EPA/ROD/R2006040001234
2006

EPA Superfund
Record of Decision:

CHERRY POINT MARINE CORPS AIR STATION
EPA ID: NC1170027261
OU 05
HAVELOCK, NC
07/21/2006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

4WD-FFB

Brigadier General C. S. Patton
Commanding General
Marine Corps Air Station
PSC Box 8003
Cherry Point, NC 28533-0003

SUBJ: Record of Decision
Operable Unit 5
Marine Corps Air Station
Cherry Point, NC

Dear Sir:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document and concurs with the selected remedy for Operable Unit 5. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

The selected remedial alternatives include no further action for Site 1 and monitored natural attenuation (MNA) for groundwater and institutional controls (ICs) that will limit exposure to and prohibit the use of surficial groundwater except for monitoring for Site 2. It has been determined that no remedial action for Site 2 soil and surface water media is required. This remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective.

EPA appreciates the coordination efforts of MCAS Cherry Point and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the exemplary working relationship with MCAS Cherry Point and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site. If you have any questions, please contact Gena Townsend of my staff at (404) 562-8538.

Sincerely,

Beverly H. Banister

Beverly H. Banister, Acting Division Director
Waste Management Division

cc: Jeff Christopher, MCAS Cherry Point
Rodger Jackson, NAVFAC Atlantic
George Lane, NCDENR

Final

Record of Decision
for
Operable Unit 5

Marine Corps Air Station
Cherry Point, North Carolina

Department of the Navy
Naval Facilities Engineering Command
Atlantic

May 2006

Contents

Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
BEHP	bis(2-ethylhexyl) phthalate
bgs	below ground surface
BHC	benzene hexachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	constituent of concern
COPC	constituent of potential concern
CT	central tendency
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
ft	foot, feet
ft/day	feet per day
GIS	Geographical Information Systems
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
IR	Installation Restoration
MACS-6	Marine Air Control Squadron-6
MCAS	Marine Corps Air Station
MNA	monitored natural attenuation
msl	mean sea level
NACIP	Naval Assessment and Control of Installation Pollutants
Navy	United States Department of the Navy
NCAC	North Carolina Administrative Code
NCGS	North Carolina General Statutes
NC2L	North Carolina 2L groundwater standards
NCDENR	North Carolina Department of Environment and Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O& M	operation and maintenance
OU	operable unit
PRAP	Proposed Remedial Action Plan
RAA	Remedial Action Alternative
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision

SARA	Superfund Amendments and Reauthorization Act
SVOC	Semi-volatile organic compounds
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TOC	total organic carbon
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VGM	Voluntary Groundwater Monitoring
VOC	volatile organic compound

Glossary

ARARs: Applicable or Relevant and Appropriate Standards, Limitations, Criteria, and Requirements. These are Federal or State environmental rules and regulations and there are three types: chemical-specific for the contaminant in question, location-specific for where the site is located, and action-specific for the remedial alternative.

Background Concentration: The concentration of a naturally occurring or manmade constituent, such as a metal, found in groundwater, soil, sediment, and surface water in areas not impacted by spills, releases, or other site-specific activities. Background concentrations of some metals and other constituents are often at levels that may pose a risk to human health or the environment. These background-related risks should be considered (i.e., subtracted) when calculating the risk posed by site conditions.

Carcinogenic Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, USEPA's acceptable risk range for Superfund sites is 1×10^{-4} to 1×10^{-6}, meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a site that is not remediated.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act. A Federal law, commonly referred to as the "Superfund" Program, passed in 1980 that provides for cleanup and emergency response in connection with numerous existing inactive hazardous waste disposal sites that endanger public health and safety or the environment.

COPCs: Constituents of Potential Concern. Constituents that exceed regulatory criteria during the nature and extent phase of the RI are considered COPCs, and are subsequently analyzed for risk to human health and the environment.

COCs: Constituents of Concern; constituents that exceed acceptable risk ranges or exceed other criteria set as remediation goals.

ERA: Ecological Risk Assessment. An evaluation of the risk posed to the environment if remedial activities are not performed at the site.

FS: Feasibility Study. Analysis of the practicability of a remedial proposal. The feasibility study usually recommends the selection of a cost-effective alternative.

GIS: Geographical Information System. A computer system that integrates, stores, edits, analyzes, and displays geographically referenced information.

Groundwater: Subsurface water that occurs in soils and geologic formations that are fully saturated.

HHRA: Human Health Risk Assessment. An evaluation of the risk posed to human health should remedial activities not be implemented.

HI: Hazard Index. A number indicative of non-carcinogenic health effects equaling the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effects.

HQ: Hazard Quotient. HQs are used to evaluate non-carcinogenic health effects and ecological risks. A value equal to or less than one indicates that the human or ecological populations are not likely to experience adverse effects.

IAS: Initial Assessment Study. A document produced in 1983 as part of the Navy Assessment and Control of Installation Pollutants (NACIP) program to systematically identify, assess, and control contamination from past hazardous materials management operations.

Institutional Controls: Administrative methods to prevent human exposure to contaminants, such as by restricting the use of groundwater for drinking water.

LCID: Land Clearing and Inert Debris. A type of waste including demolition and construction waste, yard waste, and other stable forms of debris.

MCAS: Marine Corps Air Station. A military installation run by the Marine Corps to support aviation operations.

Media (singular, Medium): Soil, groundwater, surface water, or sediments at the site.

Monitored Natural Attenuation (MNA): Natural attenuation is the process by which contaminant concentrations are reduced by various naturally occurring physical, chemical, and biological processes. The main processes include biodegradation, retardation, dispersion, advection, and adsorption.

NACIP: Navy Assessment and Control of Installation Pollutants (NACIP). A Navy program developed after CERCLA was passed to identify sites requiring further investigation.

NC 2L Standards: These are groundwater quality standards for the protection of the groundwater of North Carolina as specified in 15A North Carolina Administrative Code (NCAC) 2L.0200. They are maximum allowable concentrations resulting from any discharge of contaminants to the land or waters of the State, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage.

NCDENR: The North Carolina Department of Environment and Natural Resources. The State agency responsible for administration and enforcement of State environmental regulations.

NCP: National Oil and Hazardous Substances Contingency Plan. Provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

Nine Evaluation Criteria:

- Overall Protection of Human Health and the Environment— Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs — Addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver of the requirements.

- Long-Term Effectiveness and Permanence — Addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met.

- Reduction of Toxicity, Mobility, and Volume through Treatment— Discusses the anticipated performance of the treatment technologies a remedy may employ.

- Short-Term Effectiveness — Considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until clean-up goals are achieved.

- Implementability — Evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.

- Cost— Compares the estimated capital, operation and maintenance (O&M) and present worth costs.

- State Acceptance — Considers the State support agency comments on the Proposed Remedial Action Plan (PRAP).

- Community Acceptance — Provides the public's general response to the alternatives described in the PRAP and Remedial Investigation (RI) and Feasibility Study (FS) Reports. The specific responses to the public comments are addressed in the Responsiveness Summary section of the Record of Decision (ROD).

Non-carcinogenic Risk: Noncancer Hazards (or risk) are expressed as a quotient that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. USEPA's threshold level for non-carcinogenic risk at Superfund sites is 1, meaning that if the exposure exceeds the threshold, there may be a concern for potential noncancer effects.

NPL: National Priorities List. A list, developed by USEPA, of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Operable Unit (OU): The facility(ies) or site(s) of concern and any other areas in close proximity to it where a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, placed; has migrated; or otherwise come to be located.

Present-Worth Cost: Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well as the cost of long-term operations, maintenance, and monitoring.

Proposed Remedial Action Plan (PRAP): A document that presents and requests public input regarding the proposed cleanup alternative.

Public Comment Period: The time allowed for the members of an affected community to express views and concerns regarding an action proposed to be taken by USEPA, such as a rulemaking, permit, or Superfund-remedy selection.

