trailer Park

Site UXO-04, Knox Trailer Park, encompasses approximately 134 acres in the northern portion of the Base (**Figure 3-64**). The Knox Trailer Park area began as a Civilian Conservation Corps Camp in 1941, responsible for eliminating the source of endemic malaria by draining all surrounding wetlands. This was accomplished by ditching, using dynamite, and spraying diesel oil on water surfaces as a larvicide. Additionally, a dog-training school was located in the southernmost area of the site from 1942 to 1946. The dogs were subjected to overhead rifle and machine gun fire and explosions of charges of dynamite and TNT to simulate battlefield conditions. It has also been reported that the research facilities at Camp Knox conducted testing on body armor during World War II (WWII) through the early 1950s. The research was likely performed indoors, and the amount of ammunition expended for testing purposes is expected to be minimal. From the early 1950s until 2006, the area has been used for residential housing. Sometime between 1974 and 1976, an explosive ordnance disposal (EOD) technician responded to the discovery of UXO in the Knox Trailer Park area. A bulldozer operator uncovered a live WWII MK-II high-explosive hand grenade while conducting excavation activities. A visual inspection of the Knox Trailer Park was conducted in November 2002 by the Base's EOD team, and no UXO was discovered.

ESI (2006)

The Navy and MCB Camp Lejeune assessed a Public-Private Venture (PPV) development on approximately 38 acres of UXO-04. As a result, an Expanded SI (ESI) was conducted at UXO-04 in 2006 through 2007 to evaluate the nature, number, and density of anomalies that could potentially represent subsurface munitions of explosive concern (MEC) and to identify the presence and nature of any hazardous or toxic waste contamination that may exist (CH2M HILL, 2007c). Field activities included a geophysical survey, intrusive investigation, soil sampling, groundwater sampling, and sediment and surface water sampling.

The intrusive investigation identified one munitions-related item; a discarded military munition identified as “Signal, Illumination, Ground: Red Star Parachute M131” in its original shipping container. Based on the results of the intrusive investigation and historical information, it was concluded that the Knox Trailer Park area was not the site of a former hand grenade range. As part of the ESI, a HHRS and an Ecological Risk Screening (ERS) were conducted to evaluate potential risks to human health and the environment. No risks for current or future human health or ecological exposure were identified at Site UXO-04. As a result, the site is recommended for NFA and removal from the MRP.

Future Activities

The Draft ESI is currently under regulatory review and will be finalized in FY 2009. **Table 3-26** provides a schedule of activities proposed for UXO-04.

3.1.2.5 MRP Site UXO-05—Miniature Anti-Tank Range

Site UXO-05 is approximately 74 acres in size and is identified in the Range Identification and Preliminary Assessment Report (USACE, 2001) as being composed of the Former Miniature Anti-Tank Range. There are four separate former range areas associated with UXO-05. These ranges are generally located east of US Route 17 and west-southwest of Camp Geiger (**Figure 3-65**).

Between 1941 and 1942, the area to the northeast of UXO-05 was known as the Tent Camps. By the end of WWII, corrugated steel Quonset huts replaced most of the tents. All tents and huts were removed by the early 1950s. The Miniature Anti-Tank Range was used between 1942 and 1944. During operation, .22 caliber small arms were used to fire at a moving target. The explosive hazards for this range exist with complete rounds, which would be found at or near the firing line. Complete rounds would be located at the surface, but over the years, construction and other ground movement may have caused the rounds to become buried to an unknown depth. The area was also used extensively during WWII for blank fire and non-firing events.

Future Activities

PA/SI field activities including soil, groundwater, and surface water sampling and DGM are currently being conducted. The objectives of the field investigation are to identify the presence and nature of any MC contamination that may exist in the project area and provide geophysical data for future MEC intrusive investigations. The PA/SI report is expected to be completed in FY 2009. **Table 3-27** provides a schedule of activities proposed for UXO-05.

3.1.2.6 MRP Site UXO-06—Fortified Beach Assault Area

Site UXO-06, the Fortified Beach Assault Area, encompasses approximately 177 acres in the HPIA (**Figure 3-66**). The Range Identification and Preliminary Assessment Report (USACE, 2001) reported that this range was in use from 1953 until approximately 1977, and listed the following types of munitions as having been employed at this site: small arms, 3.5-inch practice rockets, practice rifle grenades, smoke and white phosphorus hand grenades. In addition, cleaning solvents/solutions were used at the site to clean equipment. Currently, the eastern side of Site UXO-06 is being used as a borrow pit. Soil from the borrow pit is used for other construction projects across the base.

Focused SI (2006)

In 2006, a Focused SI was conducted within the 4.4-acre military construction (MILCON) area of UXO-06, which consisted of soil and groundwater sampling and DGM. A HHRS and ERS were conducted as part of the SI. One pesticide and iron were detected in soil samples at concentrations exceeding screening levels. One polycyclic aromatic hydrocarbon (PAH), iron, and manganese were detected in groundwater samples at concentrations exceeding regulatory standards. Approximately 1,300 anomalies were identified that represented potential subsurface MEC.

Future Activities

Based on the DGM results conducted during the Focused SI, anomaly reacquisition and intrusive investigation was conducted within the MILCON area of UXO-06. The After Action Report was completed in FY 2008. As a safety precaution, “3R” (Recognize, Retreat, Report) training was completed for workers prior to grading and excavation activities.

Site-wide PA/SI field activities including soil, groundwater, surface water and sediment sampling and DGM are currently being conducted. The objectives of the field investigation are to identify the presence and nature of any MC contamination that may exist in the project area and provide geophysical data for future MEC intrusive investigations. Data from the MILCON area as well as the remainder of UXO-06 will be incorporated into the PA/SI report, which is expected to be completed in FY 2009. **Table 3-28** provides a schedule of activities proposed for UXO-06.

3.1.2.7 MRP Site UXO-07—Practice Hand Grenade Course

Site UXO-07, the Practice Hand Grenade Course, encompasses approximately two acres in the HPIA (**Figure 3-67**). UXO-07 was reportedly used as a range in 1953. The types of munitions employed at the site are unknown; however, it is assumed that practice hand grenades were used.

Future Activities

Future investigations are planned at UXO-07 in order to properly close the range in accordance with DoD and Headquarters Marine Corps (HQMC) guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-29** provides a schedule of activities proposed for UXO-07.

3.1.2.8 MRP Site UXO-08—Bazooka Range and Gas Chambers

Site UXO-08, the Bazooka Range and Gas Chambers, encompasses approximately 144 acres in the HPIA. UXO-08 is located within the boundaries of IR Site 78 (**Figure 3-68**). Areas of

interest within UXO-08 include the D-7 Gas Chamber, the alternate location of the Base Chemical Smoke Chamber, the Base Chemical Smoke Chamber and Nuclear, Biological, and Chemical (NBC) Training Trail, and a suspected 2.36-inch Bazooka Range. The Range Identification and Preliminary Assessment Report (USACE, 2001) identified the D-7 Gas Chamber as being located at Building 756. The gas chamber is estimated to have been used from 1953 to 1961 and is thought to have primarily used tear gas. Base maps and the Range Identification and Preliminary Assessment Report indicate the operation of the alternate Base Chemical Smoke Chamber and NBC Training Trail from 1985 to 1987. The amount of chemical stimulants used during the facilities operation is unknown. Reports have indicated the presence of a suspected firing range, designated as the Lejeune Cantonment 2.36 Bazooka Range. Retired Base EOD personnel have reported the findings of bazooka rounds on several occasions at various locations within Parade Grounds during the 1970s and 1990s.

Limited SI (2006)

Previous investigations at UXO-08 have been conducted under the IRP for Site 78 since 1983 (Section 3.5.27). In 2006, a Limited SI was conducted on the former Bazooka Range within UXO-08. Field activities included a geophysical investigation, soil sampling, and groundwater sampling. Soil and groundwater results revealed that munitions constituents were not detected within the Bazooka Range area. However, explosives residues were detected in six surface soil samples located outside of the Bazooka Range area footprint. In addition, metals were detected in two subsurface soil samples collected near the former gas chambers.

Future Activities

A site-wide PA/SI, including soil and groundwater sampling, was conducted for UXO-08 in 2008. Data collected from the Bazooka Range area as part of the Limited SI will be incorporated into the Final PA/SI report of UXO-08. The PA/SI report is expected to be completed in FY 2009. **Table 3-30** provides a schedule of activities proposed for UXO-08.

3.1.2.9 MRP Site UXO-09—Triangulation Range

Site UXO-09, the Triangulation Range, encompasses approximately three acres in the HPIA (**Figure 3-69**). The Triangulation Range (Range F-9) area was established in or prior to 1953. The types of weapons used on the range were service munitions and automatic rifles. The Range Identification and Preliminary Range Assessment Report (USACE, 2001) lists the time frame of use as 1953; however, the 1966 regulations for training areas indicates the range was still in use as a “Battle Site” range in the 1960s.

Future Activities

PA/SI field activities including soil and groundwater sampling are currently being conducted. The objectives of the field investigation are to identify the presence and nature of any MEC contamination that may exist in the project area. The PA/SI report is expected to be completed in FY 2009. **Table 3-31** provides a schedule of activities proposed for UXO-09.

3.1.2.10 MRP Site UXO-10—Flame Tank and Flame Thrower Range

Site UXO-10, the Flame Tank and Flame Thrower Range, encompasses approximately three acres on the Mainside of the Base (**Figure 3-70**). UXO-10 was reportedly used as a range from 1970 to 1977. The types of munitions used at the range include flame throwers and

small arms blank ammunition, which was reportedly used on tanks for demonstration purposes.

Future Activities

Future investigations are planned at UXO-10 in order to properly close the range in accordance with DoD and HQMC guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-32** provides a schedule of activities proposed for UXO-10.

3.1.2.11 MRP Site UXO-11—Practice Hand Grenade Course

Site UXO-11, the Practice Hand Grenade Course, encompasses approximately one acre located in Camp Geiger in the northwest portion of the Base (**Figure 3-71**). UXO-11 was reportedly used as a range in 1953. The types of munitions employed at the site are unknown; however, it is assumed that practice hand grenades were used.

Future Activities

Future investigations are planned at UXO-11 in order to properly close the range in accordance with DoD and HQMC guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-33** provides a schedule of activities proposed for UXO-11.

3.1.2.12 MRP Site UXO-12—New River 1,000-Inch Range

Site UXO-12, the New River 1,000-inch Range, encompasses approximately 30 acres generally located west of Camp Geiger, in the northwest portion of the Base (**Figure 3-72**). The 1,000-inch range was established under Camp Training Order Number 7-1945, dated March 19, 1945, and was disestablished in March 1946 and no longer used for the firing of live ammunition. During operation of the site, munitions used included small caliber munitions (.30 caliber weapons firing).

Future Activities

Future investigations are planned at UXO-12 in order to properly close the range in accordance with DoD and HQMC guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-34** provides a schedule of activities proposed for UXO-12.

3.1.2.13 MRP Site UXO-14—Indoor Pistol Range and Gas Chamber

Site UXO-14, the Indoor Pistol Range and Gas Chamber, encompasses approximately two acres within the Rifle Range area of the Base (**Figure 3-74**). The Indoor Pistol Range (Building RR-53) was reportedly in use from 1950 to 1996. During operation of the range, small arms were used to fire at a fixed target. The Gas Chamber (Building RR-63) was reportedly in use from 1950 through 1954 and is thought to have primarily used tear gas.

Future Activities

Future investigations are planned at UXO-14 in order to properly close the range in accordance with DoD and HQMC guidance. PA/SI field activities will be conducted in FY 2009. The PA/SI report is expected to be completed in FY 2010. **Table 3-35** provides a schedule of activities proposed for UXO-14.

3.1.2.14 MRP Site UXO-15—1000-inch Range, Courthouse Bay Amphibious Area

The Courthouse Bay Amphibious Area encompasses 11 acres, shown on **Figure 3-75**, and includes a former 1000-inch Small Arms Range that was used for service and target practice. The Courthouse Bay Amphibious Area was also used as a maneuvering area for an Amphibious Tractor Company. According to the Base Range Safety Officer most likely M-1 Rifles 30 caliber pistols, and possibly 45 caliber pistols were the only weapons used in the Courthouse Bay Amphibious Area.

Future Activities

Future investigations are planned at UXO-15 in order to properly close the range in accordance with DoD and HQMC guidance. A site-wide PA/SI will be conducted at UXO-15 in FY 2009. The PA/SI is expected to be completed in FY 2010. **Table 3-36** provides a schedule of activities proposed for UXO-15.

3.1.2.15 MRP Site UXO-16—Gun Positions 41A and 41B

Gun Position 41 is a four-acre area located in the Stone Bay area of Camp Lejeune and is east of Rifle Range Road, as shown on **Figure 3-76**. Gun Position 41 was established during World War II as a training ground where soldiers trained with 8-inch Howitzers, 4.2-inch mortars, 175 mm guns, and 120 mm mortars. Live fire training ceased in the 1960s and then resumed in the 1980s. Presently, the site continues to be used as an official training ground, but no live fire training is conducted in this area. Training may include the use of blanks and pyrotechnics. As a result of the usage and type of training conducted at the site, there should be no discarded military munitions (DMM), although ammunition packaging, range residue, barbed wire, and buried garbage may be present.

Future Activities

Site-wide PA/SI field investigations are currently being conducted at UXO-16, including soil and groundwater sampling and DGM. The PA/SI report will be submitted in FY 2009.

3.1.2.16 MRP Site UXO-17—Firing Position #2

Firing Position 2, shown on **Figure 3-77**, was a gun position used for military training, which fired into the G-10 impact area. As a result of the usage and type of training conducted at the site, there should be no DMM, although ammunition packaging, range residue, barbed wire, and buried garbage may be present. Firing Position #2 was reportedly used from the 1950s through at least 1985. 105 mm and 155 mm Howitzer guns were used at this site.

Future Activities

Site-wide PA/SI field investigations are currently being conducted at UXO-17, including soil and groundwater sampling and DGM. The PA/SI report will be submitted in FY 2009.

3.2 Remedial Investigation/Feasibility Study Sites

The following sections discuss the site history for the six IR sites (Sites 35, 69, 73, 86, 88, and 89) for which a RI and/or a FS will be conducted in FY 2009.

3.2.1 IR Sites

3.2.1.1 IR Site 35 (OU 10)—Camp Geiger Area Fuel Farm

Site 35, formerly the Camp Geiger Area Fuel Farm, is located within Camp Geiger, in the northwest portion of the Base (**Figure 3-48**). Site 35 primarily refers to five 15,000-gallon aboveground storage tanks (ASTs), underground fuel transmission lines, a pump house, a fuel unloading pad, an oil-water separator (OWS), and a distribution island. The ASTs were installed 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 the US Highway 17 Bypass. During the active life of the fuel farm, several releases of fuel occurred. During 1957 and 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.

IAS (1983)

The IAS (WAR, 1983) concluded that historical releases of fuel in significant quantities created a potential for migration into the aquifer and recommended a Confirmation Study be completed.

Confirmation Study (1984-1987)

From 1984 to 1987, a Confirmation Study was conducted, which included collecting soil, groundwater, surface water, and sediment samples. Soil analytical results indicated that soils northeast of the Fuel Farm were potentially impacted by Site activities. Groundwater analytical results identified widespread contamination of the shallow aquifer with fuel-derived contaminants (lead, oil and grease [O&G]) and VOCs, including benzene, trans-1,2-dichloroethene (trans-1,2-DCE), and trichloroethene (TCE). The source of the fuel-related compounds was thought to be the recorded historical fuel spills from the ASTs, while the source of the solvent-related compounds was thought to be an automobile maintenance shop (former Building TC-474) located 200 ft southeast of the fuel farm. Surface water and sediment analytical results suggested that contaminants from Site 35 were probably discharging into Brinson Creek during periods when the shallow groundwater level was high.

Interim Remedial Action RI/FS (1993-1994)

From 1993 to 1994, an IRA RI/FS was conducted to obtain additional data regarding petroleum hydrocarbon contamination in support of selection of an IRA to address soil contamination. IRA RI/FS activities included a soil investigation and excavation of a shallow trench along Brinson Creek. Analytical results identified three areas of petroleum hydrocarbon contamination in the soil, which corresponded to past unauthorized discharges of fuel products.

Interim PRAP and Interim ROD for Soil Contamination (1994)

Based on the findings of the IRA RI/FS, an Interim PRAP to address soils was submitted for public review and comment in July 1994 and the Interim ROD (IROD) was signed on September 15, 1994 (Baker, 1994c). The IROD identified soil removal and disposal as the selected remedy for soils at Site 35. The removal action for hydrocarbon-contaminated soil

was performed from September 1995 to May 1996, and approximately 15,700 tons of hydrocarbon-contaminated soil was shipped offsite.

Comprehensive RI (1994-1995)

From 1994 to 1995, a Comprehensive RI was completed, which included a soil gas survey and groundwater screening investigation, soil investigation, groundwater investigation, and surface water and sediment investigation. Soil analytical results identified low levels of VOCs (primarily tetrachloroethene [PCE]) possibly attributable to groundwater contamination beneath the Site. Groundwater analytical results identified fuel-related (primarily benzene) and solvent-related (primarily TCE and cis-1,2-dichloroethene [cis-1,2-DCE]) groundwater contamination in the surficial aquifer. The extent of groundwater contamination was not delineated during the RI. The HHRA concluded that the overall site risk is above the acceptable risk range for the future potential exposure to groundwater and current potential exposure to fish. The Ecological Risk Assessment (ERA) concluded that metals and pesticides have the potential to affect the integrity of aquatic and terrestrial receptors at Site 35.

Interim FS (1995)

In June 1995, an Interim FS was completed to identify and evaluate remedial alternatives for contaminated groundwater in the vicinity of the Fuel Farm at Site 35. Although the extent of groundwater contamination was not adequately defined during the RI, an Interim FS was deemed necessary because groundwater contamination in the vicinity of the Fuel Farm was a known source of ongoing contamination to Brinson Creek.

Interim PRAP and Interim ROD for Shallow Groundwater Contamination (1995)

An Interim PRAP to address shallow groundwater was submitted for public review and comment in June 1995 and the IROD was signed on September 22, 1995 (Baker, 1995b). The IROD identified *in situ* air sparging as the preferred remedial alternative for shallow groundwater at Site 35. Because of unfavorable 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 the *in situ* air sparge trench (approximately 100 ft in length) be constructed along the western edge of the proposed right-of-way. It was further recommended that the system be tested before full-scale implementation. The *in situ* air sparge trench was installed in 1998, based on the findings of a Limited Groundwater Investigation conducted in 1996 and 1997 to determine the optimal location. The pilot air sparging system is currently operating and is maintained by the Remedial Action Contract (RAC) Contractor.

Supplemental Groundwater Investigation (1997)

A Supplemental Groundwater Investigation (SGI) was completed in 1997. Field activities included soil, groundwater, and sediment sampling. Soil analytical results did not identify fuel-related or solvent-related contamination. Fuel-related constituents were detected in sediment samples, suggesting these areas had impacted by previous operations at Site 35. Low-level fuel-related contamination was primarily identified in the upper portion of the surficial aquifer; while solvent-related contamination was primarily identified in the lower portion of the surficial aquifer. As part of the SGI, a HHRA was conducted. The supplemental HHRA concluded that the overall future site risk is above the acceptable risk range, due to ingestion of contaminated groundwater containing solvent-related VOCs, iron, and arsenic.

Emergency Removal Action (2000)

In 2000, an emergency soil removal action was completed, associated with a release of POL from an existing pipeline that was severed during construction of the US Highway 17 Bypass.

Hot Spot Characterization (2002)

In October 2002, a "hot spot" characterization was completed to delineate and characterize any continuing sources associated with the "hot spots". Hot spots were defined as concentrations of TCE greater than 280 micrograms per liter ($\mu\text{g/L}$). Field activities included soil and groundwater sampling. Based on the analytical results, two "hot spots" were identified. One shallow "hot spot" was identified near Building G480 containing fuel and solvent-related contamination. A second deeper (and larger) "hot spot" containing TCE was observed extending from the vicinity of Building TC470 underneath the US Highway 17 Bypass to the wetland area (just west of Brinson Creek).