RAOs: Remedial Action Objectives. Objectives of remedial actions that are developed based on contaminated media, contaminants of concern, potential receptors and exposure scenarios, human health and ecological risk assessment, and attainment of regulatory cleanup levels, if any exist.

RCRA: Resource Conservation and Recovery Act. A Federal law, passed in 1976, that ensures that wastes are managed in a manner that protects human health and the environment. Components of RCRA include the reduction or elimination of waste generated, and conservation of energy and natural resources through waste recycling and recovery.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and public comments on the considered selected remedy.

Remedial Action: A cleanup method proposed or selected to address contaminants at a site.

RFA: RCRA Facility Assessment. A document produced as part of the 1984 Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA), that authorizes the USEPA to require corrective action for releases of hazardous waste or hazardous constituents from Solid Waste Management Units (SWMUs) and other Areas of Concern at all operating, closed, or closing RCRA facilities. The RFA includes a Preliminary Review of all available relevant documents, a Visual Site Inspection, and, if appropriate, a Sampling Visit.

RI: Remedial Investigation. A study of a facility that supports the selection of a remedy where hazardous substances have been disposed or released. The RI identifies the nature and extent of contamination at the facility.

Surficial Aquifer: The surficial aquifer is the saturated portion of the upper layer of sediments. It is unconfirmed, meaning that its upper surface is the water table rather than a confining bed.

USEPA: United States Environmental Protection Agency. The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and final approval authority for the selected ROD.

VOCs: Volatile Organic Compounds. Type of chemical that readily vaporizes, often producing a distinguishable odor.

SECTION 1
Declaration

1.1 Site Name and Location

Operable Unit 5
Sites 1 and 2
Marine Corps Air Station
Cherry Point, North Carolina
EPA ID: NC1170027261

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy for Operable Unit (OU) 5 at Marine Corps Air Station (MCAS) Cherry Point, North Carolina. The remedy for OU5 was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) § 300]. This decision is based on information contained in the Administrative Record file for OU5.

The remedy set forth in this ROD has been selected by the United States Department of the Navy and Marine Corps, together with the United States Environmental Protection Agency (USEPA), with the concurrence of the North Carolina Department of Environment and Natural Resources (NCDENR). NCDENR has indicated concurrence with the Selected Remedy by signing this ROD.

1.3 Assessment of the Site

The response actions selected in this ROD are necessary to protect the public health, welfare and the environment from actual and/or threatened releases of hazardous substances from these sites.

1.4 Description of the Selected Remedy

OU5 (Sites 1 and 2) is part of the comprehensive environmental investigation and cleanup currently being performed at MCAS Cherry Point under the CERCLA program. It has been determined that no further action is necessary at Site 1 and therefore this ROD addresses only OU5, Site 2. The Selected Remedy for Site 2 includes monitored natural attenuation (MNA) for groundwater and institutional controls (ICs) that will limit exposure to and prohibit the use of surficial groundwater except for monitoring. It has been determined that no remedial action for Site 2 soil and surface water media is required for them to be suitable for unlimited use.

The Selected Remedy was determined based on the evaluation of site conditions, site-related risks, applicable or relevant and appropriate requirements (ARARs), and Remedial Action Objectives (RAOs). Once RAOs are achieved for groundwater media, all OU5 media will be suitable for unlimited use.

The Selected Remedy includes the following major components:

- MNA will be performed by collecting and analyzing groundwater samples to confirm that no unacceptable contamination migration is occurring and to evaluate reductions in contaminant concentrations through naturally occurring processes such as biodegradation, dispersion, and dilution. MNA will continue until monitoring has demonstrated that the remedial goals have been achieved for groundwater, which will allow for unlimited use and unrestricted exposure.

- ICs will prohibit the withdrawal and/or future use of water, except for monitoring, from the surficial aquifer within 250 feet (ft) of the impacted well at Site 2 of OU5. ICs will also prohibit intrusive activities within 250 ft of the impacted well at Site 2 of OU5 unless concurrence is received from both NCDENR and USEPA. Specific types of ICs to be employed for these purposes will include: 1) incorporating land use prohibitions into the MCAS Cherry Point master planning process; 2) a deed Notice of Inactive Hazardous Substance or Waste Disposal filed in Craven County real property records per North Carolina General Statutes (NCGS) 130A-310.8; and 3) deed restrictions included in any deed transferring any portion of OU5 to any non-Federal transferee.

Site conditions will be reviewed every 5 years during the base-wide 5-year review process. If MNA and/or ICs are shown to be insufficient, other remedial approaches will be evaluated and may be implemented.

The Navy shall prepare in accordance with CERCLA, the NCP, and USEPA Guidance and submit to the USEPA and NCDENR, a Remedial Design (RD) containing IC implementation actions within 120 days of ROD signature, in accordance with the schedules in the Federal Facility Agreement (FFA). The Navy shall also submit the document memorializing remedial action completion within 120 days following completion of the remedial action for OU5.

The ICs shall be maintained to prevent unacceptable exposures to contaminated groundwater or to preserve the integrity of the remedy. The ICs shall be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unlimited exposure and unrestricted use. The Navy will be responsible for implementing, inspecting, maintaining, reporting, and enforcing the ICs described in this ROD in accordance with the approved RD.

1.5 Statutory Determinations

The Selected Remedy is protective of human health and the environment, cost effective, and complies with Federal and state requirements that are legally applicable or relevant and appropriate to remedial action. The Selected Remedy will protect human health by preventing potential exposure to contaminants at OU5 through ICs and MNA. The nature of the Selected Remedy for OU5 is such that ARARs will eventually be met through MNA for groundwater.

The Selected Remedy represents the maximum extent to which permanent solutions and alternative treatment or resource recovery technologies can be used in a practicable manner at this site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria in the NCP (long-term effectiveness and permanence, reduction in toxicity, mobility, or volume, implementability, short-term effectiveness, and cost), while also considering the statutory preference for treatment. The Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy because there is no contamination at Site 2 for which treatment would be practical or cost-effective. Reduction of groundwater contaminant concentrations are expected over time due to biodegradation, natural dispersion, advection, and adsorption processes.

Because this remedy will result in pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy continues to protect human health and the environment.

1.6 Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for OU5.

- Constituents of concern (COCs) and their respective concentrations (§ 2.5.5).
- Baseline risk represented by the COCs (§ 2.7).
- Cleanup levels established for COCs and the basis for these levels (§ 2.8).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (§ 2.6).
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy (§ 2.12.4).
- Estimated capital costs, annual operation and maintenance (O&M), and total present-worth costs; discount rate; and the number of years over which the remedy cost estimate is projected (§ 2.12.3).
- Key factors that led to selecting the remedy (i.e., a description of how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision) (§ 2.10).
- Absence of principal threat wastes (§ 2.11).
- Selected Remedy (§ 2.12).

1.7 Authorizing Signatures

C.S. Patton

19 June 2006
Date

Brigadier General, U.S. Marine Corps
Commanding General
Marine Corps Air Station, Cherry Point

The North Carolina Department of Environment and Natural Resources Concurs:

Dexter R. Matthews, Director

7-10-06
Date

Division of Waste Management
North Carolina Department of
Environment and Natural Resources

Beverly H. Banister, Acting Director

7-21-06
Date

Waste Management Division
U.S. EPA - Region 4

SECTION 2
Decision Summary

This ROD describes the Selected Remedy for OU5 at MCAS Cherry Point, North Carolina. The Navy is the lead agency and provides funding for site cleanups. OU5 is one of nine OUs at MCAS Cherry Point. OU5 is comprised of two former borrow pits/landfills. Site 1 is located on the west side of an access road in the northeastern portion of MCAS Cherry Point. Site 2 is located opposite of Site 1 on the east side of the access road.