Natural Attenuation Evaluation (1998-2003)

In April 2003, the Final Natural Attenuation Evaluation (NAE) report was completed, compiling the results of data collected as part of the original NAE conducted in September 1998, long-term monitoring (LTM) data collected from January 1999 through October 2002, and data collected from the Focused NAE conducted in January, February, and April 2002. The purpose of the NAE study was to evaluate the site conditions to determine if monitored natural attenuation (MNA) could serve as a potential remedial alternative for groundwater. The Final NAE Report concluded that conditions were generally favorable to reduce the contaminant mass in groundwater; however, complete reduction may not be possible within a regulatory time frame due to the continued release of VOCs from the primary TCE "hot spot."

In Situ Chemical Reduction Pilot Study (2003-2005)

A Technology Evaluation Report was completed in 2003, recommending injections of modified Fenton's Reagent and permanganate for a pilot study to be completed on the TCE "hot spot" identified during the 2002 Hot Spot Characterization. The pilot study was conducted from 2003 to 2005, and the Pilot Study Evaluation Report was submitted in March 2006. Within the pilot study area, TCE concentrations were reduced between 80 percent and 98 percent and total VOC concentrations were reduced between 72 percent and 85 percent. The Pilot Study report concluded that contaminant concentrations at the conclusion of the test were significantly lower; however, there are no clear, definitive lines of evidence that modified Fenton's permanganate, natural attenuation, biodegradation, or other process was the primary cause of contaminant reduction. Overall reduction is most likely associated with all of these processes

EE/CA for LNAPL (2004)

An EE/CA to address a POL light non-aqueous phase liquid (LNAPL) area near Building G480 was completed in 2004 for both soil and groundwater. During the fourth quarter of FY 2005, the POL site associated with Building G480 was transferred to the NAVFAC UST program.

EE/CA (2007)

An EE/CA to reduce source area concentrations was submitted for Site 35 in FY 2007 (CH2M HILL, 2007d). Four remedial alternatives (all *in situ*) were evaluated:

- Air sparging
- Chemical reduction using zero valent iron (ZVI) (Ferox™)
- Bioremediation (i.e., enhanced reductive dechlorination [ERD])
- Chemical oxidation using permanganate

Each technology was evaluated based on effectiveness, implementability, and cost. An Action Memorandum was submitted in May 2007 documenting ERD via emulsified vegetable oil (EVO) and lactate injection as the preferred NTCRA.

Future Activities

A Supplemental RI was conducted at Site 35 to further delineate the nature and extent of groundwater contamination. The Draft Supplemental RI was submitted in 2008. The Final Supplemental RI report is expected to be completed in FY 2009.

Injections associated with the NTCRA were completed in May and June 2007 and monitoring is on-going. The results will be presented in a Final NTCRA Report, scheduled for submittal in FY 2009.

It is anticipated that the final FS will be completed in FY 2009, followed by the PRAP and ROD. **Table 3-10** provides a schedule of activities proposed for Site 35.

3.2.1.2 IR Site 69 (OU 14)—Rifle Range Chemical Dump

Site 69, the Rifle Range Chemical Dump, encompasses approximately 14 acres located approximately 1,300 ft west of the New River in the Rifle Range area of MCB Camp Lejeune (**Figure 3-52**). From 1950 to 1976, Site 69 was reportedly used to dispose of chemical wastes including PCBs, solvents, pesticides, and drums of “gas” that possibly contained cyanide (i.e., tear gas) or other training agents, also known as CWM. Site 69 is located within a former explosive range, UXO-02 (Section 3.1.1.2), which was used as an explosive range from 1973 to 2002 and is currently being addressed under the MRP. Based upon background information, chemical agent identification sets (CAIS) containing calcium hypochlorite, high-test hypochlorite, and other chemical agents may be buried at this site.

Because the suspected CWM of concern at Site 69 are primarily CAIS and because of the remote location of Site 69, the Army CWM Team determined that Site 69 was a low priority site for CWM issues. The Army’s recommendation was to minimize disturbance of such sites until the time that the Army had developed adequate tools to use in the assessment and remediation of such sites and had sufficient personnel to support investigation and clean-up efforts. As a result, investigations conducted at Site 69 have focused on non-CWM contaminants based on historic disposal of chemical wastes (solvents, PCBs, pesticides, etc.) at the site. Monitoring for CWM was performed during the investigations with all intrusive activities for health and safety reasons, but no CWM was ever detected. However, the investigations were not intended to confirm or deny the presence of CWM.

Based on the reported history that Site 69 was a suspected radioactive waste disposal site, a radiation survey and soil sampling were conducted from 1980 to 1981. Radioactivity was

not detected at higher than average natural concentrations and soil sample results indicated naturally-occurring radioactivity. In 2007, RASO conducted a radiation survey which confirmed the 1980 to 1981 findings.

IAS (1983)

The IAS (WAR, 1983) concluded that burial of hazardous or toxic wastes at Site 69 created a potential for migration into the aquifer and recommended a Confirmation Study be completed.

Confirmation Study (1984-1987)

From 1984 to 1987, a Confirmation Study was conducted, which included collecting groundwater, surface water, and sediment samples. Analytical results identified VOCs in groundwater and surface water and pentachlorophenol (PCP) in one sediment sample.

RI (1992-1995)

The RI at Site 69 commenced in 1992 and, after a number of supplemental investigations, concluded in 1995. Field activities included geophysical investigations, groundwater sampling, and surface water and sediment sampling. Intrusive investigations were not conducted due to the potential for encountering chemical agents. Geophysical investigations indicated buried metallic objects near the groundwater source area. It is likely that the buried material consists of drums or canisters that contain solvents. Results of the RI indicated that soil has not been affected by the former disposal activities; however, it is believed that the top 2 ft of soil may be cover material that was placed over debris. Analytical results identified solvent-based groundwater contamination centered in the south-central portion of the site; which had not appeared to migrate extensively from the disposal area. Surface water and sediment analytical results indicated that the New River, Everett Creek, and an unnamed tributary north of the site have not been impaired by the former disposal operations.

In-Well Aeration Pilot Study (1996-1998)

A pilot study was initiated in March 1996 to assess the effectiveness of an innovative groundwater treatment technology called in-well aeration. After 2 years of operation and testing, in-well aeration was ineffective at reducing the number and concentration of contaminants in the groundwater. Consequently, the pilot study was discontinued.

PRAP and IROD (1998-2000)

The PRAP for Site 69 was submitted for public review and comment in May 1998. The Final IROD for Site 69 was signed on June 29, 2000 (Baker, 2000a). The IROD stipulated MNA and institutional controls for remediating groundwater. LTM at Site 69 was implemented in 1998 and continued until 2005 when the LTM Optimization Report (CH2M HILL, 2005) recommended removal of Site 69 from the LTM program, as the site is a part of ongoing investigations and studies in which the LTM requirements are being fulfilled or exceeded by site specific monitoring programs. LUCs were implemented in 2001 and updated in 2002, as indicated on **Table 3-5**.

Future Activities

Because an IROD is in place for this site, the IRP Partnering Team agreed to complete supplemental field activities in order to further delineate the nature and extent of contamination. Based on the presence of CWM, a Chemical Safety Submission (CSS) will be submitted in FY 2008. Proposed field activities include a geophysical survey monitoring

well installation, and soil, groundwater, surface water, and sediment sampling. Based on approval of the CSS, the field activities are anticipated to begin in 2009 and will follow the investigation process and procedures outlined in the CSS. **Table 3-13** provides a proposed schedule of activities at Site 69.

3.2.1.3 IR Site 73 (OU 21)—Courthouse Bay

Site 73 encompasses the Amphibious Vehicle Maintenance Facility located along the northwest shore of Courthouse Bay (**Figure 3-59**). Available information indicates that disposal activities occurred within a 13-acre area of Site 73 from 1946 until 1977. An estimated 400,000 gallons of waste oil, generated during routine vehicle maintenance, was discharged directly onto the ground surface, primarily near Building A47. In addition, approximately 20,000 gallons of waste battery acid were reportedly disposed of in the area northwest of Building A47. Waste battery acid was poured into shallow, hand-shoveled holes that were backfilled after disposal.

IAS (1983)

The IAS (WAR, 1983) concluded that historical waste releases in significant quantities at Site 73 created a potential for migration into the aquifer and recommended a Confirmation Study be completed.

Confirmation Study (1984-1987)

From 1984 to 1987, a Confirmation Study was conducted, which included collecting groundwater, surface water, and sediment samples. Chlorinated VOCs, benzene, and lead were detected in groundwater at concentrations exceeding North Carolina Groundwater Quality Standards (NCGWQS).

UST Investigations (1991-1993)

Between 1991 and 1993, several UST investigations were completed, which included the collection of soil and groundwater samples in the vicinity of several USTs at Site 73. Analytical results identified total petroleum hydrocarbons (TPH) and BTEX compounds in soil and groundwater associated with USTs located in the vicinity of Building A47.

Preliminary Investigation (1994)

A Preliminary Investigation was completed in 1994, which included a soil gas survey and groundwater screening program. The analytical results identified nine AOCs at Site 73, segregated by potential sources of contamination.

RI (1995-1996)

From 1995 to 1996, a RI was conducted at Site 73 to further investigate the nine AOCs. Field activities included soil, groundwater, surface water, and sediment sampling. Findings from the RI identified VOCs in shallow and deep groundwater samples primarily located in the vehicle wash area in the center/southeast portion of the site. The HHRA identified a risk to future receptors due to ingestion of groundwater due to the presence of vinyl chloride. The ERA identified a potential risk to terrestrial receptors due to contaminants in soil and surface water.

Supplemental Groundwater Investigation (1998)

In 1998, a Supplemental Groundwater Investigation was conducted to further define the extent of groundwater contamination at the Site. The investigation included the collection of

groundwater samples. The SGI concluded that natural attenuation was occurring and that additional delineation was necessary and recommended a NAE. A Groundwater Modeling Report was also completed in 1998, to support the evaluation of remedial alternatives in a FS.

LTM (2000-2005)

LTM was implemented at Site 73 in July 2000 and included semi-annual sampling and reporting. Although no ROD was in place, the monitoring program was implemented to provide continued analytical data. The LTM Optimization Report (CH2M HILL, 2005) recommended removal of Site 73 from the LTM program, as the site is a part of ongoing investigations and studies in which the LTM requirements are being fulfilled or exceeded by site specific monitoring programs.

Natural Attenuation Evaluation (2000-2002)

From 2000 to 2001, NAE field investigations were completed at Site 73 to provide additional data on plume characterization and natural attenuation conditions. The Final NAE Report was completed in 2002. Although natural attenuation of the VOCs in groundwater was demonstrated to be a viable treatment option, the time frame needed to reach the cleanup objectives was believed to be cost prohibitive.

Air Sparging Interim Measure (2002)

In 2002, air sparging points were employed as an interim measure to treat an area of concentrated vinyl chloride near the bulkhead. Air was injected into 29 well points for a 4-month period. Data from the treatment area indicated that the air was not effectively moving through the shallow formation due to the low permeability of the soil. Accordingly, it was decided to discontinue the air injection.

Hydrogen Sparging Pilot Study (2003-2006)

A Technology Evaluation Report and Treatability Study Work Plan were completed in 2003 (CH2M HILL, 2003), recommending a pilot study for the main TCE groundwater plume at the site. The pilot study was conducted from 2003 to 2006 and involved hydrogen sparging through a horizontal well. Results of the pilot study showed the average TCE concentration decreased approximately 35 percent over the 15-month study period and the average total VOC concentration decreased approximately 8 percent. Hydrogen was never detected in any of the wells above the background concentration. Long-term residual effects of hydrogen sparging were not expected to be significant.

Future Activities

A Supplemental RI was conducted at Site 73 to further delineate the nature and extent of groundwater and soil contamination. The Draft Supplemental RI was submitted in 2008. The Final Supplemental RI will be completed in FY 2009.

In 2007, a pilot study was implemented at Site 73 to evaluate the performance and effectiveness of ozone enhanced air sparging using a horizontal well for the purpose of groundwater remediation. The results will be presented in a Final Pilot Study Report, which will be finalized in FY 2009.

It is anticipated that the Final FS will be completed in FY 2009, followed by a PRAP and ROD. **Table 3-14** provides a schedule of activities proposed for Site 73.

3.2.1.4 IR Site 86 (OU 20)—Tank Area AS419-AS421 at MCAS

Site 86, Tank Area AS419-AS421, is located within the operations area of MCAS New River (Figure 3-58). From 1954 to 1988 Site 86 served as a storage area for petroleum products. 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 used for temporary storage of waste oil. The three tanks were emptied in 1988 and were removed in 1992. Today, the former location of the tanks is grass-covered and only a slight depression remains.

PSI (1990)

In November 1990, a Preliminary Site Investigation (PSI) was conducted, which included soil sampling. The results of the PSI revealed limited TPH contamination in two soil samples and low-level detections of VOCs likely attributable to localized surface spills.

Site Assessment (1992)

In 1992, a Site Assessment was completed, which included soil and groundwater sampling. The results of the Site Assessment revealed TPH contamination in only one soil boring obtained within the former tank area and identified benzene, PCE, and TCE in groundwater.

RI (1995-1996)

From 1995 to 1996 a RI field investigation was conducted, which included soil and groundwater sampling. Surface and subsurface soil analytical results indicated localized VOC and metals contamination in samples collected within and immediately adjacent to the former AST area and wide-spread low-level SVOC contamination (primarily PAHs). Groundwater analytical results indicated the presence of VOC contamination limited to the surficial aquifer in the central and southeastern portion of the Site. Although VOCs were not present in the Castle Hayne aquifer, the VOCs appeared to have migrated vertically to the lower portion of the surficial aquifer and were migrating horizontally in the general direction of groundwater flow.

Post-RI Fieldwork (1997-2000)

Post-RI fieldwork was conducted in 1997 and 1998 to delineate the vertical and horizontal extent of the VOC contamination. This work identified a large plume extending east-northeast from Site 86, and a much smaller plume to the southwest, near a former wash rack area. In June 1998 a FS was completed to develop and evaluate remedial alternatives for addressing groundwater at Site 86.

In June 2000 it was recommended that Site 86 be further evaluated based on the increasing levels of TCE, as noted during monitoring, in a downgradient intermediate well. The data also suggested that the TCE plume may be migrating, as indicated by several downgradient wells. Subsequently, it was decided at the July 2000 IR Partnering Meeting that Site 86 would be permanently removed from OU 6 and a new OU, OU 20, would be created for this site.

LTM (1998-2005)

Site 86 was added to the LTM program in July 1998. Although no ROD was in place, the monitoring program at Site 86 was implemented to provide continued analytical data to assess whether contamination remains present, has migrated, or has degraded through

natural processes. In September 2005, Site 86 was removed from the LTM program based on the recommendation of the LTM Optimization Report (CH2M HILL, 2005), as Site 86 is a part of ongoing investigations and studies in which the LTM requirements are being fulfilled or exceeded.

Amended RI (2001-2002)

Based on the findings from the post-RI monitoring, an Amended RI was conducted from 2001 to 2002 in order to further delineate the nature and extent of contamination. The findings from the Amended RI field investigation showed that the primary TCE plume is located at a depth of 40 to 45 ft below ground surface (bgs). The plume extends from the boundary of Site 86 to approximately 1,700 ft downgradient. The Final Amended RI Report was completed in 2003.

Air/Ozone Sparging Pilot Study (2005-2006)

The Technology Evaluation Report and Pilot Study Work Plan were completed in 2004, which recommended injection of ozone through a horizontal well. The pilot study was conducted from 2005 to 2006 for the main TCE groundwater plume at the site. The Pilot Study Report (CH2M HILL, 2006a) was prepared following completion of the test in September 2006. The report concluded that TCE concentrations were reduced 99 percent in groundwater samples collected from monitoring wells with baseline concentrations exceeding 50 µg/L, and air sparging beneath a low permeability layer using a horizontal directionally drilled (HDD) well resulted in a zone of influence of at least 50 ft on either side of the well.

Future Activities

In 2006, a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed for Solid Waste Management Unit (SWMU) 303/318 (located south of Site 86) and identified chlorinated VOCs in groundwater from an undetermined source. Based on these results, the IRP Partnering Team agreed that Site 86 would be expanded to include the SWMU area. A Supplemental RI is being conducted to fully define the nature and extent of groundwater contamination. The final RI report is expected to be completed in FY 2009.

It is anticipated that a FS will be completed in FY 2009 followed by a PRAP and ROD. **Table 3-18** provides a proposed schedule of activities for Site 86.

3.2.1.5 IR Site 88 (OU 15)—Base Dry Cleaners

Site 88, the former Base Dry Cleaning Facility (former Building 25), is located within the HPIA of MCB Camp Lejeune (**Figure 3-53**). Building 25 operated as a dry cleaning facility beginning in the 1940s. Five 750-gallon USTs were installed on the north side of the building to store dry cleaning fluids. Initially, Varsol™ was used in dry cleaning operations at Building 25. Because of flammability concerns, Varsol's use was discontinued in the 1970s and it was replaced with PCE. The PCE was stored in one 150-gallon AST adjacent to the north wall of Building 25, in the same vicinity as the USTs. PCE was reportedly stored in the AST from the 1970s until 1995. During this time, facility employees have reported that spent PCE was disposed of in floor drains. In December 1986 and March 1995, self-contained dry cleaning machines were installed in Building 25, eliminating the need for bulk storage of PCE. The USTs and AST were removed in November 1995. The dry cleaning operations ceased in January 2004, and the building was demolished to slab in August 2004.

Focused RI (1996-1998)

During removal of the USTs and ASTs, chlorinated VOCs and metals were detected in the subsurface soil samples, and chlorinated VOCs, TPH, and naphthalene were detected in the groundwater samples. As a result of these findings, a two-phased Focused RI was completed for Site 88 from 1996 to 1997. Field activities included soil and groundwater sampling. The final Focused RI report, submitted on May 15, 1998, identified subsurface soil contamination under and near Building 25, and along a line of borings paralleling an underground sewer line (apparently due to the leakage of solvent-contaminated wastewater). Groundwater analytical results identified wide-spread chlorinated solvent contamination (PCE, TCE, and cis-1,2-DCE), which had impacted the surficial aquifer and the upper portion of the Castle Hayne aquifer. A distinct contaminant plume was identified, which suggested Building 25 was the source area. The results of the RI also suggested the presence of a dense non-aqueous phase liquid (DNAPL).

DNAPL Recovery (1998-1999)

To address DNAPL at Site 88, in 1998 a partial free-phase liquid recovery was completed in addition to a pre-surfactant remediation characterization and delineation study to establish the nature and extent of the residual-phase DNAPL. Surfactant-Enhanced Aquifer Remediation (SEAR) was conducted to remove the residual phase DNAPL and some free phase DNAPL. This pilot program was completed in August 1999. The Final SEAR Report was issued January 25, 2000, and post-SEAR monitoring was completed in 2001.

Reductive Anaerobic Bioremediation In Situ Treatment (2001-2002)

In 2001, several other IRAs were also initiated. The U.S. Air Force started operations of the Reductive Anaerobic Bioremediation *In Situ* Treatment Technology (RABITT) pilot scale test within the dissolved portion of the plume near monitoring wells 88-MW05 and 88-MW05IW. This pilot test, completed in 2002, reported that PCE and TCE concentrations were reduced to below detectable levels in almost all wells after 14 weeks and remained depressed throughout the remainder of the demonstration. In addition, the RAC Contractor started aggressive fluid vapor recovery (AFVR) activities at Site 88 by pumping free phase product monthly from six existing extraction wells.

LTM (1999-2002)

LTM at Site 88 was implemented in April 1999 and discontinued in 2002 when an Amended RI was initiated.

Supplemental SI (2002-2003)

In July 2002, a Supplemental SI was conducted, which involved collection of groundwater samples in order to determine the “current” nature and extent of contamination and to provide recommendations for completing a comprehensive RI. Analytical results indicated that significant groundwater contamination still existed at Building 25. Notably, chlorinated hydrocarbons were detected in peripheral monitoring wells, indicating that the extent of groundwater contamination had not been delineated. As a result a second supplemental SI was conducted in 2003 in order to address the data gaps identified in the original SI. Activities included a sewer survey to identify potential DNAPL migration pathways, soil sampling and groundwater sampling. The sewer survey identified several areas of potential DNAPL migration pathways. The analytical results indicated a general northwest migration of contaminants. Further, the vertical distribution of VOCs suggested that the shallow silt

layer was not impermeable, and dissolved-phase VOCs were potentially migrating vertically to the intermediate-depth aquifer zone.

Membrane Interface Probe Investigation (2004)

In April 2004, a membrane interface probe (MIP) investigation was conducted to refine previous source area characterization efforts and conduct vertical soil profiling in the vicinity of Building 25 and the nearby sewer systems. Information provided by the MIP investigation was used to evaluate the horizontal and vertical distribution of the DNAPL source area.

NTCRA (2004-2005)

An EE/CA for the soil source under Building 25 was completed in September 2004, which provided recommendations for the technology and approach to be completed as part of source removal action. The EE/CA was presented at a public meeting in June 2004. Shallow soil mixing with clay-ZVI and dual phase extraction were the recommended technology presented in the EE/CA. In 2005, the removal action was completed, treating approximately 7,050 cubic yards of impacted soil. Within the treatment area PCE concentrations in the soil were reduced by greater than 99 percent. Despite the significant source area reduction, residual dissolved phase groundwater contamination remains over a large portion of the surrounding and downgradient areas.

RI (2006-2008)

The primary objective of the RI was to address the data gaps in the Final Focused RI Report (1998), which were identified during the Supplemental Site Investigation (SSI) and complete the source identification and delineation of the chlorinated solvent release at Site 88. Field activities included monitoring well installation and groundwater sampling. The RI report was submitted in March 2008 (CH2M HILL, 2008b) and identified a VOC plume in the groundwater that extended south of the source area. The HHRA identified potential human health risks based on hypothetical potable use of the groundwater by industrial or residential receptors. Potential unacceptable risks were also identified for non-potable exposure to groundwater for the construction worker and industrial worker. No ecological risks were identified.

Future Activities

A Draft FS was submitted in FY 2008. A treatability study is planned in FY 2009 to further evaluate potential remedial technologies for incorporation into the final FS. The final FS will be completed in FY 2010 followed by a PRAP and ROD. **Table 3-19** provides a proposed schedule of activities at Site 88.

3.2.1.6 IR Site 89 (OU 16)—Former DRMO

Site 89, the former Defense Reutilization and Marketing Office (DRMO), is located within OU 16, which is within Camp Geiger in the extreme northwest corner of the Base. OU 16 includes Sites 89 and 93 (**Figure 3-54**). Historical records for Site 89 indicate that the Base Motor Pool operated onsite until approximately 1988, when it was relocated to its current location, an asphalt paved area immediately north of the DRMO facility. The Base Motor Pool, while located at Site 89, reportedly used solvents (acetone, TCE, and MEK) for parts cleaning. After 1988, the site was used as the DRMO by the Defense Logistics Agency (DLA) until 2000. The facility was used as a storage yard for items such as scrap and surplus metal,

electronic equipment, vehicles, and rubber tires. In the early 1990s, fuel bladders were placed onsite. The bladders ranged in size from 600 to 20,000 gallons and were used in training exercises for helicopter refueling. Base personnel reported that the bladders were emptied on the ground, cleaned with solvents, re-emptied on the ground, and capped prior to storage at the DRMO. The bladders were stored for 3 to 4 years in a pile approximately 75 ft in diameter by 25 ft high. A shredder was then brought onsite and located immediately north of the bladder pile. The bladders were shredded into small cubes and placed into roll-off boxes. During shredding operations, liquids were observed escaping from the bladders. These liquids were not contained or removed. The site has not been used since the DRMO relocated in 2000.

Investigations at Site 89 have historically been focused on a small area within the DRMO that formerly contained a 550-gallon steel UST used to store waste oil. The UST was reportedly installed in 1983 and removed in 1993. The initial UST investigation detected chlorinated VOCs in the groundwater, which led to the inclusion of the site into the Camp Lejeune IRP.

Focused RI (1996-1997)

From 1996 to 1997, a Focused RI was conducted to characterize the nature and extent of soil and groundwater contamination at OU 16 (Sites 89 and 93). Field activities at Site 89 included the collection of soil, groundwater, surface water, and sediment samples. The Focused RI identified chlorinated solvent contamination in soil and groundwater at Site 89. Most of the groundwater contamination is located in the area of the former DRMO. The contaminant plume extends to approximately 50 ft bgs and extends approximately 1,200 ft east of the DRMO. In addition, the Focused RI concluded that chlorinated VOCs in the groundwater affected Edwards Creek, which is located along the southern boundary of Site 89. The HHRA identified potential human health risks for future receptors due to exposure to chlorinated VOCs in groundwater. The ERA identified a potential risk to ecological receptors primarily due to the presence of chlorinated VOCs in sediment.

LTM (1999-2005)

Based on the results of the RI, LTM was implemented at Site 89 in April 1999 in order to assess plume stability. LTM was discontinued in 2005 due to the ongoing FS (CH2M HILL, 2005).

Post-RI Investigations (1999)

Additional investigation activities were conducted in June/July 1999 and in October 1999. Activities included soil, groundwater, surface water, and sediment sampling. These investigations verified that the extensive amounts of chlorinated VOCs had contaminated the immediate and surrounding areas of Site 89. A follow-up investigation was conducted in December 1999 to further delineate the extensive soil contamination in the southern portion of Site 89. Soil samples were collected both inside and outside the DRMO. This sampling confirmed that extremely high levels of chlorinated VOCs were affecting an extensive area within the southern portion of the site.

Low Temperature Thermal Desorption TCRA (2000)

Based on the findings of the additional investigations, a TCRA was completed in October 2000 for the removal and treatment of vadose zone contaminants in the southern portion of the site. Low Temperature Thermal Desorption (LTTD) units were used to treat the

contaminated soil and roughly, 32,000 tons were treated. In addition, an aeration system was installed in Edwards Creek to assist in the remediation of VOCs in the creek. This system is anticipated to be operational through FY 2008.

Electrical Resistive Heating Pilot Study (2001-2004)

In 2001 and 2002, field investigations were completed in support of a NTCRA. However, based on the results of the investigations a pilot study was recommended to evaluate electrical resistance heating (ERH) prior to full-scale implementation. In 2004, the ERH pilot study was conducted as a remedial action for one of the DNAPL plumes identified in the Supplemental Investigation. The total area of treatment was approximately 15,900 square feet (ft²). The Final Pilot Study report, submitted in July 2005, concluded that an estimated 48,000 pounds of VOCs were removed from the subsurface during this remedial action.

Treatability Study (2006-2008)

In November 2006, a treatability study was implemented at Site 89 to evaluate the performance and effectiveness of four remedial alternatives, including air sparging using a HDD well; permeable reactive barrier (PRB), using mulch/compost as backfill; chemical reduction via ZVI injection through pneumatic fractures; and ERD using a combination of sodium lactate and EVO, with direct push emplacement. Groundwater monitoring in support of these treatability studies was conducted until July 2007; and results of the treatability study were presented in a Final Treatability Study report submitted in February 2008 (CH2M HILL, 2008c).

Comprehensive RI (2006-2008)

The Final Comprehensive RI was submitted in May 2008 (CH2M HILL, 2008d). Field activities included a MIP investigation; monitoring well installation; slug testing; groundwater, soil, vapor, sediment, surface water, and pore water sampling; and benthic community survey. TCE and tetrachloroethane (PCA) and their respective degradation products were detected at elevated concentrations in soil, groundwater, and adjacent surface water and sediment from Edwards Creek. The HHRA identified potential human health risks based on hypothetical potable use of the groundwater and future residential exposure to subsurface soil, primarily from exposure to VOCs. The ERA identified potential ecological risks to benthic-dwelling organisms and amphibians from exposure to PAHs and pesticides in sediment in an adjacent wetland area located west of the site. The RI recommended an FS be completed to evaluate remedial alternatives.

EE/CA (2007)

An EE/CA to reduce source area concentrations was submitted for Site 89 in FY 2007. Five alternatives were evaluated to remediate the DNAPL impacted area:

- Excavation
- Electrical resistive heating (ERH)
- Shallow soil mixing
- *In situ* thermal desorption (ISTD)
- Air sparging

Each technology was evaluated based on effectiveness, implementability, and cost. An Action Memorandum was submitted in May 2008 documenting shallow soil mixing with ZVI and bentonite addition as the preferred NTCRA.

Future Activities

In 2008, the NTCRA was initiated and monitoring will continue until August 2009. The Final NTCRA Summary Report is anticipated to be submitted in FY 2010.

To further evaluate potential ecological risk (Step 4) in an adjacent wetland area, a biological survey and sediment and surface water samples were collected in FY 2008. The results will be used to identify whether future actions are required to address site-related impacts to the wetland. A FS, PRAP, and ROD will be completed following completion of the source area NTCRA. **Table 3-20** provides a schedule of proposed activities at Site 89.

3.3 Proposed Remedial Action Plan and Record of Decision Sites

No sites are expected to be in the PRAP/ROD phase during FY 2009.

3.4 Remedial Design and Remedial Action Sites

This section discusses the site history for one IR site (Site 84) for which the RD/RA phase will be completed during FY 2009.

3.4.1 IR Site 84 (OU 19)—Building 45

Site 84, Building 45, is located approximately 200 yards south of State Route 24, one mile west of the Main Gate (**Figure 3-57**). The property on which Site 84 is located was purchased by the federal government in 1941. Building 45, constructed by the Navy soon after purchasing the property, was leased to Tidewater Electric, who operated the building through 1965. Camp Lejeune converted Building 45 to a maintenance facility for large machinery in 1965. While no official operational history exists for the building and the surrounding property, former employees recalled that site activities included PCB transformer maintenance, recycling, and onsite disposal of spent transformer casings. A transformer was discovered near the wooded area, east of the powerhouse; and additional transformers (approximately 20), potentially containing PCB dielectric oil, were discovered near the woods, east of the powerhouse. Maintenance personnel at Building 45 have indicated that additional transformers may still be buried in areas near a former lagoon. Public Works Center personnel were reported to have performed minor excavations in the area and did not discover any waste materials.

3.4.1.1 UST Investigation (1992)

During a UST Investigation conducted in 1992, low levels of PCBs were detected in a soil sample collected from the area where a transformer was discovered.

3.4.1.2 Pre-RI Screening Study (1995)

A Pre-RI Screening study was conducted in October 1995, which included soil, groundwater, surface water, and sediment sampling. Additional groundwater sampling was performed in March 1998. Samples were analyzed for PCBs only. Based on the analytical results, the Pre-RI concluded that the site had been adversely affected by PCB contamination. PCBs were 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. A Baseline Risk Assessment (BRA) was also completed as part of the Pre-RI, which did not identify any risks to human health or the environment.

Based on the results of the Pre-RI, a Draft EE/CA was prepared on January 15, 1999 to present removal action options for the NTCRA of PCB-contaminated sediments and soil in and near the lagoon at Site 84. This report, along with the Draft Action Memorandum was not finalized because the removal action was delayed to allow for more complete PCB delineation at the site.

3.4.1.3 UST Removal (1999)

In July 1999, a 500-gallon UST used for storing heating oil was removed in the vicinity of Building 45. Confirmatory soil samples identified petroleum hydrocarbons in the soil. The UST removal report concluded that the detected petroleum hydrocarbons might not be from the UST, rather it was suggested that the contamination might have come from other unidentified source(s), based on the long industrial operation history at Building 45.

3.4.1.4 Building 45 Removal (1999)

Concrete sampling and surface soil sampling was conducted at Building 45 in August 1999 in preparation for razing and offsite disposal of material from the aboveground portions of Building 45. Analytical results identified PCBs in the concrete. As a result, the aboveground portion of Building 45 was removed between August and September 1999, with the foundation left in place.

3.4.1.5 RI/FS (2001-2002)

The RI/FS field investigation was completed in August 2001. RI field activities included a soil investigation, trenching to locate a drain line from former Building 45 to the former lagoon, and a shallow groundwater investigation. The findings from the RI indicated that soil around former Building 45 and limited areas west of the building were impacted by organic compounds (primarily PCBs, pesticides, and PAHs) and metals. The RI also identified limited groundwater contamination present in the surficial aquifer (primarily benzene, pesticides, and metals). Sediments in the lagoon are also contaminated, primarily from PCBs. The HHRA identified unacceptable risks to current receptors due to the presence of PCBs and PAHs in surface soil. The ERA identified potential unacceptable risks to terrestrial receptors primarily due to the presence of pesticides, PCBs, and metals in surface soils and potential unacceptable risks to ecological receptors primarily due to the presence of VOCs, SVOCs, and PCBs in lagoon sediments. The Final RI recommended completion of a NTCRA to remove surface soils surrounding Building 45, in the lagoon area, and in the midfield area as well as remove the Building 45 foundation materials. The Final FS was completed in June 2002, which developed and screened remedial alternatives for addressing soil contamination.

3.4.1.6 Phase I NTCRA (2002)

Based on the recommendations of the RI/FS, an NTCRA Work Plan was submitted in January 2002 to remove the remaining building foundation at Building 45 and some surrounding PCB-contaminated soil. The Phase I removal action was completed in the fall of

2002, and included removal of 4,857 tons of non-hazardous PCB-contaminated soil and 142 tons of contaminated soil.

3.4.1.7 PRAP (2002)

The PRAP for Site 84 was submitted for public review and comment in June 2002 for a 30-day period. The PRAP consisted of eight alternatives to address residual soil contamination and two alternatives to address groundwater contamination. Owing to the national debate between USEPA and DoD regarding enforcement issues of the LUCs, completion of the Final ROD was temporarily delayed. Accordingly a Draft EE/CA was also presented at the public meeting for completing an IRA to address residual soil contamination.

3.4.1.8 Phase II NTCRA (2002-2004)

The EE/CA was finalized in October 2002 and the Action Memorandum was finalized in November 2002, identifying excavation and offsite disposal of contaminated soil and lagoon sediments as the selected response action. The Phase II NTCRA was conducted from December 2003 to August 2004, and included the removal of approximately 12,000 tons of contaminated soil/sediment. However, rather than meeting the PCB remediation goal and reaching site closure, the Phase II NTCRA uncovered additional areas of contamination. A steel pipe was unearthed in the northern portion of the site and concerns were raised about a possible second burial lagoon.

3.4.1.9 Corrective Action Plan (2003)

In October 2003, a Final Corrective Action Plan (CAP) was submitted to NCDENR to address pesticide contamination in the groundwater at Site 84. The groundwater remediation program proposed in the CAP is being managed under the authority of NCDENR's UST program.

3.4.1.10 Phase III NTCRA (2006-2007)

A Final Recommendations Report was completed in September 2006 to re-evaluate the site and determine what additional actions were required to meet the established objectives. Based on its findings, a Phase III NTCRA was conducted from April to October 2006, which included the excavation of approximately 680 tons of PCB-contaminated soil. At test pit TP-14, located west of the Uncontrolled Fill area along the site access road, excavation was not feasible due to the presence of multiple buried, active utilities. Consequently, total excavation to achieve the PCB remediation goal of 10 parts per million (ppm) was deemed impractical and a 2-ft thick vegetative soil cover was placed over the remaining PCB-contaminated soil. The Final Construction Closeout Report was submitted November 30, 2007 to summarize the NTCRA.

3.4.1.11 Amended FS, PRAP, and ROD (2008)

An Amended FS report (Rhea, 2008a) and a Final PRAP report (Rhea, 2008b) were submitted March 31, 2008. The PRAP proposed removal of PCB-contaminated soil and LUCs to prohibit intrusive activities, prohibit use of the site for residential housing, and protect site workers. A ROD was finalized in FY 2008.

3.4.1.12 Future Activities

A RD is expected to be completed in FY 2009. LUCs will be implemented and a RACR is expected to be completed in FY 2009. **Table 3-17** provides a proposed schedule of activities at Site 84.

3.5 Remedy-in-Place and Response Complete Sites

The following sections discuss the site history for 21 IR sites which are in the RIP stage as well as the 15 IR sites and one MRP site which are NFA and in the RC stage of the CERCLA process. Of the 21 RIP sites, all have LUCs in place, as shown in **Table 3-5**. Six of the RIP sites (Sites 3, 6, 36, 78, 82, and 93) are also currently in the LTM program (**Table 3-4**), as required by the applicable signed ROD.

3.5.1 IR Sites

3.5.1.1 PA Site—HPIA (Buildings 1120, 1409, and 1512)

The HPIA PA site includes Buildings 1120, 1409, and 1512, located in the HPIA (**Figure 3-10**). Building 1120 has been used as an Automobile Hobby Shop since 1955. One 1,000-gallon AST storing waste oil was reportedly installed prior to 1972 in the vicinity of Building 1120. Operations conducted in this building include automotive repair and painting. Known wastes used or stored in this building include automotive grease, oil, waste oils, and paint.

Building 1409 was constructed in the 1940s and has been used as an upholstery and carpentry shop, a decontamination building, a storage building, and a furniture repair shop. Painting was also conducted at this building and a number of wastes including paint stripper, hydraulic fluid, penetrating fluid, and gear case oil have been used or stored here. The Furniture Repair Shop contained a 550-gallon vat of paint stripper, which was reportedly disposed of in 55-gallon drums, transported to the Fly Ash Dump (IR Site 24) where the contents was poured on the ground (WAR, 1983). Paint stripping chemicals can include any of the following products: mineral spirits, toluene, MEK, or acetone. Currently, the building houses a military Boat Shop. Several ASTs are currently located adjacent to Building 1409; however, the contents and capacity of the ASTs are unknown.

The operational history for former Building 1512 is unknown. It is assumed that it was used as an automotive repair support structure for the series of vehicle maintenance buildings in this area. Currently the area is being used as open storage for drums and tires and as vehicle maintenance support. During a site visit in 2004, approximately 75 tires and fifteen 55-gallon drums were observed.

PA/SI (2001-2006)

A PA was conducted for Buildings 1120, 1409, and 1512 in 2001, which included a literature review and field reconnaissance. A qualitative evaluation of the potential impact of the sites on human health and the environment was also performed. Due to known historical site use or because information was not known about the possible types and or extent of contamination at the site, field investigation activities were recommended. As a result, an SI was completed in June 2002. Field activities included soil and groundwater investigations. Based on the analytical results, the Final PA/SI report (issued in February 2006) recommended NFA at Buildings 1120, 1409, and 1512.

3.5.1.2 IR Site 1 (OU 7)—French Creek Liquids Disposal Area

Site 1, the French Creek Liquids Disposal Area, is located within OU 7 on the Mainside of the Base. OU 7 includes Sites 1, 28, and 30 (**Figure 3-45**). Site 1 has been used by several different mechanized, armored, and artillery units since the 1940s. Liquid wastes generated from vehicle maintenance were reportedly routinely poured onto the ground surface. At times, holes were reportedly excavated 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 estimated the quantity of POL waste disposed at the areas is between 5,000 and 20,000 gallons; and the quantity of battery acid waste is between 1,000 and 10,000 gallons. Currently, Site 1 continues to serve as a vehicle and equipment maintenance/staging area.

IAS (1983)

The IAS (WAR, 1983) concluded that waste POL and used battery acid may threaten a potable water well (Building 636) and could potentially migrate offsite into Cogdels Creek; and thus recommended that a Confirmation Study be conducted to determine the boundaries of the disposal area.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included groundwater, surface water, and sediment investigations. Groundwater samples collected from the surficial aquifer identified the presence of chlorinated VOCs (PCE and TCE), metals, and O&G.