The Public Meeting for OU5 was held on November 3, 2005. The Preferred Alternative, as detailed in the Final Proposed Remedial Action Plan (PRAP), was presented at the meeting. The Decision Summary provides an overview of OU5 characteristics and describes the process by which the Selected Remedy was chosen and the rationale for its selection. Community and State acceptance of the alternatives is discussed in Section 4.0 of this ROD.

2.1 Site Name, Location, Description, and History

2.1.1 MCAS Cherry Point

MCAS Cherry Point is a military installation located in southeastern Craven County, North Carolina, just north of the town of Havelock (Figure 2-1). The Air Station is located on a 13,164-acre tract of land bounded on the north by the Neuse River, on the east by Hancock Creek, and on the south by North Carolina Highway 101. The irregular western boundary line lays approximately three-quarters of a mile west of Slocum Creek.

The mission of MCAS Cherry Point is to maintain and support facilities, services, and materiel of a Marine Aircraft Wing and other activities and units as designated by the Commandant of the Marine Corps in coordination with the Chief of Naval Operations. The Air Station has facilities for training and support of the Fleet Marine Force Atlantic aviation units and is also designated as a primary aviation supply point.

2.1.2 Operable Unit 5

OU5 is one of nine OUs at MCAS Cherry Point. OU5 consists of Sites 1 and 2, former borrow pits/landfills that cover approximately 4 acres each. Site 1 is located west of an access road near the Marine Air Control Squadron Unit-6 (MACS-6). Some chemical waste is reported to have been disposed of at OU5; however, no formal records were kept detailing the quantities or types of waste that were disposed of at this site. There is no indication that this site was a main disposal area for the base or that it was regularly used for a significant period of time. Wastes found at Site 1 include rubble, trash, vehicle batteries, crushed 55-gallon drums, and construction debris. Site 1 currently consists of wooded land. The borrow and landfill areas extend to approximately 100 ft from Reeds Gut to the north, along an unnamed tributary to the west, approximately 200 ft from an unpaved road to the south, and bordering a paved access road to the east (Figure 2-2). Historical aerial photographs of OU5 from 1949,1955,1960,1967, and 1974 showed that although site use reportedly begun in the mid-1950s, Site 1 may have operated as a borrow pit previous to 1949.

The second area of activity, Site 2, is located on the east side of the access road, directly opposite of Site 1. The borrow pit/landfill area of Site 2 contains wastes similar to that of Site 1. In addition to fill material containing construction debris, mixed wastes, and crushed 55-gallons drums, some chemical waste is reported to have been disposed of at Site 2. Site 2 currently consists of wooded land extending along an unnamed tributary of Reeds Gut to the east and northeast, along an unpaved road to the south and southwest, and the paved access road to the west and northwest. Historical aerial photographs from 1949,1955,1960, 1967, and 1974 indicate that Site 2 began operation as a borrow pit sometime between 1955 and 1960. The disposal history in the area of OU5 is based on information provided in the Initial Assessment Study (IAS) conducted in 1983 and a review of historical aerial photographs.

2.2 Previous Investigations and Enforcement Activities

2.2.1 Previous Investigations

Initial Assessment Study
The Initial Assessment study was conducted in 1983 as the first step in the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The study identified 14 sites requiring further investigation, including Sites 1 and 2 of OU5.

1985 and 1987 Investigations
An investigation of OU5 conducted in 1985 involved the installation and sampling of four groundwater monitoring wells at Site 1 and three groundwater monitoring wells at Site 2. The groundwater samples were analyzed for volatile organic compounds (VOCs), selected metals (copper, chromium, zinc, cadmium, nickel, and silver), priority pollutants, cyanide, total organic halogens, total organic carbon (TOC), and phenolics. Sampling occurred in January 1985 and October 1985 and again in February 1987. Detected compounds in ground-water samples included chloroform, alpha-benzene hexachloride (BHC), arsenic, mercury, nickel, zinc, and cyanide (total).

1991 Investigation
In December 1991, groundwater samples were collected from three monitoring wells and analyzed for cyanide only. Cyanide was not detected in any of the monitoring wells sampled. Although no significant contamination was observed at OU5, the report describing the results of the 1991 field investigation activities (Halliburton NUS, August 1993) recommended that additional sampling activities be performed due to the crushed drums, construction rubble, and discolored seepage that had been observed at OU5.

Remedial Investigation
Field activities for the Remedial Investigation (RI) of OU5, Sites 1 and 2, were completed in 2002. Surface and subsurface soil, groundwater, sediment, and surface water samples were collected and analyzed as part of the RI. Groundwater samples were collected from six permanent monitoring wells and 23 temporary groundwater sampling locations (eleven at Site 1 and twelve at Site 2). Twelve co-located surface water and sediment locations were sampled at OU5 (seven at Site 1 and five at Site 2), in addition to one extra sediment sample.

Soil samples were collected from sixteen locations (eight at Site 1 and eight at Site 2), and each location one surface and one subsurface soil sample were collected and analyzed.

The RI presented a complete summary of the risks determined by the baseline Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA). The RI concluded that the only media with constituent of potential concern (COPCs) that exceeded risk-based concentrations (RBCs) that were potentially associated with past disposal practices at OU5 was groundwater.

Groundwater was the only medium carried forward from the RI risk assessment. One COC (benzene) from the RI was retained for groundwater on the basis that it exceeded NC 2L standards, and is attributable to historic, site-related activities at Site 2. The remaining COPCs that exceeded the screening criteria did not exceed the risk calculations that would have identified them as a COC.

Voluntary Groundwater Monitoring
Voluntary groundwater monitoring (VGM) of four wells at OU5 (OU5-2MW01, OU5-S1-TW09, OU5-S1-TW11, OU5-S2-TW03) was performed in 2003, 2004, and 2005. Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), and RCRA metals. VGM indicated that samples in 2003 and 2004 showed concentrations above North Carolina 2L groundwater standards (NC 2L) limits for benzene, trichloroethene (TCE) and vinyl chloride. As a result of the detection of two additional constituents (TCE and vinyl chloride) above NC 2L standards at Site 2, these constituents were added to the list of regulatory COCs for OU5.

Feasibility Study
A Focused Feasibility Study (FFS) was completed in October 2005 to present the development and evaluation of remedial action alternatives (RAAs) to address the issues identified in the RI and VGM. The FFS used information gathered from the previous investigations conducted at OU5. The data from these investigations were compiled and evaluated to identify RAOs.

Five RAAs were developed for OU5. Each remedial alternative was analyzed with respect to the nine evaluation criteria provided in the NCP. The alternatives were then compared to one another under the NCP evaluation criteria. Based on the comparative analysis, Alternative 4 - ICs with MNA - was selected as the Preferred Alternative for OU5.

Proposed Remedial Action Plan
In accordance with the NCP, the Navy issued a PRAP for OU5 in November 2005. The PRAP identified the Preferred Alternative for addressing potential contamination at OU5. As required by Sections 113 and 117 of CERCLA, the Navy provided a public comment period from November 1 through December 15, 2005, for the PRAP. In addition, a public meeting to present the PRAP was held on November 3, 2005, at Havelock High School, Havelock, NC. Public notice of the meeting and availability of documents was placed in the Sun Journal Newspaper on Thursday, October 27th, the Carteret County News-Times on October 30th, the Havelock News on November 2nd, and the Windsock on November 3rd. No changes were made to the Preferred Alternative identified in the PRAP as a result of the public meeting and comment period. The Responsiveness Summary is included in Section 4.0 of this ROD.