Soil Assessment (1991)

In July 1991 a soil assessment was completed for an area in the southern portion of the site that was being considered for a MILCON project. Surface soil and subsurface soil samples identified inorganic constituents at levels generally consistent with background concentrations.

Groundwater Study (1993)

In April 1993, additional groundwater sampling was conducted to determine current site conditions during scoping of the RI/FS. Groundwater analytical results also identified inorganic constituents at concentrations generally consistent throughout the site.

RI (1994)

In 1994, a RI was conducted at OU 7 (Sites 1, 28, and 30). RI field activities at Site 1 consisted of a site survey, a soil investigation, and a groundwater investigation. Due to a lack of rainfall and the intermittent nature of surrounding drainages, a surface water and sediment investigation was not completed. VOCs were not found in surface soil, but were detected in limited number of subsurface soil samples. VOCs (primarily TCE and vinyl chloride) detected in groundwater above their respective NCGWQS were limited to the northern portion of the study area. The HHRA did not identify any unacceptable risks to human health or the environment. The ERA concluded that metals may have the potential to affect the integrity of terrestrial receptors at Site 1. Remedial alternatives for groundwater were evaluated during preparation of the FS, submitted in July 1995.

PRAP (1995) and ROD (1996)

The Final PRAP for OU 7 (Sites 1, 28, and 30) was issued July 13, 1995 and the Final ROD was signed on May 16, 1996 (Baker, 1996a). The ROD identified LTM and LUCs as the selected remedy for Site 1. LTM at Site 1 was implemented in 1996 and discontinued in January 2001 when site-wide groundwater concentrations fell below the remedial action goals.

Remedy-In-Place

LTM at Site 1 was implemented in 1996 and discontinued in January 2001 when site-wide groundwater concentrations fell below the remedial action goals. A Final OU 7 Closeout Report was completed in September 2002 (CH2M HILL, 2002) to document the completion of the remedial action (monitoring). LUCs were implemented 2001 and updated in 2002, as shown in **Table 3-5**.

3.5.1.3 IR Site 2 (OU 5)—Former Nursery/Daycare Center

Site 2, the Former Nursery/Daycare Center, encompasses approximately five acres just inside the Main Gate in the northeast portion of the Base (**Figure 3-43**). From 1945 to 1958, an onsite building (Building 712) was used for storing, handling, and dispensing pesticides. Chemicals known to have been used at Site 2 include chlordane, 4,4'-DDT, diazinon, and 4,4'-DDD. Chemicals known to have been stored at Building 712 include dieldrin, lindane, malathion, and silvex. Historical aerial photos display evidence that a former storage area was primarily used to store bulk materials; however, there is no indication that this area actually had pesticides stored on it. Contamination at the site is believed to have occurred as a result of small spills, washout, and excess product disposal.

IAS (1983)

The IAS (WAR, 1983) indicated Building 712 had been used as a nursery/daycare center for children; however, the daycare center was relocated in April 1982 when a preliminary soil sampling investigation conducted in 1982 indicated the presence of pesticides. Building 712 is currently used as a personnel office for non-appropriated-funding personnel.

Confirmation Study (1984-1990)

From 1984 through 1990, a Confirmation Study was conducted to verify the presence of potential contaminants in groundwater, surface water, soil, and sediment. The results of the Confirmation Study indicated the presence of pesticides and VOCs in environmental media throughout Site 2. The Confirmation Study recommended that further characterization of groundwater be conducted and suggested the completion of a supplemental surface water and sediment investigation.

Geophysical Investigation (1992)

In July 1992, a surface geophysical investigation was performed at Site 2 to establish the source of groundwater contamination. No anomalies that could serve as sources (i.e., tanks or drums) of groundwater contamination were identified during this investigation. However, an atypical subsurface feature was detected. The data from this anomaly was not conclusive to ascertain whether or not it was a tank, large diameter utility line or other buried structure.

RI/FS (1993-1994)

A RI/FS was initiated in April 1993 and completed in September 1994. RI field activities included a geophysical investigation; soil gas survey; and soil, groundwater, surface water, and sediment sampling. Analytical results identified elevated levels of pesticides 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. Ethylbenzene and toluene are known constituents in petroleum-based pesticides similar to what was historically used at Site 2. The HHRA identified unacceptable risks to current receptors due to the presence of pesticides in the soil and identified unacceptable risks to future receptors due to the presence of VOCs in groundwater. The ERA identified potential risks to aquatic and terrestrial receptors due to the presence of pesticides in sediment and soil.

TCRA (1994)

Based on the findings of the RI, a TCRA was recommended for removal of pesticide-contaminated soil. The TCRA was initiated in January 1994 and included the excavation and offsite treatment of pesticide-contaminated soil and concrete. A total of 1,049 tons of pesticide-contaminated soil was excavated and sent for offsite disposal. Because site risks due to the presence of contaminated soil were reduced by the completion of the TCRA, the FS (completed in June 1994) focused on evaluating remedial alternatives for addressing groundwater contamination.

PRAP and ROD (1994)

The Final PRAP for OU 5 was issued June 23, 1994 and the Final ROD for OU 5 was signed on September 15, 1994 (Baker, 1994b). The ROD identified LTM of groundwater and LUCs as the preferred remedial alternative.

Remedy-In-Place

LUCs were implemented in 2001 and updated in 2002, as shown on **Table 3-5**. LTM at Site 2 was implemented in 1995 and was discontinued in May 2007 after groundwater concentrations fell below NCGWQS for four consecutive quarters. The Site Closeout Report for Site 2 is expected to be completed in late FY 2008/early FY 2009 to document all environmental activities for OU 5, Site 2 based on the results of the RI, FS, PRAP, ROD, and completion of the necessary requirements for the LTM program. **Table 3-6** provides a proposed schedule of activities for Site 2.

3.5.1.4 IR Site 3 (OU 12)—Old Creosote Plant

Site 3, the Old Creosote Plant, encompasses approximately five acres on the Mainside of the Base (**Figure 3-50**). The Creosote Plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Camp Lejeune Railroad. An onsite sawmill, which supplied cut timbers for the creosote treatment, was reportedly located in the northern portion of the Site. Remnants of the former creosote plant, including the chimney, concrete pads, and train rails, are present in the southern portion of Site 3.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 3, and concluded that no further assessment was necessary since any wastes present at the site would be inert. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.

SI (1991)

In June 1991, a SI was conducted, which included soil, groundwater and sediment investigations. The analytical results identified SVOCs, particularly PAHs in soil and groundwater. Based on these results, a RI was proposed.

RI (1994-1996)

From September 1994 through January 1996, RI field activities were conducted to characterize the nature and extent of contamination at Site 3. These field activities included installation of monitoring wells, and the collection of surface soil, subsurface soil, and groundwater samples. The RI identified PAHs (primarily naphthalene) in both soil and groundwater, with the highest concentrations occurring within the former treatment area in the central portion of the Site. The PAHs detected at Site 3 were believed to be linked to the operation at the former creosote plant. Fuel constituents, such as ethylbenzene and xylenes, were also detected in soil and groundwater within the former treatment area. The HHRA identified potential human health risks due to exposure to SVOCs in subsurface soils and VOCs and SVOCs in groundwater. The ERA did not identify any potential ecological risks.

FS (1996)

In August 1996, a FS was prepared which developed and screened remedial alternatives for addressing soil and groundwater contamination.

PRAP (1996) and ROD (1997, 1999)

The PRAP for Site 3 was submitted for public review and comment in November 1996. The PRAP consisted of five alternatives to address soil contamination and three alternatives to address groundwater contamination at Site 3. The Final ROD for OU 12 was signed on April 3, 1997, and identified source removal with onsite biological treatment of PAH-contaminated subsurface soils, groundwater monitoring, and LUCs as the preferred remedial alternative. However, a pilot scale treatability study conducted in 1998 indicated that biological treatment of soils was not effective. As a result, an Amended ROD was signed on June 20, 2000 (Baker, 2000b), identifying soil excavation with offsite disposal, groundwater monitoring, and LUCs as the preferred remedial alternative.

Remedy-in-Place

The removal action identified in the Amended ROD was completed as a NTCRA in 2000, during which 3,295 tons of PAH-contaminated soil was removed from Site 3.

LTM at Site 3 was implemented in 1997 and is on-going, in accordance with the recommendations of the LTM Optimization Report (CH2M HILL, 2005). The LTM program for Site 3 is summarized in **Table 3-4**. **Table 3-7** provides a proposed schedule of LTM activities at Site 3. LUCs were implemented in 2001 and updated in 2002, as shown in **Table 3-5**.

3.5.1.5 IR Site 6 (OU 2)—Lots 201 and 203

Site 6 is located within OU 2 approximately two miles east of the New River and two miles south of State Route 24. OU 2 covers approximately 210 acres and includes Sites 6, 9, and 82 (**Figure 3-40**). Site 6 covers an area of approximately 177 acres that incorporates Storage Lots 201 and 203, a wooded area between the storage lots, and a ravine. From the 1940s to the late 1980s, Site 6 was used for disposal and storage of wastes and supplies, including pesticides transformers containing PCBs, solvents, electrolytes, and waste oils. Currently,

Lot 201 is used to store military equipment, vehicles, hydraulic oils, and other “non-hazardous” supplies. Most of Lot 203 remains an open field; 21 acres are temporarily being used by the DRMO for metal staging operations.

IAS (1983)

The IAS (WAR, 1983) indicated the wastes present at Site 6 originated from dumping and storage activities and recommended that a Confirmation Study be conducted to verify the presence of contamination.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included soil, groundwater, surface water, and sediment investigations. Low levels of pesticides were detected in soil samples. Groundwater samples collected from shallow monitoring wells at Site 6 revealed low levels of VOCs and benzene. Further, elevated levels of TCE, PCE, DCE, and vinyl chloride were identified in nearby water supply wells, at a depth of approximately 200 ft.

Soil Gas Survey (1989)

In February 1989, a soil gas survey was conducted to identify the presence of VOCs that may potentially affect personnel working within Lot 203. No imminent hazards were identified with the results of the survey.

RI (1992-1993)

A RI was conducted at OU 2 (Sites 6, 9, and 82) from August 1992 to May 1993. Field activities consisted of a preliminary site survey; a geophysical survey; a soil investigation including drilling and sampling; a groundwater investigation including monitoring well installation and sampling; drum waste sampling; test pit investigation; a surface water and sediment investigation; and an aquatic and ecological survey. Levels of organic compounds (primarily PCBs, pesticides, VOCs, and SVOCs) and inorganic compounds (primarily barium, cadmium, chromium, lead, manganese, and zinc) were identified throughout the site in various media (i.e. soil, groundwater, surface water, and sediments). The HHRA identified potential human health risks due to exposure to vinyl chloride, arsenic, and beryllium in groundwater and PCB-1260 in biota from Wallace Creek. Further, the findings of the ERA indicated past disposal practices at Site 6 may potentially be adversely impacting the ecological integrity of Wallace Creek and the ravine.

FS (1993)

In August 1993, a FS was completed for OU 2 (Sites 6, 9, and 82), which developed and screened remedial alternatives for addressing groundwater (TCE and vinyl chloride) and soil (pesticides, PAHs, and PCBs) contamination.

PRAP and ROD (1993)

The PRAP for OU 2 (Sites 6, 9, and 82) was submitted for public review and comment in August 1993 for a 30-day period. The PRAP consisted of seven alternatives to address soil contamination and five alternatives to address groundwater contamination. The Final ROD for OU 2 was signed on September 4, 1993 (Baker, 1993a). The ROD identified onsite treatment and offsite disposal of contaminated soil and implementation of LTM of groundwater, surface water, and sediment as the selected remedies for Site 6.

Remedy-in-Place

The removal action identified in the ROD was completed under a TCRA in 1994. Twenty drums containing DDT were removed and contaminated soil was excavated. A second TCRA was conducted in 1995 and 1996 to remove more than 2,655 cubic yards of drums, batteries, and communications wire. The soil was contaminated with POLs.

LTM at Site 6 was implemented in 1996 and is on-going, in accordance with the recommendations of the LTM Optimization Report (CH2M HILL, 2005). The LTM program for Site 6 is summarized on **Table 3-4**. LUCs were implemented in 2001 and updated in 2002, as shown in **Table 3-5**.

During LTM, chlorobenzene has been detected intermittently in one groundwater monitoring well. Accordingly, a focused field investigation near this monitoring well was completed in June 2004 to delineate the extent of the chlorobenzene contamination. Results of the investigation indicated localized chlorobenzene detections in both the soil and groundwater in the vicinity of the well. A supplemental field investigation, including a geophysical survey to identify the potential source of contamination and groundwater sampling to delineate the extent of chlorobenzene concentrations, is expected to be completed in FY 2009. **Table 3-8** provides a proposed schedule of activities at Site 6.

3.5.1.6 IR Site 7 (OU 11)—Tarawa Terrace Dump

Site 7, the Tarawa Terrace Dump, encompasses approximately five acres within OU 11, which is also comprised of Site 80 (**Figure 3-49**). 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 at this facility; only construction debris, water treatment plant filter media, and household trash.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 7 was insignificant and did not warrant further investigation.

SI (1991)

In June 1991, a SI was conducted which included soil and groundwater investigations. The analytical results identified SVOCs and pesticides in soil and groundwater. Based on these results, a RI was proposed.

RI (1994-1996)

The RI field program at Site 7 was conducted in 1994 and consisted of a site survey, soil investigation, groundwater investigation, surface water and sediment investigation, a habitat evaluation, and an earthworm bioaccumulation study. The Final RI was submitted in February 1996 and identified infrequent pesticide detections in soil and sediment samples across the site at concentrations consistently at or below Base background levels. SVOCs (primarily PAHs) were detected in surface soil samples in the north and eastern portions of the study area; however, these contaminants were not detected in groundwater. Metals were the most prevalent and widely distributed contaminants in soil and groundwater at Site 7. The HHRA and ERA did not identify any unacceptable risks to human health and the environment due to site-related contaminants.

PRAP (1996) and ROD (1997)

Based on the findings of the RI, a Final PRAP for OU 11 (Sites 7 and 80) was submitted for public review and comment in November 1996. The Final ROD for OU 11 (Sites 7 and 80) was signed on August 21, 1997 (Baker, 1997a). No remedial actions were required in the ROD for Site 7 due to the absence of contamination. Therefore, Site 7 was closed with NFA.

3.5.1.7 IR Site 9 (OU 2)—Fire Fighting Training Pit at Piney Green Road

Site 9 is located within OU 2 approximately two miles east of the New River and two miles south of State Route 24. OU 2 covers approximately 210 acres and includes Sites 6, 9, and 82 (Figure 3-40). Site 9 includes the original fire-fighting training area, which is still presently in use. Flammable liquids such as heating oil, solvents, and fuels are used as accelerants during the training exercises. From the early 1960s to 1981, training exercises were conducted in an 800 ft² unlined fire training pit, located in the southern area of the site. In 1981 the pit was lined with asphalt and an OWS was installed next to the pit; and in 2002 the pit was lined with concrete. Four 500-gallon ASTs were located near the training area but are no longer present.

IAS (1983)

The IAS (WAR, 1983) estimated that 30,000 gallons per year of used oil, solvents, and contaminated fuels were burned during training exercises. Based on its findings, the IAS recommended that a Confirmation Study be conducted to verify the presence of contamination and determine whether migration was occurring.

Confirmation Study (1984-1987)

From 1984 to 1987, a Confirmation Study was conducted, which included a groundwater investigation. Chromium, lead, phenols, and ethylene dibromide were detected in groundwater samples.

RI (1992-1993)

An RI was conducted at OU 2 (Sites 6, 9, and 82) from August 1992 to May 1993. Field activities at Site 9 consisted of a preliminary site survey, a soil investigation, and a groundwater investigation. Analytical results did not reveal extensive contamination.

PRAP and ROD (1993)

The PRAP for OU 2 (Sites 6, 9, and 82) was submitted for public review and comment in August 1993 for a 30-day period. The Final ROD for OU 2 was signed on September 4, 1993 (Baker, 1993a). No remedial actions were required in the ROD for Site 9 due to the absence of contamination.

Removal Action (2000)

A new POL Fire Training Pit was completed in 2000. The new training facility employs a petroleum source for burning operations and the pit is lined with high-temperature concrete. During the installation of the new facility, POL-contaminated soil was excavated and removed from the site.

Remedy-in-Place

Although the ROD did not require remedial action, for conservativeness, LUCs were implemented in 2001 and updated in 2002 (Table 3-5) due to the site's continued use as a fire-training area.

3.5.1.8 IR Site 10 (Pre-RI)—Original Base Dump

Site 10, the Original Base Dump, is located on the Mainside of the Base (**Figure 3-12**). Site 10 was approximately five to 10 acres in size during full operation of the landfill and was reportedly used for construction debris and as a burn dump during construction of the Base, prior to 1950.

IAS (1983)

During the IAS (WAR, 1983), it was determined that Site 10 did not require further investigation. However, the site was added to the IRP in 1994 when it was reported that two marines developed skin rashes after contacting a heavy oily material that may have been at the site.

SI (1998)

Project plans for Site 10 were finalized in January 1998. An SI was conducted at the site in two phases; the first was completed in March 1998 and the second was completed in February/March 2001. Field work conducted as part of the SI included a site survey and soil, groundwater, surface water, and sediment sampling. The HHRA identified no unacceptable risks to human health and the environment. The ERA identified potential risk to aquatic receptors due to the presence of metals in surface water; however, it was determined that the conservative nature of the screening overestimated the risks. Based on the findings, the Final SI recommended NFA at Site 10.

NFA Decision Document (2005)

A Final NFA Decision Document (DD) was completed May 12, 2005.

3.5.1.9 IR Site 12 (Pre-RI)—EOD Detonation Area

Site 12, the EOD Detonation Area, covers approximately 8 to 10 acres, located on the Mainside of the Base (**Figure 3-13**). Since the early 1960s, Site 12 has operated as an EOD detonation area. Ordnance is disposed by burning or detonating when it is found to be inert, unserviceable, or defective. Materials disposed at Site 12 include ordnance, colored smokes, and white phosphorous. Any undestroyed residues are typically less than 1 pound.

IAS (1983)

The IAS (WAR, 1983) concluded that the quantity of any waste disposed at Site 12 was insignificant and did not warrant further investigation. However, during a disposal exercise in 1992, an explosive crater (approximately 8 ft deep) uncovered an oily sheen and a suspected petroleum odor was noted.

Pre-RI Screening Study (1995-1998)

Project plans for Site 12 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. During the Pre-RI field investigation, EOD personnel stated that disposal of small arms ammunition was carried out by piling up the rounds, sometimes inside a crater from a past disposal, dousing the pile with diesel fuel and exploding the pile with a small explosive. EOD personnel also stated that the range had been used for a brief time as a target range for aircraft to drop “dummy” bombs onto. Soil and groundwater sampling was conducted at Site 12 in January and February 1996. Analytical results indicated that soil and groundwater at Site 12 had not been impacted by site activities. As a result, the Pre-RI recommended site closeout.

NFA Decision Document (2001)

The Final NFA DD was completed May 8, 2001. Because Site 12 is an active range, it now falls under the Navy's Active Range Program.

3.5.1.10 IR Site 16 (OU 8)—Former Montford Point Burn Dump

Site 16, the Former Montford Point Burn Dump, encompasses approximately four acres in the Montford Point area of the Base (**Figure 3-46**). The Montford Point Burn dump was open from approximately 1958 to 1972, although, unauthorized dumping subsequently occurred. Trash from the surrounding housing area and buildings is suspected to have been burned and then covered with soil at Site 16. Records indicate that building debris, garbage, tires, and small amounts of waste oils were disposed of at the site. Materials, including asbestos insulating material for pipes, were also dumped on the surface. The quantity of asbestos material was estimated at less than one cubic yard, and mitigation was completed. Currently, Site 16 is vacant.

IAS (1983)

The IAS (WAR, 1983) indicated that unauthorized dumping of asbestos posed a possible health threat and recommended an investigation or removal be completed. Corrective measures were undertaken to remove the asbestos material.

RI/FS (1994-1995)

An RI/FS was initiated at Site 16 in June 1994 and completed in December 1994. Field activities included a site survey, soil investigation, groundwater investigation, and surface water and sediment investigation. A second round of groundwater samples was collected in February 1995, and a confirmatory soil investigation was conducted in December 1995. Several pesticides were detected among soil and sediment samples obtained from the site; however, the detected levels were similar to levels detected across the Base and were considered indicative of historical pest control operations. PCBs were also detected in surface soil samples collected across the site, and the likely source was considered to be the use of oils during burning activities. PCBs were not found in the groundwater, indicating that vertical migration to the water table had not occurred. SVOCs (primarily PAHs) were infrequently encountered at low levels in the surface soil; likely due to historical open burning. Benzene and ethylbenzene were detected in one groundwater sample collected during the first round of groundwater sampling; however, VOCs were absent in all groundwater samples collected as part of the second round of sampling. Site-related contaminants were not detected in surface water and sediment samples. The HHRA identified a potential risk to future residential receptors due to the ingestion of PCBs in the soil. However, an evaluation of the detected PCB concentrations in soil against the USEPA's *Guidance for Cleaning up PCBs under CERCLA* revealed that the maximum detected PCB concentration (2.1 ppm) was below the recommended remediation level for PCBs of 10 to 25 ppm for industrial areas. The ERA did not identify any potential risks to aquatic and terrestrial receptors.

PRAP and ROD (1996)

Although several contaminants were detected among the various samples of environmental media, the levels were not high enough to warrant further action. The Final PRAP for Site 16 was submitted for public review and comment in February 1996 for a 30-day period. The

Final ROD for Site 16 was signed on September 30, 1996 (Baker, 1996b). No remedial actions were required in the ROD for Site 16 due to the absence of contamination.

Remedy-in-Place

Although the ROD did not require remedial action, for conservativeness, LUCs were implemented in 2001 and updated in 2002 (**Table 3-5**) due to the site's past use as a dump.

3.5.1.11 IR Site 21 (OU 1)—Transformer Storage Lot 140

Site 21, Transformer Storage Lot 140, is located within OU 1 approximately one mile east of the New River and two miles south of State Route 24. OU 1 covers approximately 690 acres and includes Sites 21, 24, and 78. Site 21 is located within the boundaries of Site 78 on the Mainside of the Base (**Figure 3-39**). From 1950 to 1951, a pit located in the northern portion of the site was used as a drainage receptor for oil from transformers; however, the quantity of oil is unknown. Surface discharge of transformer oils was also reported. According to the IAS, the upper four inches of soil at Lot 140 was sampled for PCBs in 1980, and concentrations were less than 1 ppm. In 1958 the pest control shop was moved from Building 712 (Site 2) to Building 1105, located in the southern portion of Site 21. From 1958 to 1977, Building 1105 was used for pesticide mixing and as a cleaning area for pesticide application equipment. Overland discharge of waste water generated during cleaning operations was documented. The estimated quantity of wastewater discharged was approximately 350-gallons per week in 1977.

IAS (1983)

The IAS (WAR, 1983) indicated that past site operations may have impacted soil, groundwater, and surface water and recommended an additional investigation.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included soil and groundwater investigations. Analytical results confirmed the presence of pesticides and PCBs in soils, but they were not detected in groundwater samples.

RI (1994)

A RI was completed for OU 1 (Sites 21, 24, and 78) in June 1994. Field activities at Site 21 included groundwater, soil, sediment, and surface water sampling. The analytical results indicated that soils and sediment at the site had been by former activities. The HHRA concluded that contaminants detected at Site 21 did not pose an unacceptable risk to human health. The ERA identified potential ecological impacts due to the presence of pesticide- and PCB-contaminated soils.

FS (1994)

In July 1994, a FS was completed for OU 1 (Sites 21, 24, and 78), which developed and screened remedial alternatives for addressing soil contamination at three separate areas at Site 21.

PRAP and ROD (1994)

The PRAP for OU 1 (Sites 21, 24, and Site 78) was submitted for public review and comment in July 1994 for a 30-day period. The PRAP consisted of four alternatives to address soil contamination at Site 21. The Final ROD for OU 1 (Sites 21, 24, and 78) was signed September 15, 1994 (Baker, 1994a). The selected remedial alternative was excavation and

offsite disposal to address soil contamination at Site 21. Before implementing the soil remedy, an Explanation of Significant Differences (ESD) was issued to revise the cleanup level for PCBs to the Federal PCB action level for industrial sites due to the industrial nature of site activities at Site 21.

Remedy-in-Place

The removal action identified in the ROD was performed during 1995, and approximately 650 tons of pesticide-contaminated soil and 161 tons of PCB-contaminated soil were excavated and disposed offsite. Because the removal action was only considered protective for industrial site use, a LUC Implementation Plan (LUCIP) was completed in March 2001 that restricts development to industrial land use and use of groundwater. LUCs were implemented at Site 21 in 2001 and amended in 2002, as shown in **Table 3-5**.

3.5.1.12 IR Site 24 (OU 1)—Industrial Area Fly Ash Dump

Site 24, the Industrial Area Fly Ash Dump, encompasses approximately 100 acres within OU 1 approximately one mile east of the New River and two miles south of State Route 24. OU 1 covers approximately 690 acres and includes Sites 21, 24, and 78 (**Figure 3-39**). From the late 1940s to 1980, Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment sludge. An estimated 31,500 tons of fly ash was disposed at the site and an estimated 45,000 gallons of stripping compounds was disposed over a 7-year period.

IAS (1983)

The IAS (WAR, 1983) indicated that past site operations may have impacted groundwater and surface water and recommended an additional investigation.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included groundwater, surface water, and sediment investigations. Analytical results identified the presence of metals in groundwater, surface water, and sediment. However, the detected concentrations in surface water and sediment did not exceed regulatory standards.

RI (1994)

A RI was completed for OU 1 (Sites 21, 24, and 78) in June 1994. Field activities at Site 24 included a site survey, groundwater, soil, sediment, and surface water sampling. The analytical results identified pesticides and metals in soil and groundwater. The metals were considered site-related due to fly ash disposal. Based on the relatively low concentrations and widespread detections of pesticides found in the soil and groundwater at Site 24, the RI concluded that the pesticides resulted from routine spraying activities, not direct disposal. This conclusion was supported by the fact that there is no history of pesticide disposal at Site 24. The HHRA identified an unacceptable risk to future residential receptors from ingestion of groundwater due to the presence of vinyl chloride and metals. However, this risk was calculated based on data from all monitoring wells across OU 1. The ERA identified potential ecological impacts to terrestrial receptors due to the presence of metals. The RI recommended evaluation of metal-contaminated soil at Site 24.

FS (1994)

In July 1994, a FS was completed for OU 1 (Sites 21, 24, and 78), which developed and screened remedial alternatives for addressing groundwater contamination at Site 24. As part

of the FS, contaminants of concern (COCs) were evaluated against risk-based remediation goals, and as such, the COCs identified in soil during the RI were not retained as COCs in the FS.

PRAP and ROD (1994)

The PRAP for OU 1 (Sites 21, 24, and Site 78) was submitted for public review and comment in July 1994 for a 30-day period. The Final ROD for OU 1 (Sites 21, 24, and 78) was signed September 15, 1994 (Baker, 1994a). The selected remedial alternative was LTM for addressing site groundwater at Site 24.

Remedy-in-Place

LTM at Site 24 was implemented in 1996 and was discontinued in 1998 after achieving four consecutive quarterly sampling periods without any detections of pesticides. Although not identified in the ROD, LUCs for OU 1 were implemented through a LUCIP (Baker, 2000c) that was completed in 2001, as shown in **Table 3-5**.

3.5.1.13 IR Site 28 (OU 7)—Hadnot Point Burn Dump

Site 28, the Hadnot Point Burn Dump, is located within OU 7 on the Mainside of the Base. OU 7 includes Sites 1, 28, and 30 (**Figure 3-45**). Site 28 operated from 1946 to 1971 as a burn area for a variety of solid wastes generated on the Base. Industrial waste, trash, oil-based paint, and construction debris were reportedly burned and 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 on a surface area of 23 acres and a depth ranging from 5 to 10 ft. Currently, most of Site 28 is used for recreation and physical training exercises.

IAS (1983)

The IAS (WAR, 1983) concluded that residuals due to past disposal practices could potentially impact Codgels Creek and the New River and recommended an additional investigation to determine the boundaries of the disposal area and verify the presence of hazardous wastes.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included groundwater, surface water, sediment, and fish tissue investigations. Metals detected in groundwater, surface water, and sediment were determined to be related to past site activities. Additionally, VOCs and O&G were detected in groundwater samples.

RI (1994)

In 1994, a RI was conducted at OU 7 (Sites 1, 28, and 30). RI field activities at Site 28 consisted of a site survey, a soil investigation, a groundwater investigation, surface water and sediment investigation, and an aquatic and ecological survey. SVOCs (primarily PAHs) detected in soil samples were linked to past disposal practices. Metals and pesticides were widely detected in soil samples. Low levels of VOCs were detected in the surface soil and subsurface soil. Based upon their wide dispersion, infrequent detection, and low concentration, VOCs were not considered to be related to past disposal practices. Metals were the most prevalent and widely distributed contaminants in groundwater at Site 28 and were found distributed throughout the site. Concentrations of metals in samples obtained during both sampling rounds were generally higher in shallow groundwater samples than

in samples collected from the deeper aquifer. The HHRA identified potential risks to current and future receptors due to the presence of metals in groundwater. The ERA did not identify any potential risk to ecological receptors.

FS (1995)

Remedial alternatives for groundwater were evaluated during preparation of the FS, submitted in July 1995.

PRAP (1995) and ROD (1996)

The Final PRAP for OU 7 (Sites 1, 28, and 30) was issued July 13, 1995 and the Final ROD was signed on May 16, 1996 (Baker, 1996a). The ROD identified LTM and LUCs as the selected remedy for Site 28.

Remedy-in-Place

LTM (groundwater, surface water, and sediment sampling) at Site 28 was implemented in 1996. In 2001, one shallow monitoring well was installed in the area of the highest lead concentrations observed in soil found during the RI. Results from soil and groundwater sampling indicated lead concentrations in both media, but below the levels detected during the RI. The lead was found to be at naturally high levels because of natural soil conditions. This new well was added to the LTM program in 2001. The LTM program at Site 28 was discontinued in January 2001 when site-wide concentrations fell below the remedial action goals. A Final OU 7 RACR and closeout report were completed in September 2002 (CH2M HILL, 2002) to document the completion of the remedial action (monitoring). LUCs were implemented 2001 and updated in 2002, as shown in **Table 3-5**.

3.5.1.14 IR Site 30 (OU 7)—Sneads Ferry Road Fuel Tank Sludge Area

Site 30, the Sneads Ferry Road Fuel Tank Sludge Area, is located within OU 7 on the Mainside of the Base. OU 7 includes Sites 1, 28, and 30 (**Figure 3-45**). Site 30 was reportedly used by a private contractor in 1970 to clean out two 12,000-gallon emptied fuel storage tanks when the contents of the tanks were converted from leaded gasoline to unleaded gasoline. Sludge and/or washout was reportedly drained from the tanks and disposed of along a tank trail which intersects Sneads Ferry Road. The composition of the waste is unknown, but it may have contained cleansing compounds and possibly diluted tetraethyl lead. An estimated minimum of 600 gallons was reportedly disposed.

IAS (1983)

The IAS (WAR, 1983) concluded that sludge deposits could potentially impact groundwater and recommended an additional investigation to determine the boundaries of the impacted area and verify the presence of hazardous wastes.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included groundwater, surface water, and sediment investigations. Analytical results identified O&G in the disposal area and in stream bed sediments as well as lead in groundwater.

RI (1994)

In 1994, a RI was conducted at OU 7 (Sites 1, 28, and 30). RI field activities at Site 30 consisted of a site survey, a soil investigation, a groundwater investigation, and surface water and sediment investigations. One VOC was detected in a limited number of surface

and subsurface soil samples. No significant detections of any other potentially hazardous compounds were noted during the RI. The HHRA and ERA did not identify any unacceptable risks to human health and the environment.

PRAP (1995) and ROD (1996)

The Final PRAP for OU 7 (Sites 1, 28, and 30) was issued July 13, 1995 and the Final ROD was signed on May 16, 1996 (Baker, 1996a). No remedial actions were required in the ROD for Site 30 due to the absence of contamination. Therefore, Site 30 was closed with NFA.

3.5.1.15 IR Site 36 (OU 6)—Camp Geiger Dump Area Near Sewage Treatment Plant

Site 36, the Camp Geiger Dump Area, is located within OU 6 in the northwest portion of the Base. OU 6 is comprised of Sites 36, 43, 44, and 54 (**Figure 3-44**). Site 36 was originally estimated to be approximately 1.5 acres; however, based upon a review of aerial photographs and observations recorded during a site scoping visit, the size of the site was adjusted to include nearly 20 acres. Site 36 was reported to have been used for the disposal of municipal wastes and mixed industrial wastes including trash, waste oils, solvents, and hydraulic fluids that were generated at MCAS New River. The dump was active from the late 1940s to the late 1950s.

IAS (1983)

The IAS (WAR, 1983) reported that most of the waste material brought to the dump was first burned and then buried; however, some unburned material was reportedly buried. The IAS recommended that a Confirmation Study be conducted at Site 36 to verify the presence of contamination in groundwater, surface water, and sediment.

Confirmation Study (1984-1987)

From 1984 to 1987 a Confirmation Study was conducted to verify the presence of potential contaminants in groundwater, surface water, and sediment. The results of the sampling activities indicated that metals were present in environmental media throughout Site 36.

RI (1996)

An RI was completed in 1996 to further characterize the nature and extent of contamination at Site 36. Field activities included the installation of additional monitoring wells and the collection of surface and subsurface soil samples, groundwater samples, surface water samples, and sediment samples. The RI identified metals present in all media sampled at the site. Metals were predominantly present in the central and eastern portions of the site, which corresponded to former buried material and fill locations. The HHRA identified potential human health risks due to exposure to iron and lead in subsurface soils and iron in groundwater. Further, the ERA identified potential ecological risks due to exposure to metals in site soils, surface water, and sediment. Additionally, PCBs were detected in surface and subsurface soils and VOCs were detected in the groundwater (surficial aquifer), consisting primarily of 1,2-DCE, TCE, PCE, and 1,1,2,2-tetrachloroethane (1,1,2,2-PCA). The RI recommended LTM of groundwater due to the presence of VOCs and its proximity to other surface water bodies.

TCRA (1997)

Based on the original RI soil results and subsequent soil analyses, a TCRA of PCB-contaminated soil was determined to be the most appropriate action for Site 36. A Final TCRA Design Package was completed on April 1997. In June 1997, approximately 240 tons

of non-regulated and regulated PCB-contaminated soil was removed from the northwestern region of the site. Following completion of the PCB removal action, the soil remaining in the area contained met the USEPA's cleanup goal for industrial use.

Post-RI Groundwater Monitoring (1998-present)

A post-RI monitoring program at Site 36 began in 1998 consisting of quarterly groundwater and surface water sampling. Monitoring was implemented to determine if MNA could be a viable remedial alternative for VOCs in groundwater and to evaluate plume movement.

FS (1998)

Remedial alternatives for groundwater were evaluated during preparation of the FS, submitted in June 1998.

Additional Groundwater Sampling (2000)

Three temporary groundwater monitoring wells were installed on private property across Brinson Creek from the Base and sampled (for TCE only) in June 2000 to ascertain whether contaminants were migrating off Base property. The data indicated non-detectable levels of TCE in all three wells. In addition, groundwater elevation data from the temporary wells confirmed that groundwater within the surficial aquifer discharges into Brinson Creek.

Revised FS (2002)

In June 2002, a Revised FS was completed for OU 6 (Sites 36, 43, 44, and 54), which developed and screened remedial alternatives for addressing soil contamination (PAHs, pesticides, and lead) and groundwater contamination (TCE, 1,1,2,2-PCA, and vinyl chloride) at Site 36.

PRAP (2002)

The PRAP for OU 6 (Sites 36, 43, 44, and 54) was submitted for public review and comment in June 2002 for a 30-day period. The PRAP consisted of three alternatives to address soil contamination and three alternatives to address groundwater contamination at Site 36. Owing to the national debate between USEPA and the DoD regarding enforcement issues of the LUCs, completion of the Final ROD was temporarily delayed.

NTCRA (2003)

Accordingly, an EE/CA was also presented at the June 2002 public meeting for completing an interim response removal action at Site 36. The EE/CA was completed in October 2002 and the removal action was completed as an NTCRA in 2003, before the Final ROD was issued. The primary focus of the NTCRA was the removal of PAH and pesticide-contaminated soil in four areas within the south central portion of the site. A total of 1,630 tons of soil was excavated during the removal action (Shaw, 2003).

ROD (2005)

The Final ROD for Site 36 was signed on July 6, 2005 (Baker, 2005). The ROD identified LUCs and MNA as the selected remedy for the site.

Remedy-in-Place

LTM at Site 36 was implemented in 1998 and is on-going, in accordance with the recommendations of the LTM Optimization Report (CH2M HILL, 2005). The LTM program for Site 36 is shown on **Table 3-4**. **Table 3-11** provides a proposed schedule of LTM activities at Site 36. LUCs were implemented in 2005, as shown in **Table 3-5**.

A Final OU 6 IRACR was completed in August 2007 (CH2M HILL, 2007e) to document the remedy-in-place at Site 36 (monitoring and LUCs). The decision to restrict development of the site is based on the former use of the site as a dump.

3.5.1.16 IR Site 41 (OU 4)—Camp Geiger Dump near Former Trailer Park

Site 41, the Camp Geiger Dump near the Former Trailer Park, encompasses approximately 30 acres within OU 4 in the Camp Geiger area of the Base. OU 4 is comprised of Sites 41 and 74 (**Figure 3-42**). From 1946 to 1970, Site 41 was used as an open burn dump. Construction debris, POL compounds, solvents, batteries, ordnance, chemical training agents, and, in 1964, a bag of mirex (a pesticide), were reportedly disposed at Site 41. The debris was reportedly burned and graded over with soil. The dump area contains an estimated 110,000 cubic yards of waste. The amount of solvents and oil disposed was estimated to be between 10,000 and 15,000 gallons; and the quantity of mirex was estimated at several tons.

IAS (1983)

The IAS (WAR, 1983) concluded that disposal of industrial wastes and pesticides may impact groundwater and recommended an additional investigation to verify the presence of hazardous wastes.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included groundwater, surface water, and sediment investigations. O&G and phenols were detected in groundwater, surface water, and sediment samples. VOCs and metals were detected in a limited number of groundwater samples at concentrations above regulatory criteria. In addition, one nitroaromatic (RDX) was detected in one groundwater sample, suggesting groundwater may have been impacted by ordnance disposal.

RI (1993-1995)

An RI was initiated for OU 4 (Sites 41 and 74) in December 1993 and completed in May 1995. Field activities for Site 41 included a geophysical investigation, soil investigation, groundwater investigation, surface water and sediment investigation, and an aquatic and ecological survey. 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 PAH compounds that were most likely the result of previous burning activities. Groundwater samples obtained from the site exhibited levels of chromium, iron, lead, and manganese above the NCGWQS. No chemical agents were detected during borehole monitoring by the U.S. Army Technical Escort Unit (TEU), and no chemical surety degradation compounds were detected in soil samples. The HHRA stated that there were no risks to current receptors because groundwater in this area is not used as a potable supply. The HHRA did identify a potential risk to future residential receptors due to exposure to shallow groundwater containing metals; however, residential use of Site 41 is not likely due to the likelihood of buried CWM. The ERA concluded that potential adverse impacts to ecological receptors were low based on the low levels of contamination in soil, sediment, and surface water.