2.2.2 Enforcement Activities

The Navy entered into a RCRA Section 3008(h) Administrative Order on Consent with EPA on December 14,1989, Docket No. 89-12-R. MCAS Cherry Point was later placed on the CERCLA

National Priorities List (NPL) effective January 17,1995 (59 Federal Register 65206, December 16,1994). In May 2005, USEPA Region 4, NCDENR, and the Navy and Marine Corps finalized a Federal Facilities Agreement (FFA) for MCAS Cherry Point. The primary purpose of the FFA is to ensure that environmental impacts associated with past and present activities at the site are thoroughly investigated and that the appropriate Remedial Action is taken as necessary to protect the public health, welfare, and the environment (MCAS FFA, 2005). The RCRA Section 3008(h) Administrative Order on Consent was terminated as of the effective date of the FFA (May 12, 2005). No enforcement activities have been recorded to date at OU5.

2.3 Community Participation

The MCAS Cherry Point Restoration Advisory Board (RAB) was formed in 1995. Meetings continue to be held to provide an information exchange among community members, USEPA, the State of North Carolina, and the Navy. These meetings are open to the public to provide opportunity for public comment and input, including the assumptions about reasonably anticipated future land use and potential beneficial uses of groundwater. A community relations program is being conducted through the IR Program process and public input is considered a key element in the decision-making process.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from November 1 through December 15, 2005, for the PRAP for OU5. A public meeting to present the PRAP for OU5 was held on November 3, 2005, at Havelock High School, Havelock, NC. Public notice of the meeting and availability of documents was placed in the Sun Journal Newspaper on Thursday, October 27th, the Carteret County News-Times on October 30th, the Havelock News on November 2nd, and the Windsock on November 3rd.

The public expressed their support for the Preferred Alternative presented at the public meeting. The questions and concerns raised at the meeting were general inquiries for informational purposes only; no adverse comments were received from the public. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript, included as Appendix C. No written comments, concerns, or questions were received by the Navy, the EPA, or the State of North Carolina during the public comment period.

The Community Relations Plan, Installation Restoration (IR) Program fact sheets, and final technical reports concerning OU5 are available to the public in the Administrative Record and information repository maintained at:

Havelock-Craven County Library
301 Cunningham Blvd
Havelock, NC 28532
252-447-7509

2.4 Scope and Role of Response Action

The greatest risk posed by sites within OU5 is related to groundwater contamination that has resulted from former disposal activities. Drinking groundwater from beneath the site could pose a threat to human health. The risks posed by these potential threats were quantified in the HHRA and ERA portions of the RI (CH2M HILL, 2003). Intrusive activities that result in contact with the groundwater could pose a threat through direct contact with contamination.

Creating ICs and performing MNA provide the best alternatives for eliminating current and future exposure pathways. The IC objectives are:

- Prohibit the withdrawal and/or future use of water, except for monitoring, from the surficial aquifer within a 250-ft radius of the impacted well, S2-TW03, at Site 2 (Figure 2-3).

- Prohibit intrusive activities within a 250-ft radius of S2-TW03 unless specifically approved by both NCDENR and USEPA.

Within 120 days following the execution of this ROD, the Navy shall develop, and submit to USEPA and NCDENR, a RD document that shall contain IC implementation and maintenance actions, including requirements for periodic inspections containing long-term monitoring.

The remedy selected in this ROD addresses contamination at one of the nine OUs that have been identified at the Air Station. CERCLA environmental investigations began in 1983 with an Initial Assessment Study. Additional investigations and remedial actions are ongoing. According to the schedule provided in the Draft Site Management Plan for Fiscal Year 2006 (CH2M HILL, 2005d), most remedial actions will have been initiated by 2008 and will be completed by 2028.

2.5 Site Characteristics

2.5.1 Site Overview

OU5 is located in the northeastern corner of MCAS Cherry Point, and consists of two sites (Site 1 and Site 2) located on the west and east sides, respectively, of an access road near the MACS-6. Sites 1 and 2 are areas where borrow material was excavated and removed, beginning in the 1950s and continuing for an unknown period of time. Some of the borrow pits where soils had been removed were later filled with debris and waste materials. No records were kept detailing the quantities or types of wastes disposed of at these sites, but there is no indication that they were primary disposal sites for the Air Station, or that they were regularly used for a significant period of time. Most of the surface debris visible at Sites 1 and 2 appears to be of the types typically associated with fill material, namely construction debris, although several crushed 55-gallon drums were found in some areas.

The sites currently consist of vacant, wooded land areas. There are surface water bodies on and adjacent to each site.

2.5.2 Surface and Subsurface Features

OU5 currently consists of wooded land with observed surface debris. Site 1 is relatively flat with a few hills located along the western boundary, ranging from approximately 10 to 15 feet high. Site 2 is also relatively flat, with the ground surface approximately level with the access road elevation. The ground surface at Site 2 slopes gently towards the eastern boundary. Ground surface elevations at OU5 range from approximately 5 to 20 feet above mean sea level (msl).

Subsurface fill material, construction debris, and other various debris present at Site 1 form linear and circular elevated features across the site. The elevated features contain soil fill material and sporadic debris. All linear and circular features were observed above grade.

Subsurface fill material, construction debris, and other various debris present at Site 2 form elevated features across the site. All the features are linear in shape with the exception of a sizeable oval shaped mound of fill material with construction debris along the northeastern edge. All linear and circular features were observed above grade.

Based upon topographic relief, surface water at Site 1 drains toward the unnamed tributary toward the west, to a pond located in the central area on the northern portion of Site 1, or directly into Reeds Gut. Surface water runoff at Site 2 drains toward the north and east in the direction of Reeds Gut and its unnamed tributary

Topsoil generally exists from 0-1 foot below ground surface (bgs), consisting of organic-rich matter and soft, moist silty, clayey sands. Sands make up the remainder of the geologic cross-section at OU5, with varying percentages of silts and clays. Shell fragments typically are found between 5-10 feet bgs.

The water table typically is located at approximately 7 feet bgs. The surficial aquifer is approximately 31 to 68 feet bgs and the hydraulic conductivity of the surficial aquifer averages 14 feet per day (ft/day). Groundwater flow in the surficial aquifer at OU5 generally mimics topography and flows east towards Reeds Gut. The surficial aquifer is underlain by a clay confining unit (Yorktown confining unit) that ranges in thickness from 30 to 40 feet. There is little risk of contamination moving from the surficial aquifer to the Yorktown Aquifer because the vertical hydraulic conductivity of the confining clay is very low (estimated to be less than 0.05 ft/day).

2.5.3 Sampling Strategy

Surface and subsurface soil, groundwater, sediment, and surface water samples were collected and analyzed to characterize the nature and extent of contamination and potential risk to human health and the environment as part of the RI. The field activities were conducted in 2002. The results of the RI are summarized in Section 2.0 of this ROD and in the RI report (CH2M HILL, 2003).

2.5.4 Sources of Contamination

The main source of contamination at OU5, Sites 1 and 2 is from the fill material. The main classes of constituents detected in the Site 1 media are inorganics and VOCs. The main classes of constituents detected in the Site 2 media are inorganics, VOCs, and SVOCs.

2.5.5 Types of Contamination

The types of contamination at OU5 addressed by the Selected Remedy include VOCs in groundwater. Other inorganic constituents identified during the HHRA as potentially posing human health risk at OU5 are not the result of OU5 site activities, but rather are representative of natural background conditions and were not carried forward as COCs. Many of the constituents observed during the RI and VGM were not attributable to OU5 historical activities. However, three organic constituents found at well OU5-S2-TW03 in groundwater may have been the result of disposal activities at OU5 and were carried forward as final COCs due to their exceedance of

NC 2L standards. These COC include TCE, vinyl chloride and benzene[1] (Figure 2-4).

2.5.6 Location of Contamination and Routes of Migration

Lateral and Vertical Extent of Contamination
The lateral extent of VOCs in groundwater is limited to well OU5-S2-TW03 (Figure 2-4). No distinct groundwater plume has been identified at OU5. Based on the low levels of chemicals detected in the surficial aquifer and the nature and thickness of the underlying Yorktown Confining Unit, no aquifers below the surficial aquifer were investigated.