FS (1995)

In May 1995, a FS was prepared which developed and screened remedial alternatives for addressing soil, groundwater, and surface water contamination.

PRAP and ROD (1995)

The Final PRAP for OU 4 (Sites 41 and 74) was issued May 8, 1995 and the Final ROD was signed on December 5, 1995 (Baker, 1995a). The selected remedy for Site 41 included LTM and LUCs. NCDENR acceptance of the ROD was contingent on completion of a groundwater reclassification and surface water variance due to the nature of potential contamination that could not feasibly be remediated. In August 1997, a letter from NCDENR Wilmington Regional Office informed the Base that based on limited site contamination; the groundwater reclassification and surface water variance were no longer required.

Remedy-in-Place

LTM (groundwater, surface water, and sediment sampling) at Site 41 was implemented in 1997 and was discontinued in 2004 when site-wide concentrations dropped below remediation goals. LUCs were implemented 2001 and updated in 2002, as shown in **Table 3-5**.

A Final OU 4 RACR was completed in July 2006 (CH2M HILL, 2006d) to document the completion of the remedial action (monitoring). The decision to restrict development of the site is based on the former use of the site as a dump. The Army Corps of Engineers may be involved with issues in the future regarding the chemical training agents.

3.5.1.17 IR Site 43 (OU 6)—Agan Street Dump

Site 43, the Agan Street Dump, encompasses approximately 11 acres within OU 6 in the operations area of MCAS New River. OU 6 is comprised of Sites 36, 43, 44, and 54 (**Figure 3-44**). An abandoned sewage treatment plant (STP) is adjacent to the site. The Agan Street Dump reportedly received inert material such as construction debris (i.e., fiberglass and lumber) and trash. Sludge from the former STP was also reportedly dumped onto the ground surface of Site 43; however, it is not clear when disposal operations took place.

IAS (1983)

The IAS (WAR, 1983) concluded that waste quantities at Site 43, regardless of their nature, were minor; therefore, a Confirmation Study was not recommended. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.

SI (1991)

From July to August 1991, a SI was conducted which included soil, groundwater, surface water, and sediment investigations. The analytical results identified low levels of PAHs in a single soil sample and several sediment samples. Additionally, metals were detected in groundwater and surface water. Based on these results, further characterization as part of a RI/FS was proposed.

RI (1995)

The RI field investigation commenced in February 1995 and continued through May 1995. Field activities included a site survey, soil investigation, groundwater investigation, surface water and sediment investigation, habitat evaluation, and bioassay study. Exploratory test pits completed as part of the soil investigation identified miscellaneous debris (i.e., metal straps, metal containers, bricks, and plastic) associated with the disposal of construction debris from the nearby housing area. SVOCs, pesticides, and metals were detected in

surface and subsurface soil samples. SVOCs in soil (primarily PAHs) were attributed to former disposal operations at Site 43. Metals were detected in soil samples at locations corresponding to areas with buried containers, fill, and graded soil. Inorganic compounds were the most prevalent and widespread constituents in groundwater at Site 43. Pesticides and metals were detected in surface water and sediment samples above screening values; however, the pesticide concentrations were similar to those detected elsewhere at the Base and were not attributed to past activities. The HHRA identified a potential human health risk under the future land use scenario due to the presence of metals in groundwater; however, the presence of metals in groundwater was not considered attributable to past site use, rather it was considered indicative of the natural high concentrations observed across the Base. The ERA identified slight potential impacts to ecological receptors due to PAHs and metals in soil and pesticides and metals in surface water and sediment; however, the detected concentrations only slightly exceeded screening values, and therefore, the risks were considered minimal and did not warrant further action. Based on the findings of the RI, a removal action was recommended.

TCRA (1995)

Based on the RI, a TCRA for debris removal was determined to be the most appropriate action for Site 43. A Final Remedial Action Work Plan was submitted in May 1995. In July 1995, approximately 7.3 tons of surficial metallic debris was removed for recycling recovery. Additionally, 1,400 pounds of hazardous materials were shipped offsite for disposal.

FS (2002)

In June 2002, a Revised FS (the original FS only included Site 36) was completed for OU 6 (Sites 36, 43, 44, and 54), which developed and screened remedial alternatives for addressing localized areas of higher PAH concentrations in soil at Site 43.

PRAP (2002)

The PRAP for OU 6 (Sites 36, 43, 44, and 54) was submitted for public review and comment in June 2002 for a 30-day period. The PRAP consisted of three alternatives to address soil contamination at Site 43. Owing to the national debate between EPA and the DoD regarding enforcement issues of the LUCs, completion of the Final ROD was temporarily delayed.

NTCRA (2003)

Accordingly, an EE/CA was also presented at the public meeting for completing an interim response removal action at Site 43. The EE/CA was completed in October 2002 and the removal action was completed as an NTCRA in 2003, before the Final ROD was issued. The primary focus of the NTCRA was the removal of PAH-contaminated soil in one area located in the western portion of the site. A total of 1,477 tons of soil was excavated during the removal action (Shaw, 2003).

ROD (2005)

The Final ROD for Site 43 was signed on July 6, 2005 (Baker, 2005). The ROD identified LUCs as the preferred remedial alternative for Site 43.

Remedy-in-Place

An RD was completed for OU 6 in September 2005 to document the LUC implementation, as shown in **Table 3-5**. A Final OU 6 IRACR was completed in August 2007 (CH2M HILL, 2007e) to document the remedy-in-place at Site 43 (LUCs).

3.5.1.18 IR Site 44 (OU 6)—Jones Street Dump

Site 44, the Jones Street Dump, encompasses approximately five acres within OU 6 in the operations area of MCAS New River. OU 6 is comprised of Sites 36, 43, 44, and 54 (**Figure 3-44**). 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.

IAS (1983)

The IAS (WAR, 1983) concluded that due to the negligible quantity of inert material reportedly disposed at Site 44, a Confirmation Study was not recommended. However, the EPA requested an additional investigation to determine whether hazardous waste contamination existed.

SI (1991)

From July to August 1991, a SI was conducted which included soil, groundwater, surface water, and sediment investigations. The analytical results identified PAHs, pesticides, and metals in soil; VOCs, PAHs, and metals in surface water; and pesticides and metals in sediment. Based on these results, further characterization as part of a RI/FS was proposed.

RI (1995)

An RI field investigation at Site 44 commenced in February 1995 and continued through May 1995. Field activities included a site survey, soil investigation, groundwater investigation, surface water and sediment investigation, habitat evaluation, and bioassay study. Pesticides and metals were detected in soil samples across the site; however, their occurrence was not considered attributable to past site activities. Additionally, low levels of SVOCs (primarily PAHs) were detected in soil samples. Metals were the most prevalent and widely distributed constituents in groundwater at Site 44. VOCs were detected in two monitoring wells and from 13 surface water samples obtained from Edwards Creek, but were not detected in any of the 10 sediment samples obtained from the creek. The occurrence of VOCs among the limited groundwater and surface water samples obtained from the study area was attributed to Site 89, located upgradient of Site 44. The HHRA identified a potential human health risk under the future land use scenario due to the presence of iron in groundwater; however, the presence of iron in groundwater was not considered attributable to past site use, rather it was considered indicative of the natural high concentrations observed across the Base. The ERA identified slight potential impacts to ecological and terrestrial receptors due to pesticides in sediment and metals in surface water and soil; however, the detected concentrations only slightly exceeded screening values, and therefore, the risks were considered minimal and did not warrant further action.

FS (2002)

In June 2002, a Revised FS (the original FS only included Site 36) was completed for OU 6 (Sites 36, 43, 44, and 54). Based on the findings of the RI, the FS recommended no action at Site 44.

PRAP (2002)

The PRAP for OU 6 (Sites 36, 43, 44, and 54) was submitted for public review and comment in June 2002 for a 30-day period. Owing to the national debate between EPA and the DoD regarding enforcement issues of the LUCs, completion of the Final ROD was temporarily delayed.

ROD (2005)

The Final ROD was signed on July 6, 2005 (Baker, 2005). Although no action was recommended for Site 44 during the FS, for conservativeness the Base identified potential risks based on the OU 6 sites formerly used for waste disposal. Therefore, LUCs were the preferred alternative presented in the ROD.

Remedy-in-Place

An RD was completed for OU 6 in September 2005 to document the LUC implementation, as shown in **Table 3-5**. A Final OU 6 IRACR was completed in August 2007 (CH2M HILL, 2007e) to document the remedy-in-place at Site 44 (LUCs).

3.5.1.19 IR Site 48 (OU 3)—MCAS Mercury Dump

Site 48, the MCAS Mercury Dump, encompasses approximately four acres within MCAS New River, in the northwest portion of the Base (**Figure 3-41**). Building AS-804 was constructed in 1955 and was used as the Administration Office and Photographic Lab from 1955 to 1990. From 1956 to 1966, mercury was drained from radar units and disposed in small quantities behind the building. It was reported that approximately 1 gallon of mercury per year over a 10-year period was disposed in this manner. Building AS-804 is currently used as a classroom training facility.

IAS (1983)

The IAS (WAR, 1983) estimated that 1,000 pounds of mercury may be dispersed over approximately 20,000 ft² adjacent to the New River. The IAS concluded that mercury disposal practices could potentially impact the New River and recommended a Confirmation Study to verify the presence of mercury.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included soil and sediment investigations. Low levels of mercury were identified in both media, so further characterization was recommended.

Supplemental Characterization (1991)

In January 1991, a Supplemental Characterization Investigation was conducted, which included surface water and sediment sampling. Mercury was not detected in any samples collected during the investigation. Based on the findings of the IAS, Confirmation Study, and Supplemental Characterization, a Site Assessment report was completed in 1991. No additional sampling was conducted; however, a preliminary risk evaluation was completed. The risk evaluation did not identify mercury as a contaminant of potential concern (COPC); rather, it identified several other metals as COPCs.

RI (1992)

An RI was completed in 1992, which included a geophysical investigation, and soil, groundwater, surface water, and sediment investigations. During the RI, historical aerial photographs were obtained and evaluated to identify the suspected disposal area(s). The geophysical investigation did not identify any objects associated with mercury disposal. The soil and groundwater investigations focused on anomalies identified in the aerial photographs. The results of the RI did not identify mercury in any media sampled. Pesticides and metals were detected in surface soil samples, but their presence was not considered to be site-related. Low levels of organics and metals were detected in

groundwater and surface water samples, and pesticides, PAHs, and metals were detected in sediment samples. The HHRA and ERA both concluded that the detected concentrations at Site 48 did not pose a threat to human health or the environment.

PRAP and ROD (1993)

The PRAP for Site 48 was submitted for public review and comment in June 1993 for a 30-day period. The Final ROD was signed on September 10, 1993 (Baker, 1993b). No remedial actions were required in the ROD for Site 48 due to the absence of contamination. Therefore, Site 48 was closed with NFA.

3.5.1.20 IR Site 54 (OU 6)—Crash Crew Fire Training Burn Pit

Site 54, the Crash Crew Fire Training Burn Pit, is located within OU 6 in the operations area of MCAS New River. OU 6 is comprised of Sites 36, 43, 44, and 54 (**Figure 3-44**). Site 54 has served as the fire training burn pit since the mid-1950s. The former Crash Crew Fire Training Burn Pit was 90 ft in diameter and was situated at the center of this 1.5-acre site. Originally, fire training was conducted on the ground surface within a bermed area. The exercises were conducted within the burn pit using JP-type fuel, which was stored in a 8,000-gallon UST stored northwest of the burn pit. An OWS, located approximately 100 ft southeast of the burn pit, was used for temporary storage and collection of the spent fuel. In 1975, a lined burn pit was constructed and was used until 1999. Beginning in August 2000, the burn pit was converted to a training area that employs clean-burning fuels with operational and engineering controls. During the installation, POL-contaminated soil was removed. The IAS (WAR, 1983) reported that based on present POL usage rates, nearly one-half million gallons of POL may have been used at Site 54. Most of the POL was burned, but as many as 3,000 to 4,000 gallons may have soaked into the soil.

IAS (1983)

The IAS (WAR, 1983) concluded that waste fuels, oils, and solvents may remain in the soil at Site 54 and recommended an additional investigation to verify the presence of hazardous wastes. A Confirmation Study, conducted from 1984 to 1987, included groundwater, and sediment investigations. Due to the presence of low levels of petroleum compounds, further characterization was recommended.

RI (1995)

An RI field investigation at Site 54 began in February 1995 and continued through May 1995. Field activities included a site survey, soil investigation, groundwater investigation, and habitat evaluation. Soil borings were taken to assess the suspected impact of burn pit operations and were used to install monitoring wells. SVOCs 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 VOC and SVOC compounds in soil and groundwater samples obtained from this portion of the study area is consistent with former site operations. The HHRA identified a potential human health risk under the future land use scenario due to the presence of iron and lead in groundwater. The ERA identified slight potential impacts to terrestrial receptors due to SVOCs in soil.

Post-RI Monitoring (1998-2002)

Based on the findings of the RI, post-RI monitoring at Site 54 began in June 1997, which included collection of groundwater samples on a quarterly basis.

Removal Action (2000-2001)

A removal action was completed in 2000/2001 during conversion of the burn pit. Approximately 6,461 tons of POL-contaminated soils and construction debris from the former burn pit was removed from an area that was 128 ft long by 96.5 ft wide and extended 9 ft bgs to the depth of groundwater. Based on groundwater data collected following the removal action, it was determined that lead, SVOCs, and VOCs no longer posed an impact to groundwater. Subsequently, groundwater monitoring was discontinued in 2002.

FS (2002)

In June 2002, a Revised FS (the original FS only included Site 36) was completed for OU 6 (Sites 36, 43, 44, and 54). Based on the findings of the RI, the FS recommended no action at Site 54.

PRAP (2002)

The PRAP for OU 6 (Sites 36, 43, 44, and 54) was submitted for public review and comment in June 2002 for a 30-day period. Owing to the national debate between EPA and the DoD regarding enforcement issues of the LUCs, completion of the Final ROD was temporarily delayed.

ROD (2005)

The Final ROD was signed on July 6, 2005 (Baker, 2005). Although no action was recommended for Site 54 during the FS, for conservativeness the Base identified potential risks based on the OU 6 sites formerly used for waste disposal. Therefore, LUCs were the preferred alternative presented in the ROD.

Remedy-in-Place

An RD was completed for OU 6 in September 2005 to document the LUC implementation, as shown in **Table 3-5**. A Final OU 6 IRACR was completed in August 2007 (CH2M HILL, 2007e) to document the remedy-in-place at Site 54 (LUCs).

3.5.1.21 IR Site 63 (OU 13)—Verona Loop Dump

Site 63, the Verona Loop Dump, encompasses approximately five acres, nearly two miles south of the MCAS New River operations area (**Figure 3-51**). 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 area reportedly received bivouac wastes generated during training exercises. No hazardous wastes were reportedly disposed of at Site 63. Currently, training exercises, maneuvers, and recreational hunting frequently take place in the area.

IAS (1983)

The IAS (WAR, 1983) reported that the quantities of waste disposed at Site 63, whether hazardous or not, were insignificant and concluded that no further assessment was necessary. However, the EPA requested an additional investigation to determine whether hazardous waste contamination existed.

SI (1991)

In 1991 an SI was completed at Site 63. Field activities included soil, groundwater, surface water, and sediment sampling. Fill materials were encountered in site soils, confirming that disposal of waste materials occurred at Site 63. SI results indicated inorganic and organic compounds detected in soil samples may be attributable to past disposal practices. Metals and organic compounds were detected in groundwater samples. Based on these findings, the SI recommended further evaluation.

RI (1995)

The RI field investigation of Site 63 was completed during November 1995. The RI field program consisted of a site survey, a soil investigation, a groundwater investigation, surface water and sediment investigation, and a habitat evaluation. SVOCs, pesticides, and metals were detected at Site 63. Pesticide concentrations were low (i.e., less than 0.1 milligrams per kilogram) and primarily limited to areas 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. The HHRA and ERA did not identify a risk to human health or the environment due to site-related contaminants.

PRAP (1996) and ROD (1997)

The PRAP for Site 63 was submitted for public review and comment in November 1996 for a 30-day period. The Final ROD was signed on April 3, 1997 (Baker, 1997b). The ROD for Site 63 stipulated that no additional remedial action or monitoring was required.

Remedy-in-Place

Although the ROD did not require remedial action, the Base implemented LUCs in 2001 and updated them in 2002 (**Table 3-5**), due to the site's history as a dump.

3.5.1.22 IR Site 65 (OU 9)—Engineer Area Dump

Site 65, the Engineer Area Dump, is located in the Courthouse Bay area of MCB Camp Lejeune and is approximately five acres in size (**Figure 3-47**). Two separate disposal areas have been reported at Site 65, a battery acid disposal area and a liquid disposal area. The liquids that have been disposed are reported to have been POL types. In addition, the dump was used to burn construction debris. The dump was in operation from at least 1958 until 1972.

IAS (1983)

The IAS (WAR, 1983) reported that no hazardous wastes were disposed at Site 65, and concluded that no further assessment was necessary since any wastes present at the site would be inert. However, the USEPA requested an additional investigation to determine whether hazardous waste contamination existed.

SI (1991)

In 1991 an SI was completed at Site 65. Field activities included soil, groundwater, surface water, and sediment sampling. Fill materials were encountered in site soils, confirming that disposal of waste materials occurred at Site 63. SI results indicated low levels of PAHs in surface soil samples may be attributable to past disposal practices. Pesticides and metals were detected in groundwater and sediment samples. Based on these findings, the SI recommended further evaluation.

RI (1995)

An RI was conducted at Site 65 in 1995, which included a soil investigation, groundwater investigation, surface water and sediment investigation, and ecological investigations. Findings from the RI indicate that there were no releases of hazardous substances from the waste disposal areas that would result in a risk to human health or the environment.

Post-RI Sampling (2001)

In early 2001, several discarded containers were discovered near Site 65. The containers were heavily corroded and no materials were observed in the containers. Groundwater, soil, and surface water and sediment (from a nearby creek) were collected in April 2001 to determine if surrounding media had been affected by potential releases, but the data indicated there were no effects caused by the containers.

PRAP and ROD (2001)

The PRAP for Site 65 was submitted for public review and comment in July 2001 for a 30-day period. The Final ROD was signed on September 30, 2001 (Baker, 2001a). The ROD for Site 65 stipulated that no additional remedial action or monitoring was required.

3.5.1.23 IR Site 68 (Pre-RI)—Rifle Range Dump

Site 68, the Rifle Range Dump, is located in the Rifle Range Area of the Base (**Figure 3-34**). From 1942 to 1972, 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 depth of the fill area is approximately 10 ft and the amount of material deposited has been estimated to be 100,000 cubic yards. The amount of solvents disposed at Site 68 was estimated to be between 1,000 and 2,000 gallons.

IAS (1983)

The IAS (WAR, 1983) reported that organic compounds were identified in potable supply wells RR-45 and RR-97, located upgradient from the site. Even though these wells are located upgradient from the site, it was suspected that continuous pumping may have drawn contaminants to the wells. Based on these findings, the IAS recommended an additional investigation.

Pre-RI Screening Study (1995-1998)

Project plans for Site 68 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. Field activities included soil, groundwater, surface water, and sediment sampling. One pesticide and one PCB compound were detected in the surface soil samples above the established screening criteria. One PCB was detected in subsurface soil samples at a concentration below the screening standard. Two VOCs and metals were detected in groundwater samples collected at the site. Sediment samples detected the presence of pesticides and metals. The BRA, completed as part of the Pre-RI, identified a slight risk due to the presence of metals in the shallow groundwater. However, these metals were considered to be naturally occurring and not site related. As a result, the Pre-RI recommended no further remedial action; however, because the site was a former dump, LUCs were implemented in June 2001 and updated in July 2002, as shown in **Table 3-5**.