Current and Potential Future Surface and Subsurface Routes of Exposure and Receptors
The following receptors were assessed during the HHRA for the RI:

- Current and future industrial workers
- Potential current and future construction workers
- Potential current and future adolescent trespassers
- Potential future residents (child and adult)

Receptor exposure to soil, sediment, surface water, and groundwater was evaluated. Although unlikely based on expected and planned future use of the site and base, future residents were considered as a worst case hypothetical receptor.

Aquifer Characteristics
MCAS Cherry Point is located within the Coastal Plain Physiographic Province. To a depth of approximately 500 feet, there are five non-saline aquifers and four confining units. However, only the surficial aquifer unit is relevant to the remedial action at OU5, and is described below.

The aquifer beneath OU5 that could be potentially affected by site-related contamination is the surficial aquifer. Deeper aquifers are not considered because of depth and separation from contaminant sources by confining units. The thickness of the surficial aquifer at the Air Station, ranges from 31 to 68 feet and is exposed at the ground surface and in streambeds at many locations on the Air Station. The upper portion of the surficial aquifer consists of interlayered clay, silt, and sand and extends to an approximate depth of 20 to 30 ft bgs. The lower surficial aquifer consists of fine-to-coarse sand with shell fragments. Precipitation that does not run off of the surface or is not evaporated or transpired into the air, infiltrates the ground surface. The infiltrating water moves by gravity downward through the unsaturated soil until it reaches the water table and enters the shallow groundwater system. Depth to groundwater at OU5 ranges from zero (ponded surface water present) to 12.5 feet bgs. Groundwater flow generally mimics topography and flows northeast towards Reeds Gut.

The surficial aquifer is recharged by the downward migration of precipitation and surface water through the vadose zone. The water table typically exists at approximately 7 ft bgs. The horizontal hydraulic conductivity of the surficial aquifer averages 14 ft/day. Groundwater flow in the surficial aquifer at OU5 generally mimics topography and flows north towards Reeds Gut and east and west towards its tributaries (Figure 2-2). In the RI report, the groundwater flow rate at OU5 was estimated to be 0.445 ft/day.

1 One additional constituent, chloroform, had been identified as a regulatory COC in the RI, FFS, and PRAP. However, as of April 1, 2005, the NC 2L standard for chloroform was raised from 0.19 microgram per liter (µg/L) to 70 µg/L. Since chloroform has not been detected at OU5 above the revised standard, it has been removed from the list of final COCs.

The Yorktown confining unit underlies the surficial aquifer and serves as a hydrogeologic barrier to the underlying Yorktown Aquifer. The confining unit consists largely of clay and sandy clay that locally includes beds of fine sand or shells. These confining sediments comprise the youngest beds of the Yorktown Formation. The average thickness of the Yorktown confining unit is about 22 ft (Winner and Coble, 1996). No soil borings or wells at Site 1 or Site 2 were advanced to the Yorktown confining unit or Yorktown Aquifer.

2.6 Current and Potential Future Site and Resource Uses

2.6.1 Current Site Land Uses

OU5 consists of approximately 8 acres which had previously been used as borrow pits and landfill areas. Most of the site is wooded or occupied by surface water drainage courses. These areas do not get substantial operational use by the Marine Corps.

2.6.2 Future Site Land Uses

Sites 1 and 2 consist of wooded land that is not occupied by base personnel. The sites are subject to periodic controlled burns. The industrial worker was conservatively included as a potential current exposed population for the HHRA. The Air Station and surrounding areas are used for residential, recreational, industrial, and commercial purposes. As neither site is fenced, there is the opportunity for trespassers/visitors to access the sites and be exposed to site media.

The current land use at OU5 is anticipated to continue indefinitely. Potential future site use could be industrial or residential, resulting in increased exposure to site media. Future exposed populations may include construction workers, full-time industrial workers, and/or residents. The Navy does not currently intend to build at OU5, thereby eliminating potential exposure to the groundwater by intrusive activities (i.e., excavations). The remote location of OU5 makes it unlikely that any type of significant aboveground construction will occur.

2.6.3 Current Groundwater and Surface Water Uses

Groundwater is a major source of potable water at MCAS Cherry Point and the City of Havelock. The majority of the groundwater used in the area is from the Castle Hayne Aquifer. Groundwater uses in the area include domestic, light industrial, and industrial. The Air Station uses between 2.5 and 4.5 million gallons of water per day (Tetra Tech, 2002). This supply is derived from about 25 active wells that range in depth from 195 to 330 feet. The number of wells in use at any one time varies with need. The groundwater in the vicinity of MCAS Cherry Point is classified by the state of North Carolina as Class GA. Class GA groundwater is considered to be an existing or potential source of drinking water.

Groundwater beneath OU5 is not used as a water supply. Additionally, surficial aquifer groundwater is not used as a water supply anywhere on MCAS Cherry Point, nor is it likely to be used as a water supply in the future due to low potential yield and poor natural water quality. The Air Stations potable water supply is withdrawn upgradient of OU5 and from the deeper aquifer (i.e., Castle Hayne Aquifer).

The nearest potable wells to OU5 are approximately 1 mile west of the site at Jackson Drive and Roosevelt Avenue. Groundwater in the Roosevelt Avenue area flows toward Slocum Creek and

away from OU5. The wells are located at a sufficient distance from OU5 to keep the area of pumping influence from affecting groundwater flow at the site. The City of Havelock's potable water wells are located several miles south of the Air Station, along Highway 70E. MCAS Cherry Point is located within the limits of the City of Havelock, North Carolina. The area surrounding the Air Station consists of commercial and residential developments, waterways, and public lands (Croatan National Forest). It is isolated from relatively large population centers. The largest cities in the vicinity are the City of New Bern (approximately 19 miles northwest of the Air Station) and Morehead City (approximately 19 miles southeast of the Air Station).

2.6.4 Future Groundwater and Surface Water Uses

Potential beneficial uses of groundwater and surface water are expected to be the same as the current uses identified above. The remedial action plan for OU5 would prohibit use of the surficial aquifer beneath the site for any purpose other than environmental monitoring and testing. No additional surface water uses are anticipated.

2.7 Summary of Site Risks

The human health and ecological risks associated with exposure to contaminated media at OU5 were evaluated in the RI for OU5 (CH2M HILL, 2005a) and summaries are provided in the following subsections.

2.7.1 Human Health Risk Assessment Summary

The baseline HHRA estimates the human health risks posed by OU5 if no remedial actions are taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this site.

The HHRA was prepared using conservative assumptions designed to ensure that risks are not understated. Exposure pathways were evaluated for current and potential future site use based on current site conditions. Potential cancer risks and hazard indices (HIs) were calculated for construction workers, maintenance workers, full-time employees, adolescent trespassers, on-site recreational users, and on-site residents. The total risk from the site to these receptors was estimated by logically summing the multiple pathways likely to affect the receptor during a given activity.

Industrial Workers
The risk assessment assumed that a current/future industrial worker may be exposed to site surface soil, surface water, and sediment. The total reasonable maximum exposure (RME) non-carcinogenic hazard and carcinogenic risk to an adult industrial worker exposed to all of these media does not exceed the USEPA target risk level or non-carcinogenic hazard level (CH2M HILL, 2005a). At Site 1, the total HI is 0.03 and the total carcinogenic risk is $5x10^{-6}$, while at Site 2, the total HI is 0.02 and the total carcinogenic risk is $4x10^{-6}$.