NFA Decision Document (2001)

The Final NFA DD was completed May 8, 2001, which stated that all investigations or activities for the IRP for Site 68 are complete. Although no remedial action was required, the

Base implemented LUCs in 2001 and updated them in 2002 (**Table 3-5**), due to the site's history as a dump.

3.5.1.24 IR Site 74 (OU 4)—Mess Hall Grease Dump Area

Site 74, the Mess Hall Grease Dump, is located within OU 4, which is also comprised of Site 41 (**Figure 3-42**). From the early 1950s through the early 1960s, grease from the mess hall at Site 74 was reportedly disposed of in trenches. It was also reported that drums containing PCBs and pesticide-soaked bags were buried near the grease pit. Estimates of quantities include 1,100 gallons of PCB oil, 50 to 500 gallons of DDT, and 2,200 gallons of drummed pesticides. One internal memorandum reports that chemical training agents in the form of test kits, similar to the types documented at Site 69, also were reportedly taken to Site 74. A former Pest Control Area was also reportedly located in the southeastern portion of the Site; however information on past activities is unknown.

IAS (1983)

The IAS (WAR, 1983) concluded that disposal of pesticides and PCBs may impact groundwater and recommended an additional investigation to verify the presence of hazardous wastes.

Confirmation Study (1984-1987)

A Confirmation Study, conducted from 1984 to 1987, included soil and groundwater investigations. Pesticides were detected in soil and groundwater samples collected from Site 74.

RI (1993-1995)

An RI was initiated for OU 4 (Sites 41 and 74) in December 1993 and completed in May 1995. Field activities for Site 74 included a geophysical investigation, site survey, soil investigation, groundwater investigation, surface water and sediment investigation, and an aquatic and ecological survey. Historical aerial photographs of Site 74 depict extensive trenching operations. Results of the RI indicated that soils in the former pest control area had been impacted by site activities; however, the extent of impact was limited. Analytical results also indicated that soil and groundwater in the vicinity of the former grease pit had not been significantly impacted by site activities. No chemical agents were detected during borehole monitoring by the U.S. Army TEU, and no chemical surety degradation compounds were detected in soil samples. The HHRA stated that there were no risks to current receptors. The HHRA did identify a potential risk to future residential receptors due to exposure to shallow groundwater and soils. The ERA did not identify potential risks to ecological receptors.

FS (1995)

In May 1995, a FS was prepared which developed and screened remedial alternatives for addressing soil and groundwater contamination.

PRAP and ROD (1995)

The Final PRAP for OU 4 (Sites 41 and 74) was issued May 8, 1995 and the Final ROD was signed on December 5, 1995 (Baker, 1995a). The selected remedy for Site 74 included LTM and LUCs.

Remedy-in-Place

LTM (groundwater sampling) at Site 74 was implemented in 1997 and was discontinued in 1998, because detected metal concentrations were deemed indicative of naturally occurring metals in the presence of acidic soil. A Final OU 4 RACR was completed in July 2006 (CH2M HILL, 2006d) to document the completion of the remedial action (monitoring). LUCs were implemented 2001 and updated in 2002, as shown in **Table 3-5**.

3.5.1.25 IR Site 75 (Pre-RI)—MCAS Basketball Court Site

Site 75, the MCAS Basketball Court Site, is located in the MCAS New River operations area (**Figure 3-35**). Site 75 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 ft long by 70 ft wide and was sufficiently deep to have encountered the water table. An estimated 75 to 100 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.

IAS (1983)

The IAS (WAR, 1983) concluded that degradation of the buried drums could result in the release of the suspected materials into the groundwater. This was of particular concern because of the site's proximity to several water supply wells in the area, two of them within 500 ft of the alleged disposal site. Based on these findings, the IAS recommended additional investigation.

Pre-RI Screening Study (1995-1998)

Project plans for Site 75 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. Field activities included a geophysical investigation, soil, and groundwater sampling. The geophysical survey did not detect any major subsurface anomalies that could have been the suspected drums. SVOCs, pesticides, and metals were detected in the soil samples. No organic compounds were detected in groundwater samples; however, several metals were detected at concentrations exceeding state and/or federal regulatory levels. The BRA, completed as part of the Pre-RI, did not identify any risk from the media sampled at the site. As a result, the Pre-RI recommended no further action.

NFA Decision Document (2001)

The Final NFA DD was completed May 8, 2001, which stated that all investigations or activities for the IRP for Site 75 are complete.

3.5.1.26 IR Site 76 (Pre-RI)—MCAS Curtis Road Site

Site 76, the MCAS Curtis Road Site, is located in the MCAS New River operations area (**Figure 3-36**). There are several base housing units to the immediate north of the Site 76 study area. Site 76 was reportedly used as a drum disposal area on two occasions in 1949. The estimated area of the disposal unit is a quarter-acre, and approximately 25 to 75 55-gallon drums were allegedly disposed at this site. The drums reportedly contained a chloroacetophenone tear gas solution used for training similar to that allegedly buried at Site 75. Additional organic chemicals, such as chloroform, carbon tetrachloride, benzene, and chloropicrin, may have been present in the solution.

IAS (1983)

The IAS (WAR, 1983) concluded that degradation of the buried drums could result in the release of the suspected materials into the groundwater. Based on these findings, the IAS recommended an additional investigation.

Pre-RI Screening Study (1995-1998)

Project plans for Site 76 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. Field activities included a geophysical investigation, soil, and groundwater sampling. The geophysical survey did not detect any major subsurface anomalies that could have been the suspected drums. Several VOCs, SVOCs, and pesticides were detected in the soil samples at Site 76. Metals were detected in each of the groundwater samples; however, only aluminum and iron exceeded state and/or federal regulatory levels. The BRA, completed as part of the Pre-RI, identified a slight risk to future residents due to the presence of metals in groundwater. However, these metals were considered to be naturally occurring and not site related. As a result, the Pre-RI recommended NFA. In response to an agency comment and because metals were previously detected above screening criteria, groundwater was sampled again in October 1999. This data showed the presence of some metals above screening criteria but within range of the natural background of groundwater at Camp Lejeune.

NFA Decision Document (2001)

The Final NFA DD was completed May 8, 2001, which stated that all investigations or activities for the IRP for Site 76 are complete.

3.5.1.27 IR Site 78 (OU 1)—HPIA

Site 78, HPIA, is located within OU 1 approximately 1 mile east of the New River and two miles south of State Route 24. OU 1 covers approximately 690 acres and includes Sites 21, 24, and 78. (**Figure 3-39**). Site 78 covers approximately 590 acres comprised of maintenance shops, warehouses, painting shops, printing shops, auto body shops, and other small industrial facilities. The HPIA, constructed in the late 1930s, was the first developed area at MCB Camp Lejeune. Due to the industrial nature of the site, many spills and leaks have occurred over the years.

IAS (1983)

The IAS (WAR, 1983) identified four sites within the HPIA (Sites 21, 22, 24, and 28) requiring further investigation.

Confirmation Study (1984-1988)

From 1984 to 1988, a Confirmation Study was conducted, which included collecting groundwater samples from monitoring wells and existing supply wells within the HPIA. The Confirmation Study confirmed the presence of VOCs related to fuels and/or solvents in groundwater and nearby water supply wells. As a result, four supply wells (HP-601, HP-602, HP-608, and HP-634) were immediately shut down. In addition, three groundwater plumes were identified in the shallow portion of the surficial aquifer, centered in the vicinity of Building 902, Site 22, and Building 1601. The source of groundwater contamination was generally not linked to the existing sites, so Site 78 was created to investigate the entire HPIA.

Hadnot Point Fuel Farm Groundwater Study (1990)

In 1990, a groundwater study was conducted at the Hadnot Point Fuel Farm (Site 22) as part of the MCB Camp Lejeune UST Program. Although this study was conducted for Site 22, the results are applicable to Site 78 given the proximity of the sites. The study concluded that fuel losses of gasoline/fuels likely occurred predominantly through leaks in the transfer lines or valves. Analysis indicated that floating product had contributed significant levels of dissolved petroleum compounds including BTEX into the groundwater. Trace levels of non-petroleum VOCs including TCE and PCE were also detected within the fuel farm area. Based on the results of this study, a product recovery/groundwater treatment system was designed for the fuel farm and began operation in 1991.

Supplemental Characterization Study (1990-1991)

A Supplemental Characterization Study was performed in 1990 and 1991 to further evaluate the extent of contamination in the shallow and deeper portions of the aquifer and to characterize the contamination within the shallow soils at suspected source locations. The study concluded that TCE was only present in soils associated with a UST at Building 902, which was reportedly used to store spent solvents. The results of the shallow groundwater sampling confirmed findings from previous investigations; and the results from the intermediate and deep monitoring wells identified BTEX constituents downgradient of the fuel farm and at other areas of the site.

Interim Remedial Action RI/FS (1992)

An IRA RI/FS for the surficial aquifer at Site 78 was conducted in 1992. The IRA RI report identified three contaminant plumes within the shallow aquifer at Site 78. However, one plume was determined to be associated with the Hadnot Point Fuel Farm (Site 22) and was addressed under a separate UST program. The second plume was located in the vicinity of Building 903. This plume contained solvent contamination (e.g., TCE) and low-levels of fuel-related contamination (BTEX). The third plume was believed to originate in the vicinity of Buildings 1502, 1601, and 1602, and contained solvent-related compounds, fuel-related compounds, and lead. The qualitative risk assessment concluded that benzene and TCE could impact human health if shallow groundwater were to migrate into the deep portions of the aquifer, or if the shallow aquifer were to be utilized in the future as potable water.

Interim PRAP and IROD (1992)

An IRA PRAP for addressing shallow groundwater at Site 78 was submitted for public review and comment in May 1992. The PRAP consisted of four alternatives to address shallow groundwater contamination at Site 78. The IROD was signed on September 23, 1992 (Baker, 1992). The preferred alternative for remediating shallow groundwater involved groundwater extraction and treatment through two separate pump and treat systems constructed in the northern and southern portions of the site. Design of the interim extraction/treatment system was completed in 1993 and construction was completed in December 1994.

RI (1994)

A RI was completed in June 1994 to further characterize potential environmental and ecological impacts, and to evaluate risks to human health resulting from previous storage, operation, and disposal activities at OU 1. The field program consisted of a soil gas survey, a site survey, a soil investigation, and groundwater investigation. The analytical results indicated groundwater in the surficial and Castle Hayne aquifers has been impacted by

organics and metals, primarily due to former operational/disposal practices conducted within the industrial area. The RI also concluded that the Castle Hayne aquifer is contaminated due to vertical migration, but to a far lesser degree than the surficial aquifer. No specific source areas were identified during the RI, with the exception of a few suspected USTs and buildings where solvents are known to have been stored. The HHRA identified potential human health risks due to exposure to groundwater. The ERA indicated that pesticides in soil appear to be the most significant COC for decreasing the viability of terrestrial organisms at Site 78.

FS (1994)

In July 1994, a FS was completed for OU 1, which developed and screened remedial alternatives for addressing soil contamination (PAHs, pesticides, metals) and groundwater contamination (PCE, TCE, 1,2-DCE, BTEX, and vinyl chloride).

PRAP and ROD (1994)

The PRAP for OU 1 (Sites 21, 24, and Site 78) was submitted for public review and comment in July 1994 for a 30-day period. The PRAP consisted of four alternatives to address soil contamination and five alternatives to address groundwater contamination at Site 78. The Final ROD for OU 1 (Sites 21, 24, and 78) was signed September 15, 1994 (Baker, 1994a). The ROD identified LUCs to address soil contamination and continuation and expansion of the groundwater treatment system and implementation of LTM to address groundwater contamination as the selected remedies for Site 78.

Natural Attenuation Evaluation (2001-2002)

Based on the findings of the LTM sampling, a NAE was conducted to further characterize the nature and extent of the southern contaminant plume and determine whether natural attenuation of chlorinated VOCs was occurring. As a result, operations at the south plant were temporarily discontinued from January 2000 through May 2002 to allow for the completion of an NAE. The NAE was completed in July 2001 (Site 78 North) and February 2002 (Site 78 South). The NAE indicated there is “limited” to “adequate” evidence for natural attenuation processes at Site 78 South, and “adequate” to “strong” evidence for natural attenuation processes at Site 78 North. The NAE recommended that pilot studies should be performed at both 78 North and 78 South plumes.

Supplemental Investigation (2002)

A Supplemental Investigation was conducted in June 2002 to further characterize groundwater at Site 78 South in the ball field area of the site. Soil samples were also collected at several known “hot spot” areas within Sites 78 South and North. The additional groundwater data indicated that the plume at Site 78 South extends further south and southwest than delineated during the NAE study. Analytical data further identified VOCs and BTEX compounds in soil samples collected from within several known “hot spot” areas.

Technology Evaluation (2002)

In April 2002, a Technology Evaluation was completed to evaluate remedial alternatives for reducing groundwater concentrations in two “hot spot” areas in order to reduce the time needed to reach North Carolina cleanup goals. The Technology Evaluation recommended completing a pilot study using several of the technologies evaluated.

ORC® and HRC® Pilot Study (2003)

In 2003, two pilot studies were initiated to determine if *in situ* technologies are effective in remediating chlorinated compounds in groundwater at Site 78. The pilot study performed at Site 78 North, near the corner of Building 903, included injection of Oxygen Release Compound® (ORC®) into groundwater at locations with vinyl chloride concentrations higher than 1,000 µg/L. The pilot study performed at Site 78 South, near the corner of Building 1601, included the injection of Hydrogen Release Compound® (HRC®), into groundwater at locations with TCE concentrations greater than 1,000 µg/L. The Final Pilot Study report, concluded that the concentration of vinyl chloride in groundwater at Site 78 North was reduced by 25 to 50 percent and that the concentration of TCE in groundwater at Site 78 South was reduced by an order of magnitude at the majority of wells. The pilot study report recommended continuation of LTM in order to observe further reductions in concentrations under natural conditions and testing for total oxidant demand in order to determine if the addition of another oxidant is feasible.

Remedy-in-Place

LTM at Site 78 was implemented in 1995 and is on-going, in accordance with the recommendations of the LTM Optimization Report (CH2M HILL, 2005). The LTM program for Site 78 is shown on **Table 3-4**. **Table 3-15** provides a proposed schedule of activities at Site 78. LUCs were implemented in June 2001 and updated in July 2002, as shown in **Table 3-5**.

3.5.1.28 IR Site 80 (OU 11)—Paradise Point Golf Course Maintenance Area

Site 80, the Paradise Point Golf Course Maintenance Area, encompasses approximately one acre within OU 11, which is also comprised of Site 7 (**Figure 3-49**). Information regarding past maintenance procedures at Site 80 is unknown; however, the facility is currently in operation. Golf course maintenance operations which include the machine shop (a potential source of waste oils) and the routine spraying of pesticides and herbicides may have contributed to potential contamination at this site. It is unknown when the wash pad was constructed, and what the exact procedure was for cleaning the maintenance equipment prior to the construction of the wash pad.

SI (1991)

In June 1991, a SI was conducted at Site 80 which included soil, groundwater, surface water, and sediment investigations. The analytical results identified pesticides and PCBs in soil, low level VOCs in groundwater and petroleum hydrocarbons in surface water. Based on these results, a RI was proposed.

RI (1994-1995)

The RI field program at Site 80 was conducted from 1994 to 1995 and consisted of a site survey, soil investigation and groundwater investigation. The Final RI was submitted in April 1996 and identified pesticides in soil samples collected in the west/northwest portion of the site at concentrations higher than those considered attributable to past historical applications. Low levels of pesticides, SVOCs, and metals were detected in groundwater at Site 80. The HHRA identified a potential risk to current and future receptors primarily due to the presence of pesticides in soil. The ERA did not identify any unacceptable risks to ecological receptors due to site-related contaminants.

TCRA (1996)

Based on the risk assessment presented in the RI, a TCRA was recommended to remove soil contaminated with pesticides to industrial levels. A Final TCRA Work Plan was submitted in April 1996. In July 1996, approximately 988 tons of contaminated soil was excavated from Site 80.

PRAP (1996) and ROD (1997)

The Final PRAP for OU 11 (Sites 7 and 80) was submitted for public review and comment in November 1996. The Final ROD for OU 11 (Sites 7 and 80) was signed on August 21, 1997 (Baker, 1997a). No remedial actions were required in the ROD for Site 80 due to the absence of contamination.

Remedy-in-Place

Although the ROD did not require remedial action, the soil remediation goals for the TCRA were based on industrial risk-based concentrations. Therefore, the Base implemented LUCs to protect human health and the environment by preventing future exposure to surface and subsurface soil within the site boundary, including the previous soil removal action area. In May 2007, LUCs were implemented through a LUCIP (CH2M HILL, 2007f), as shown in **Table 3-5**.

3.5.1.29 IR Site 82 (OU 2)—Piney Green VOC Area

Site 82, the Piney Green Road VOC site, is located within OU 2 approximately two miles east of the New River and two miles south of State Route 24. OU 2 covers approximately 210 acres and includes Sites 6, 9, and 82 (**Figure 3-40**). Site 82 encompasses approximately 30 acres and is predominantly covered by woodlands. Before the late 1980s, much of the site was reportedly used for storage, disposal, and handling of potentially hazardous waste and material. Site 82 was identified as a result of the 1986 Confirmation Study at Site 6. At the time of the site assessment, the site was randomly littered with debris including spent ammunition casings, and empty or rusted drums. Some of the drums were marked as “lubrication oil” and “anti-freeze”.

SI (1991)

A SI was conducted at Site 82 in June 1991, based on the results of the Confirmation Study. Surface water samples collected from Wallace Creek during this investigation contained VOCs, which were considered attributable to activities conducted at Site 82.

RI (1992-1993)

A RI was conducted at OU 2 (Sites 6, 9, and 82) from August 1992 to May 1993. Field activities consisted of a preliminary site survey; a geophysical survey; a soil investigation including drilling and sampling; a groundwater investigation including monitoring well installation and sampling; drum waste sampling; test pit investigation; a surface water and sediment investigation; and an aquatic and ecological survey. Levels of organic compounds (primarily PCBs, pesticides, VOCs, and SVOCs) and inorganic compounds (primarily barium, cadmium, chromium, lead, manganese, and zinc) were identified throughout OU 2 in various media (i.e. soil, groundwater, surface water, and sediments). Chlorinated VOCs in groundwater were found as deep as 240 ft bgs. The HHRA identified potential human health risks due to exposure to vinyl chloride, arsenic, and beryllium in groundwater and PCB-1260 in biota from Wallace Creek. Further, the findings of the ERA indicated past

disposal practices at Site 82 may potentially be adversely impacting the ecological integrity of Wallace Creek.

FS (1993)

In August 1993, a FS was completed for OU 2 (Sites 6, 9, and 82), which developed and screened remedial alternatives for addressing groundwater (TCE and vinyl chloride) and soil (pesticides, PAHs, and PCBs) contamination.

PRAP (1993) and ROD (1997)

The PRAP for OU 2 (Sites 6, 9, and 82) was submitted for public review and comment in August 1993 for a 30-day period. The PRAP consisted of seven alternatives to address soil contamination and five alternatives to address groundwater contamination. The Final ROD for OU 2 was signed on September 24, 1993 (Baker, 1993a). The ROD identified soil vapor extraction (SVE) to address soil contamination and groundwater extraction and treatment, implementation of LTM, and aquifer restrictions and LUCs to address groundwater contamination as the selected remedies for Site 82.

Remedy-in-Place

The SVE system was in operation at Site 82 for 6 months in 1996 to remediate residual soil contamination in the vadose zone. Construction of the groundwater extraction and treatment system began in December 1994 and full-scale operation of the system began in July 1996. Groundwater from both the surficial and Castle Hayne aquifers is being treated by this system. Operation of the plant will continue in FY 2009. In February 2007, a groundwater pilot study was initiated at Site 82 to evaluate the performance of ERD via EVO and lactate injection and to determine whether it is a viable alternative to supplement, enhance, or replace the current groundwater extraction and treatment system. The Pilot Study Report was issued in FY 2008.

LTM at Site 82 was implemented in 1995 and is on-going, in accordance with the recommendations of the LTM Optimization Report (CH2M HILL, 2005). The LTM program for Site 82 is shown on **Table 3-4**. LUCs were implemented in June 2001 and updated July 2002, as shown in **Table 3-5**. **Table 3-16** provides a proposed schedule of activities at Site 82.

3.5.1.30 IR Site 85 (Pre-RI)—Camp Johnson Battery Dump

Site 85, the Camp Johnson Battery Dump, encompasses approximately 4.5 acres in the Camp Johnson support operations area of the Base (**Figure 3-37**). Site 85 was used as a battery dump during the 1950s. In 1992, decomposed batteries, which were used in military communication equipment during the Korean era, were unearthed as a roadway was being widened. Military personnel using 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 two-acre to three-acre area.

Pre-RI Screening Study (1995-1998)

Project plans for Site 85 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. Field activities included soil and groundwater sampling. Samples were analyzed for metals only. Analytical results indicated that soil near the battery disposal piles has been contaminated by metals leaching from the batteries. The BRA, completed as part of the Pre-RI, identified a potential risk due to the presence of

metals at the site. As a result, the Pre-RI recommended completion of an EE/CA to evaluate remedial alternatives for soil contamination at the site.

TCRA (1999)

Based upon comments by USEPA (Region 4), an EE/CA was completed on September 10, 1999, and an Action Memorandum was completed on September 17, 1999. The EE/CA recommended removal of the soil and battery packs through a TCRA followed by re-evaluation of site groundwater. The TCRA was completed from October to December 1999, and included the removal of 158 tons of contaminated soil and debris. The Final Closeout Report for this removal was submitted in February 2000. Post-removal groundwater monitoring was conducted from 2001 to 2005, when site-wide concentrations dropped below action levels.

NFA Decision Document (2005)

The Final NFA DD was completed May 12, 2005, which stated that all investigations or activities for the IRP for Site 85 are complete.

3.5.1.31 IR Site 87 (Pre-RI)—MCAS Officers' Housing Area

Site 87, the MCAS Officers' Housing Area site (formerly Site A), is located on the west bank of the New River (**Figure 3-38**). This area was identified during the second round of sampling conducted as part of the Confirmation Study in 1986. Waste was identified eroding out of a cut bank along the New River near 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 and it is unclear how the materials got into the river bank.

Pre-RI Screening Study (1995-1998)

Project plans for Site 87 were finalized in January 1995, and a Pre-RI screening study was conducted from 1995 to 1998. Field activities included a site survey, exploratory test pits, and soil, groundwater, surface water, and sediment sampling. The Pre-RI study concluded that none of the media sampled had been significantly affected by site activities. The BRA, completed as part of the Pre-RI, did not identify any risk from the media sampled at the site. As a result, the Pre-RI recommended no further action. In response to an agency comment due to detection of PCP in one groundwater sample above screening criteria, groundwater was sampled again in October 1999. No PCP was detected in groundwater from the October 1999 sampling event.

NFA Decision Document (2001)

The Final NFA DD was completed May 8, 2001, which stated that all investigations or activities for the IRP for Site 87 are complete.

3.5.1.32 IR Site 90 (OU 17)—Building BB-9

Site 90, Building BB-9, encompasses approximately six acres within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex (**Figure 3-55**). OU 17 includes Sites 90, 91, and 92, which are all former UST program sites that have been placed in the IRP because contaminants not typically related to petroleum UST sites were detected. Site 90 primarily refers to a former UST basin where three 1,000-gallon steel USTs, containing heating oil,

were previously located. The former UST basin is located between a dry cleaning distribution facility and a heating plant. The USTs were removed in March 1993. Dry-cleaning processes were performed at this location for an unknown period of time, but were subsequently discontinued. During the years that dry cleaning operations were conducted at this location, a 250-gallon AST was located onsite.

Focused RI (1997-1999)

In 1997, a Focused RI was conducted for OU 17 (Sites 90, 91, and 92). Field activities at Site 90 included a site survey, soil investigation, and groundwater investigation. Analytical results identified the presence of toluene in soil samples. Groundwater samples identified PCE in a single sample and chloroform. A quantitative risk assessment, completed as part of the Focused RI, identified a potential risk due to the presence of PCE in groundwater. Based on these findings, which were presented in the Draft Focused RI report, NCDENR requested additional groundwater sampling to confirm the presence of the identified COPCs. Supplemental groundwater sampling was conducted in 1999 and 2000. The additional monitoring identified TCE as the only site-related contaminant present at Site 90. Further, the detected concentration only slightly exceeded screening criteria. As a result, the Final Focused RI recommended NFA at the site.

PRAP and ROD (2001)

The PRAP for OU 17 (Sites 90, 91, and 92) was submitted for public review and comment in July 2001 for a 30-day period. The Final ROD for OU 17 (Sites 90, 91, and 92) was signed on September 30, 2001 (Baker, 2001b). The ROD for Site 90 stipulated that no remedial actions were required due to the absence of contamination. Therefore, Site 90 was closed with NFA.

3.5.1.33 IR Site 91 (OU 17)—Building BB-51

Site 91, Building BB-51, encompasses approximately eight acres within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex (**Figure 3-55**). OU 17 includes Sites 90, 91, and 92, which are all former UST program sites that have been placed on the IRP list because contaminants not typically related to petroleum UST sites were detected. Site 91 is currently used by the Marine Corps School of Engineering to train personnel. Site 91 primarily refers to a former UST basin where two 300-gallon steel USTs, used to store waste oil, were previously located. The former UST basin is located northeast of Building BB-51. The USTs were removed in August 1992. At the time of the UST closure, TPH contamination was detected in the soil samples.

Focused RI (1997)

In 1997, a Focused RI was conducted for OU 17 (Sites 90, 91, and 92). Field activities at Site 91 included a site survey, soil investigation, and groundwater investigation. Analytical results identified the presence of two VOCs (toluene and acetone) in several soil samples. Groundwater samples identified the presence of two VOCs (PCE and chloroform). A quantitative risk assessment, completed as part of the Focused RI, did not identify a potential risk due to site-related contaminants. However, chloroform and several metals were retained as COPCs. Based on these findings, which were presented in the Draft Focused RI report, NCDENR requested additional groundwater sampling to determine whether the presence of the identified COPCs was site-related and to confirm the detected levels of PCE. Supplemental groundwater sampling was conducted in 1999. The additional

monitoring confirmed chloroform as a potentially site-related COPC; therefore, post-RI monitoring was recommended.

Post-RI Groundwater Monitoring (2000-2001)

Post-RI groundwater monitoring was initiated in July 2000, and included quarterly groundwater sampling for VOCs, SVOCs, iron, and arsenic. Results of the groundwater monitoring activities were documented in LTM reports for OU 17. In April 2001, groundwater monitoring was discontinued when concentrations dropped below NCGWQS or base background concentrations.

PRAP and ROD (2001)

The PRAP for OU 17 (Sites 90, 91, and 92) was submitted for public review and comment in July 2001 for a 30-day period. The Final ROD for OU 17 (Sites 90, 91, and 92) was signed on September 30, 2001 (Baker, 2001b). The ROD for Site 91 stipulated that no remedial actions were required due to the absence of contamination. Therefore, Site 91 was closed with NFA.

3.5.1.34 IR Site 92 (OU 17)—Building BB-46

Site 92, Building BB-46, is located within OU 17, in the southeast portion of the Base in the Courthouse Bay Complex (**Figure 3-55**). OU 17 includes Sites 90, 91, and 92, which are all former UST program sites that have been placed on the IRP list because contaminants not typically related to petroleum UST sites were detected. Site 92 is approximately one acre, located in the vicinity of former Building BB-46, now replaced by Building BB-246. Site 92 primarily refers to a former UST basin where one 1,000-gallon steel UST, containing gasoline, were previously located. The former UST basin is located at the end of Front Street, within the confines of the Courthouse Bay Marina. The UST was installed in 1980, deactivated in 1989, and removed in January 1994. A subsequent SI identified the presence of chlorinated hydrocarbons in the groundwater.

Focused RI (1997)

In 1997, a Focused RI was conducted for OU 17 (Sites 90, 91, and 92). Field activities at Site 92 included a site survey, soil investigation, and groundwater investigation. No fuel-related contaminants were detected in soil or groundwater samples. Chloroform was detected in several groundwater samples. A quantitative risk assessment, completed as part of the Focused RI, did not identify a potential risk due to site-related contaminants. However, chloroform, acetone, and several metals were retained as COPCs. Based on these findings, the Focused RI recommended additional groundwater sampling to verify the presence or absence of contaminants identified as COPCs.

Post-RI Groundwater Monitoring (2000-2001)

Post-RI groundwater monitoring was initiated in July 2000, and included quarterly groundwater sampling for VOCs, SVOCs, iron, arsenic, and manganese. Results of the groundwater monitoring activities were documented in LTM reports for OU 17. In April 2001, groundwater monitoring was discontinued when concentrations dropped below NCGWQS or base background concentrations.

PRAP and ROD (2001)

The PRAP for OU 17 (Sites 90, 91, and 92) was submitted for public review and comment in July 2001 for a 30-day period. The Final ROD for OU 17 (Sites 90, 91, and 92) was signed on

September 30, 2001 (Baker, 2001b). The ROD for Site 92 stipulated that no remedial actions were required due to the absence of contamination. Therefore, Site 92 was closed with NFA.

3.5.1.35 IR Site 93 (OU 16)—Building TC-942

Site 93, Building TC-942, is located within OU 16, which is within Camp Geiger in the extreme northwest corner of the Base. OU 16 includes Sites 89 and 93 (**Figure 3-54**). The buildings in this portion of Camp Geiger were constructed during the Korean War and currently function as classrooms, barracks, and supply rooms for the Marine Infantry School. Historical records indicate that a 550-gallon UST storing waste oil was previously located on Site 93, off the southwest corner of Building TC-942; however no documentation was available regarding the installation date of the UST. The UST was permanently closed as part of a tank removal in December 1993, completed under the authority of the State of North Carolina's UST program. Based on elevated concentrations of O&G at the time of the tank removal, a release was suspected to have occurred. Upon removal of the UST, an investigation was conducted, which identified chlorinated VOCs in the groundwater. Investigations at Site 93 have been conducted since 1995 and have historically focused on the small area near the southwest corner of Building TC-942 that formerly contained the 550-gallon UST used to store waste oil. Over time, the investigations have expanded outward from TC-942.

Geotechnical Investigation (1995-1996)

Between 1995 and 1996, a geotechnical investigation and environmental screening were conducted near the barracks area. Chlorinated solvent contamination was not observed in any of the soil borings located around the barracks; however, trace levels of chlorinated VOCs were detected in groundwater samples collected from one temporary well.

RI (1996-1997)

From 1996 to 1997, a RI was conducted to characterize the nature and extent of soil and groundwater contamination at OU 16 (Sites 89 and 93). Field activities included the collection of soil and groundwater samples analyzed for VOCs. Soil analytical results for Site 93 indicated that soil had not been significantly impacted by site-related activities. Groundwater analytical results for Site 93 identified chlorinated VOC contamination (primarily TCE) concentrated in the surficial aquifer (less than 15 ft bgs) within the immediate area of the former UST. VOCs were not detected in any groundwater samples collected from the upgradient locations around the barracks. A chlorinated VOC groundwater plume was identified as generally extending from east of the barracks to "E" Street, between Ninth and Tenth streets. Groundwater analytical data also suggested contaminant discharge to Edwards Creek was occurring. The HHRA identified potential human health risks due to exposure to PCE and cis-1,2-DCE in groundwater. The ERA did not identify any risks to ecological receptors.

LTM (1999-2005)

Based on the results of the RI, LTM was implemented at Site 93 in April 1999 in order to assess plume stability. LTM was discontinued in 2005 due to the ongoing FS (CH2M HILL, 2005).

Natural Attenuation Evaluation (2001)

In 2001, a preliminary NAE was conducted to determine whether natural site conditions would encourage the natural attenuation process of degrading TCE. The results indicated limited natural attenuation of chlorinated VOCs was occurring. However, the reductive dechlorination process appeared to be stalling, indicating that the reduced state of the aquifer is not enough to encourage optimal dechlorination.

Additional Plume Characterization (2002)

At the request of the IRP Partnering Team, additional plume characterization/delineation activities were conducted in 2002 in order to further delineate groundwater contamination at Site 93, characterize “hot spots”, and provide additional data to support the selection of an active remedial system. Field activities included groundwater sampling. The analytical results identified several “hot spot” areas. The primary plume appeared related to the former UST area, with smaller “hot spot” areas downgradient. The results indicated horizontal migration of groundwater contamination had been minimal since 1995; however, vertical migration was observed.

FS (2005)

In November 2005, the Final FS was completed for Site 93, which developed and screened remedial alternatives for addressing groundwater contamination (PCE, TCE, 1,2-DCE, 1,1,2,2-PCA, and vinyl chloride).

PRAP and ROD (2006)

The PRAP for Site 93 was submitted for public review and comment in January/February 2006 for a 30-day period. The PRAP consisted of five alternatives to address groundwater contamination at Site 93. The Final ROD for Site 93 was signed on October 2, 2006 (CH2M HILL, 2006b). The ROD identified *in situ* chemical oxidation (ISCO) via permanganate injection and MNA as the selected remedy for Site 93. Site 93 is currently in the CERCLA Investigation Stage and will be completed at a later date; therefore, the ROD served as a final ROD for Site 93 and an IROD for OU 16.

Remedy-in-Place

The remedial action was initiated in October 2006 and was completed in FY 2008. Completion of the remedial action will be documented in an IRACR, which is expected to be completed in FY 2009. LTM at Site 93 will be implemented as shown on **Table 3-4**. LUCs were implemented in 2006, as shown in **Table 3-5**. **Table 3-21** provides a proposed schedule of activities at Site 93.

3.5.1.36 IR Site 94 (OU 18)—PCX Service Station

Site 94, the PCX Service Station (Building 1613), is located within the HPIA on the Mainside of the Base (**Figure 3-56**). Site 94 lies within the western portion of Site 78 (OU 1). Building 1613 is an active facility, providing refueling services for private vehicles, and consists of a single-story brick structure flanked by three concrete pump islands on two sides. Historical records indicate that two 10,000-gallon and two 30,000-gallon USTs storing various grades of gasoline were installed northeast of Building 1613 during the 1950s. The USTs and associated petroleum-contaminated soil were removed in January 1995. During subsequent phases of investigation, free phase hydrocarbons and chlorinated organic contaminants were detected in groundwater. Soil and groundwater contamination resulting from the

petroleum releases at the site is currently being remediated under NCDENR's UST program. 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 NCGWQS in three isolated areas, suggesting multiple sources. In addition, the vertical extent of purgeable halocarbons is at least 50 ft bgs. The extent of the chlorinated hydrocarbon plume is not defined. A final schedule for future actions at the site has not been established.

Groundwater Investigation (2000)

In September 2000, a Groundwater Investigation was conducted to evaluate groundwater conditions in an area of the site where monitoring wells had not been previously installed. Analytical results identified VOCs (primarily BTEX and methyl-tert butyl ether [MTBE]) and PAHs at concentrations exceeding NCGWQS. A December 1, 2000 letter from MCB Camp Lejeune to NCDENR requested the transfer of the PCX Service Station to the IRP, which resulted in the subsequent CERCLA investigation activities.

RI (2004-2005)

Project plans for Site 94 were completed in April 2004, and a RI was conducted late in 2004 to further evaluate contamination near the site. Field activities included soil and groundwater sampling. The Final RI report was submitted in September 9, 2005 which concluded that groundwater contamination was determined to be from an upgradient source (Site 78). The HHRA did not identify a potential risk to future receptors due to site soil, and the ERA did not identify any potential risks to ecological receptors.

PRAP and ROD (2006)

The PRAP for Site 94 was submitted for public review and comment in January 2006 for a 30-day period. The Final ROD for Site 94 was signed on August 26, 2006 (CH2M HILL, 2006c). The ROD stipulated that no remedial actions were required at Site 94 because contamination present in groundwater at the surrounding site (Site 78) has migrated to the Site 94 area. Hence, the contaminants identified as posing unacceptable risks/hazards to current or future receptors will be addressed as part of IR Site 78. Therefore, Site 94 was closed with NFA.

3.5.2 MRP Sites

3.5.2.1 MRP Site UXO-13—Naval Regional Medical Center

Site UXO-13, the Naval Regional Medical Center, encompasses approximately 176 acres located on the Mainside of the Base (**Figure 3-73**). No known historic live fire activities were conducted within this area; rather it was designated as a "Maneuver Training Area" used to train troops in non-live fire operations. UXO-13 was administratively closed on March 24, 2004 due to no known historic live-fire activities on this range.

3.6 Sites Transferred

This section discusses the site history for two sites (Sites 22 and 45) which were transferred out of the IRP. Transferred sites are shown on **Figure 3-3**.

3.6.1 Site 22 – Industrial Area Tank Farm

The Hadnot Point Fuel Farm (Site 22) is located within the HPIA on the Mainside of the Base.

Confirmation Study (1984-1988)

From 1984 to 1988, a Confirmation Study was conducted, which included collecting groundwater samples from monitoring wells and existing supply wells within the HPIA. The Confirmation Study confirmed the presence of VOCs related to fuels and/or solvents in groundwater and nearby water supply wells. As a result, four supply wells (HP-601, HP-602, HP-608, and HP-634) were immediately shut down. In addition, three groundwater plumes were identified in the shallow portion of the surficial aquifer, centered in the vicinity of Building 902, Site 22, and Building 1601.

Hadnot Point Fuel Farm Groundwater Study (1990)

In 1990, a groundwater study was conducted at Site 22 as part of the MCB Camp Lejeune UST Program. The study concluded that fuel losses of gasoline/fuels likely occurred predominantly through leaks in the transfer lines or valves. Analysis indicated that floating product had contributed significant levels of dissolved petroleum compounds including BTEX into the groundwater. Trace levels of non-petroleum VOCs including TCE and PCE were also detected within the fuel farm area. Based on the results of this study, a product recovery/groundwater treatment system was designed for the fuel farm and began operation in 1991.

Supplemental Characterization Study (1990-1991)

A Supplemental Characterization Study was performed in 1990 and 1991 to further evaluate the extent of contamination in the shallow and deeper portions of the aquifer and to characterize the contamination within the shallow soils at suspected source locations. The study concluded that TCE was only present in soils associated with a UST at Building 902, which was reportedly used to store spent solvents. The results of the shallow groundwater sampling confirmed findings from previous investigations; and the results from the intermediate and deep monitoring wells identified BTEX constituents downgradient of the fuel farm and at other areas of the site.

Site Transfer

All sampling events in and around Site 22 indicated that petroleum-related products from tanks were the only apparent source of contamination. Further, the tanks at Site 22 contain only jet fuel and the site is therefore exempt from CERCLA under the petroleum exclusion. In a letter dated April 21, 1992, the Superfund Section of NCDENR suggested that all further remediation work at Site 22 would be appropriately performed under the UST program of the State of North Carolina.

3.6.2 Site 45 – Campbell Street Underground AVGAS Storage and Adjacent JP Fuel Farm

The Campbell Street Underground AVGAS Storage and Adjacent JP Fuel Farm (Site 45) is located at the intersection of Campbell and White Streets aboard MCAS New River. The Campbell Street Fuel Farm is an active fuel storage facility, with four 215,000-gallon steel above ground storage tanks that hold JP-5 jet fuel, which is pumped to the tarmac helicopter refueling station via an underground delivery line.

Site Transfer

Although Site 45 was initially identified for inclusion on the NPL, petroleum-related contamination is exempt from CERCLA and remediation work at Site 45 will be appropriately performed under the UST program of the State of North Carolina.

SECTION 4

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