Construction Workers
Risk to construction workers was evaluated for exposure to groundwater through dermal contact and inhalation of volatile emissions, as well as to subsurface soil through incidental ingestion,

dermal contact, and inhalation of fugitive dust and volatile emissions. The total potential future RME risk and hazard to a construction worker exposed to these media at Site 1 and Site 2 does not exceed USEPA's target carcinogenic risk or non-carcinogenic hazard levels. For Site 1, the total calculated RME HI is 0.03 and the total RME carcinogenic risk is $1x10^{-7}$. The total potential future RME carcinogenic risk is $2x10^{-6}$ and RME HI is 0.01 for a construction worker exposed to media at Site 2.

Adolescent Trespassers
The HHRA assumed that a current/future adolescent trespasser may be exposed to surface soil, surface water, and sediment. The total RME non-carcinogenic hazard and carcinogenic risk to an adolescent trespasser/visitor exposed to these media does not exceed USEPA target levels. At Site 1, the total calculated RME HI is 0.02 and the total RME carcinogenic risk is $1x10^{-6}$. The total calculated RME HI is 0.01 and the total RME carcinogenic risk is $7x10^{-7}$ at Site 2.

Adult Recreational Users
All estimated cancer risks for adult recreational users were less than or within USEPA's target risk range of 10^{-4} to 10^{-6}. The estimated cancer risk for adult recreational users was 6.3×10^{-7} for exposure to surface soil, 5.4×10^{-7} for exposure to sediment, and 8.1×10^{-8} for exposure to surface water. The estimated cancer risk for an adult recreational user from ingestion of fish was 9.0×10^{-5}. The total cancer risk across all media was 9.2×10^{-5}.

All estimated HIs were less than the acceptable level of 1.0 with the exception of ingestion of fish. The HIs for an adult recreational user were 0.01 for exposure to surface soil, 0.01 for exposure to sediment, and 0.01 for exposure to surface water indicating that no adverse health effects anticipated for adult recreational users exposed to soil, sediment, and surface water under the defined conditions. The HI for an adult recreational user from ingestion of fish was 1.5. The cumulative HI across all media was 1.5. USEPA guidance recommends looking at the hazard quotients (HQs) of the individual target organs when the HI exceeds 1.0. The HQs for the individual target organ are 0.2 for blood (antimony), 0.5 for skin (arsenic), and 0.8 for the central nervous system (mercury). These results are less than the acceptable level of 1.0, which indicates that there is minimal potential for adverse health effects from ingestion of fish.

Future Residents
It was assumed that future adult and child residents may be exposed to surficial aquifer groundwater, surface soil, subsurface soil, surface water, and sediment. Exposure to groundwater would occur as a result of ingestion, or direct contact while showering (adult) or bathing (child).

For Site 1, exposure to these media would result in a cumulative hazard greater than USEPA's benchmark level for an adult (1.3) and child (3.3) resident. Arsenic is the risk driver for both residential scenarios, primarily associated with potable use of the groundwater. Dermal exposure to arsenic in the sediment also contributes to non-carcinogenic hazard to the residential child, however, the HI associated with exposure to sediment alone (0.8) is below USEPA's target HI. The central tendency (CT) HIs to the child and adult resident are below USEPA's target HI.

The arsenic concentration used in the quantitative risk evaluation for the groundwater was the maximum detected level at the site. However, this maximum detected arsenic concentration is within the range of background concentrations for arsenic at MCAS Cherry Point. Background sediment data are not available for comparison to site concentrations, yet site-related activities are not likely to be the source of arsenic in sediment or groundwater. Soil and groundwater

arsenic results across OU5 are consistent with background concentrations. Additionally, there is a high degree of uncertainty associated with the calculation of dermal absorption of arsenic from sediment, particularly associated with the sediment to skin adherence factor used in the risk assessment. The sediment to skin adherence factor used for the child is two orders of magnitude higher than that used for the adult.

Carcinogenic risks associated with exposure to all media for a lifetime resident ($3x10^{-4}$) exceeds USEPA's target risk range of 10^{-6} to 10^{-4}. The carcinogenic risk to the adult resident ($1x10^{-4}$) and child resident ($1x10^{-4}$) are equal to the upper end of USEPA's target risk range. The carcinogenic risk is primarily associated with arsenic detected in the groundwater, with smaller contributions from arsenic in the soil and sediment. The CT carcinogenic risks for all receptors are within USEPA's target risk range.

For Site 2, exposure to media would not result in a hazard greater than USEPA's benchmark level to an adult (0.5). The cumulative hazard across media for the residential child (1.9) slightly exceeds USEPA's benchmark level. Dermal exposure to arsenic in the sediment (0.3) and ingestion of arsenic in the surface water (0.5) were the exposure routes driving the cumulative hazard across media for the residential child at Site 2. However, the arsenic concentration in soil at OU5 were found to be consistent with background concentrations at MCAS Cherry Point. Background sediment data are not available for comparison to site concentrations, yet site-related activities are not likely to be the source of arsenic in sediment or surface water since the soil and groundwater results across OU5 are consistent with background concentrations. Therefore, the risk associated with arsenic is not likely related to site activities, but is more likely associated with natural background conditions.

Carcinogenic risks associated with exposure to all media for an adult and child resident ($2x10^{-5}$ and $4x10^{-5}$) and summed for a lifetime resident ($1x10^{-5}$) were within USEPA's target risk range at Site 2.

Summary of Total Risks across Pathways and Media

At Site 1, the cumulative hazards across media for the residential adult (1.3) and child (3.3) exceed USEPA's benchmark level. Arsenic in the sediment and groundwater is the main contributor to risk for the residential child. However, the maximum detected arsenic concentration is within the range of background concentrations for arsenic at MCAS Cherry Point. Site-related activities are not likely to be the source of arsenic in sediment or groundwater since the soil and groundwater results across OU5 are consistent with background concentrations. Therefore, the risk associated with arsenic at Site 1 is not likely related to site activities, but is more likely associated with natural background conditions.

At Site 2, the cumulative hazard across media for the residential child (1.9) exceeds USEPA's benchmark level. Arsenic in the sediment and surface water are the main contributor to risk for the residential child at Site 2. However, the arsenic concentrations in soil and groundwater at OU5 were found to be consistent with background concentrations at MCAS Cherry Point. Therefore, the risk associated with arsenic at Site 2 is not likely related to site activities, but is more likely associated with natural background conditions.

2.7.2 Ecological Risk Summary

OU5 contains disturbed areas, sections of wooded areas and several aquatic features. A dammed

pond is located within Site 1. Two unnamed tributaries bracket OU5 to the east and west, flowing north into Reeds Gut. Reeds Gut is a tidal fresh water body located just north of the site which flows east into Hancock Creek (Figure 2-2). OU5 contains several disturbed areas consistent with the site being used for borrow material and disposal of fill and other debris.

Both sites contain wooded areas dominated by loblolly pine trees. Other common overstory tree species in the Reeds Gut corridor include shortleaf and longleaf pine, poplar, and oak. Midstory species include hickory, oak, gum, maple, and dogwood. Inkberry, grape, red bay, switchcane, sweetleaf, and wax myrtle are the primary species found in the understory. Compared to Site 1, Site 2 has a higher percentage of deciduous trees. Both sites are managed as planned burn areas.

The aquatic and wooded environments at Sites 1 and 2 support a variety of aquatic and terrestrial wildlife. The unnamed tributary to the east is a perennial stream that is relatively shallow (1 to 2 inches deep) at the upstream portion and (6 to 10 inches deep) near the confluence with Reeds Gut. Wildlife observed during the site walk of this area include mosquito fish, crayfish and a snake. The unnamed tributary to the west has a much deeper channel (3 to 4 feet deep) with a well developed riparian zone. Frogs, fish and crayfish inhabit the area and although no benthic invertebrates were observed during the site walk a turtle and a skink were seen. The pond located to the north side of Site 1 covers approximately 0.1 acres. The pond supports a variety of floating aquatic vegetation, odonates and other aquatic insects, tadpoles, mosquito fish and crayfish. Evidence of historical beaver activity was observed in the drainage area of the pond.

Reeds Gut is a tidal, fresh water body generally greater than 100 feet wide (Figure 2-2). The gut is several feet deep at the road bridge located between Site 1 and Site 2, and supports submerged aquatic vegetation. Amphipods were abundant in dip net samples. The benthic environment is highly organic, with soft, deep sediment. There is some emergent vegetation in Reeds Gut and the riparian zone is primarily comprised of deciduous shrubs and trees.

An intensive threatened and endangered species survey of the Air Station was conducted by the North Carolina Natural Heritage Program (LeBlond et al., 1994). The only threatened or endangered species located during the survey was the American alligator (Alligator mississippiensis). While the American alligator is relatively common in North Carolina, it is federally classified as threatened due to similarity of appearance to the American crocodile (Crocodylus acutus), which is federally endangered.

The following subsections detail the ecological risks to aquatic, benthic, and terrestrial receptors posed by potential exposure to various site media. Analytical data for both Sites 1 and 2 were combined for the screening risk calculations. Refer to the RI report (CH2M HILL, 2005a) for further details of the ERA. HQs are used to evaluate ecological risks; below a HQ of 1, adverse effects to ecological receptors are not expected. For OU5, risks were evaluated for terrestrial habitats and for aquatic habitats in the surface water bodies that may be impacted from discharges of site-related contaminants in the groundwater. The ERA also considered the following factors when evaluating and interpreting the risk results: inorganic constituent concentrations in site soils compared to those in reference samples; chemical bioavailability in sediment; chemical distribution in site soil and sediment; influence of grain size and total organic carbon on chemical distribution in sediment; potential chemical sources to site drainages; and potential risks to ecological receptors in the unnamed tributaries and Reeds Gut.

Aquatic Ecosystems
Mercury, selenium, silver, 2,4-dinitrophenol, 4,6-dinitro-2-methyphenol, 4-chloro-3-methyphenol, hexachlorobutadiene, hexachlorocyclopentadiene, and bis(2-ethylhexyl) phthalate (BEHP) had a HQ greater than 1.0 for Sites 1 and 2 using maximum concentrations. Using average concentrations only silver had a HQ greater than 1.0.

Benthic Ecosystem
BEHP had a HQ greater than 1.0 for Sites 1 and 2 using maximum concentrations in the sediment. Using average concentrations arsenic, cadmium, lead, mercury, and dibenz(a, h) anthracene all had HQs greater than 1.0.

Terrestrial Ecosystem
No detected COPCs yielded HQs greater than 1.0 for Sites 1 and 2 using maximum concentration modeling. Using average concentrations, chromium and mercury had HQs greater than 1.0.

Summary of Ecological Risk Assessment
Several metals and organic chemicals were detected at maximum concentrations in OU5 media (surface soil, groundwater, surface water, and sediment) exceeding conservative screening levels and toxicity reverence values; thus, they were selected as ecological COPCs. However, these COPCs were either detected infrequently or levels were close to site background levels. Some of the constituents detected did not have screening values, but due to infrequent detections, the lack of screening values for some chemicals is not considered a significant risk. Because of the lack of bioaccumulative chemicals detected, no food chain modeling was conducted. The COPCs were assessed in a less conservative Step 3A evaluation. Analysis of the COPCs suggested that risks do not appear to be of sufficient magnitude to warrant further ecological study or active remediation.

2.8 Remedial Action Objectives

Despite the lack of site-attributable constituents from the risk assessments being carried forward as final COCs in the evaluation of remedial alternatives, three constituents (TCE, vinyl chloride and benzene) detected in groundwater at Site 2 were nevertheless carried forward as final COCs due to their exceedance of NC 2L standards. It is the recommendation of the Navy and USEPA, in consultation with NCDENR, that a remedial action be implemented to address the exceedances of NC 2L groundwater standards at OU5 Site 2. With the absence of identified COCs and NC 2L exceedances, no further action is necessary at Site 1. The following RAOs focus on site-specific objectives for OU5 and should be attainable by the proposed remedial alternatives:

- Prevent human exposure to groundwater containing COCs in excess of NC 2L standards.
- Achieve suitability of OU5 groundwater for unlimited use with a reasonable approach and within a reasonable timeframe.
- Reduce exceedances of COCs to meet the NC 2L standards (Table 2-1).

TABLE 2-1
Remedial Goals
MCAS Cherry Point OU5 ROD

COC	Remedial Goal	Basis for Remedial Goal
Benzene	1.0 microgram per liter (µg/L)	NC 2L Standard
Trichloroethene	2.8 µg/L	NC 2L Standard
Vinyl Chloride	0.015 µg/L	NC 2L Standard

2.9 Description of Alternatives

Five remedial alternatives were developed to address exceedances of NC 2L standards in groundwater at Site 2. It has been determined that no remedial action for Site 2 soil and surface water media is required for them to be suitable for unlimited use. The remedial alternatives for Site 2 groundwater are discussed in detail in the FFS (CH2M HILL, 2005b).

Each alternative, with the exception of the no action alternative, was developed to meet the RAOs.

2.9.1 Alternative 1— No Action

Alternative 1 consists of No Action. The NCP requires that the No Action alternative be retained throughout the feasibility study process as a basis of comparison for other approaches. No action would leave impacted groundwater in place at Site 2 and there would be no restrictions on activities at the site. Natural attenuation processes, such as dilution, dispersion, and biodegradation would be expected to occur with the potential to reduce chemical concentrations over time. However, the concentrations would not be monitored and the degree to which attenuation occurs would be unknown. There are no capital or O&M costs for the No Action alternative.

2.9.2 Alternative 2— Institutional Controls

ICs would be implemented with the objective of preventing exposure to contaminated Site 2 groundwater until remediation goals have been met. These ICs would ensure that the potential exposure pathway to contamination would remain incomplete by prohibiting the withdrawal and/or future use of water from the surficial aquifer within the identified boundary of groundwater contamination. The ICs will also prohibit intrusive activities within 250 ft of impacted wells that encounter the water table unless specifically approved by both the NCDENR and USEPA. The IC would consist of a Notice of Inactive Hazardous Substance or Waste Disposal Site filed as a deed notice in Craven County real estate property records.

Some administrative costs are associated with this alternative. The O&M cost would depend on the duration of the IC program and other applicable regulatory requirements. Costs incurred for this alternative would consist primarily of time for MCAS Cherry Point environmental personnel, NCDENR, and the USEPA to agree on any necessary updates to the LUC implementation portion of the remedial design. Costs would also include incorporating the new LUC into the Air Station's Geographic Information System (GIS). The site would be inspected periodically, and the effectiveness of the ICs would be certified by USEPA and NCDENR.

2.9.3 Alternative 3— Monitored Natural Attenuation

Under Alternative 3, periodic monitoring would be performed to evaluate changes in site conditions over time and to ultimately signal when remediation goals have been achieved for the unit via natural attenuation. Various groundwater parameters and conditions would be assessed and documented. Physical parameters such as groundwater depth, flow direction, and flow rates would be tracked by measuring water levels in groundwater monitoring wells. The final COCs (benzene, TCE, and vinyl chloride) would be evaluated by sampling and analyzing groundwater at OU5-S2-TW03. Additional groundwater quality parameters such as temperature, pH, dissolved oxygen, oxidation-reduction potential, and conductivity would also be measured during sampling activities. Technical memoranda would be prepared to summarize analytical results and document progress toward remediation goals.

Upon demonstrating that the COCs are at or below their respective remediation goals for four consecutive sampling events procedures for site closure would be initiated.

MNA has been proven effective for documenting the progress of changes in site conditions over time. It is a straightforward, commonly accepted site management technique that is easily implemented. Supporting evidence for the viability of natural attenuation to achieve remedial goals at Site 2 includes the following.

- The low contaminant levels detected at Site 2 are amenable to natural attenuation.
- Detected breakdown products of TCE (i.e., 1,1-DCE and vinyl chloride) indicate that natural degradation is occurring.
- No source area of ongoing contamination has been identified.
- Contaminant detections are isolated and sporadic in nature (no discernable plume).

There is minimal capital cost associated with this remedial alternative, because the monitoring well network at Site 2 is already established. The temporary well in which COCs have been detected above NC 2L standards would be converted to a permanent well by constructing a pad and installing a locking steel casing to protect the portion of the well above the ground surface. If the temporary well construction is not appropriate for conversion to a permanent well, a new permanent well would be installed at the same location. The total O&M costs would depend on the ultimate duration of the monitoring program.

2.9.4 Alternative 4— MNA and ICs

Alternative 4 is a combination of Alternatives 2 and 3. The benefit of this combination is that the ICs prevent human exposure to constituents during the MNA process, except for exposure during or related to groundwater monitoring activities. In addition, the monitoring component helps determine when remediation goals have been achieved in order to initiate site closure.

2.9.5 Alternative 5— Groundwater Pump and Treat with Air Stripping and Discharge to Reeds Gut

Under Alternative 5, a groundwater extraction well network would be installed to collect

contaminated groundwater and pump it to an ex situ air stripper treatment system. An air stripper is a physical mass transfer technology that strips VOCs and SVOCs from the water and transfers them to a countercurrent air stream. Depending on the air phase concentrations, the stripper may require an off-gas treatment system, such as granular activated carbon canisters, to capture the contaminants. Treated groundwater would be discharged to Reeds Gut. Spent carbon canisters would require disposal as hazardous waste. Monitoring the treatment system effluent and groundwater will be a component of this alternative. The system would have an added benefit of establishing hydraulic control across OU5.

TABLE 2-1
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MCAS Cherry Point OU5 ROD

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Trichloroethene	2.8 µg/L	NC 2L Standard
Vinyl Chloride	0.015 µg/L	NC 2L Standard

2.10 Comparative Analysis of Alternatives

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses nine evaluation criteria. These consist of "threshold," " primary balancing," and "modifying" criteria. All alternatives are evaluated against threshold and primary balancing criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility. To be considered for remedy selection, an alternative must meet the two threshold criteria:

1. Overall protection of human health and the environment
2. Compliance with ARARs

The primary balancing criteria are then considered to determine which alternative provides the best combination of attributes. The primary balancing criteria are:

3. Long-term effectiveness and permanence
4. Reduction in toxicity, mobility, or volume through treatment
5. Implementability
6. Short-term effectiveness
7. Cost

The Preferred Alternative is evaluated further against two modifying criteria:

8. Acceptance by the State
9. Acceptance by the community

A summary of the comparative analysis of alternatives for OU5 is provided below. The purpose of the comparative analysis is to identify the relative advantages and disadvantages of each RAA.

2.10.1 Threshold Criteria

Overall Protection of Human Health and the Environment
This criterion is used to evaluate whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are reduced or controlled.

Alternatives 1 and 3 do not reduce risk to human health and the environment because access to COCs is not limited and COCs are not actively removed. Alternatives 2 and 4 would limit access to groundwater at Site 2, preventing exposure of future residents to groundwater and thereby reducing risk. Alternative 5 is expected to reduce risk by actively removing COCs from groundwater.

Compliance with Applicable or Relevant and Appropriate Requirements
Section 121 (d) of CERCLA requires that remedial actions at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations (collectively referred to as ARARs), unless waivers are obtained.

Applicable requirements are standards and other environmental protection requirements of Federal or state law dealing with a hazardous substance, pollutant, contaminant, or a selected remedial action. Relevant and appropriate requirements are standards and environmental protection criteria of Federal or state law that, although not "applicable" to a hazardous substance or remedial action, address situations sufficiently similar to those at the site that their use is suitable.

There are three types of ARARs: chemical-specific, location-specific and action-specific. None of the alternatives meet chemical-specific ARARs in the short-term, but all would be expected to meet them over time through natural attenuation, and in the case of Alternative 5, through active groundwater extraction and treatment. Evidence of the natural attenuation process has been found in the detection of breakdown products of parent compounds, and this will be documented in a 5-year review. All of the alternatives meet the location-specific and action-specific ARARs.

2.10.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence
Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Although long-term risk may decline as COC concentrations decrease, only Alternatives 3, 4 and 5 provide a means to monitor and document the risk reduction. Any decline in risk would remain unknown and undocumented if Alternatives 1 or 2 were implemented.

Reduction in Toxicity, Mobility, or Volume through Treatment
Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy. Alternative 5 uses treatment to reduce toxicity, mobility and volume by physically removing and treating COCs from OU5. The remaining alternatives do not include treatment components.

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

Because no action is required, Alternative 1 is the easiest to implement. Alternatives 2, 3 and 4 are also easy to implement because a groundwater monitoring network at OU5 already exists. Alternative 5 would be implementable, but is not considered technically feasible due to the lack of a defined plume.

Short-Term Effectiveness
Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to site workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved. Some short-term risk is posed to site workers during implementation of Alternatives 3 and 4 due to potential contact with impacted groundwater during monitoring. Short term risk may also be posed to workers during the construction of the treatment system for Alternative 5.

Cost
The present worth cost of performing 5-year reviews for Alternative 1 is $43,700. The capital cost plus the present worth cost of O&M for Alternatives 3 and 4 are $254,800 and $279,000, respectively. Alternative 2 is a relatively low cost option (less than $70,000) while Alternative 5 is a relatively high cost option (more than $500,000).

2.10.3 Modifying Criteria

State of North Carolina Acceptance
State involvement has been solicited throughout the investigative process and through to the proposed remedy selection. The NCDENR as the designated state support agency in North Carolina has reviewed this ROD and concurs with the Selected Remedy (Alternative 4 - MNA and ICs) as described in Section 2.12.

Community Acceptance
A public meeting was held on November 3, 2005, to present the PRAP for OU5 and to answer any questions on the PRAP and on the documents in the information repositories. RAB members and the public expressed their support for the Preferred Alternative presented at the public meeting. The questions and concerns raised at the meeting were general inquiries for informational purposes only; no adverse comments were received from the public. Questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript, included as Appendix C. No written comments, concerns, or questions were received by the Navy, the EPA, or the State of North Carolina during the public comment period for the PRAP from November 1 to December 15, 2005.

2.11 Principal Threat Wastes

The NCP establishes an expectation that the EPA will use treatment to address the principal threats posed by a site whenever practicable. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure

occur. There are no principal threat wastes present at OU5.

2.12 Selected Remedy

Alternative 4 - MNA and ICs - is the remedy selected for Site 2 and is the preferred alternative presented in the PRAP. Based on available information and the current understanding of the conditions at Site 2, the Selected Remedy provides the best balance with respect to the USEPA evaluation criteria previously described.

The Selected Remedy includes the following major components:

- MNA will be performed by collecting and analyzing groundwater samples to confirm that no unacceptable contamination migration is occurring and to evaluate reductions in contaminant concentrations through naturally occurring processes such as biodegradation, dispersion, and dilution. MNA will continue until monitoring has demonstrated that the remedial goals have been achieved for groundwater, which will allow for unlimited use and unrestricted exposure.

- ICs will prohibit the withdrawal and/or future use of water, except for monitoring, from the surficial aquifer within 250 feet (ft) of the impacted well at Site 2 of OU5. ICs will also prohibit intrusive activities within 250 ft of the impacted well at Site 2 of OU5 unless concurrence is received from both NCDENR and USEPA. Specific types of ICs to be employed for these purposes will include: 1) incorporating land use prohibitions into the MCAS Cherry Point master planning process; 2) a deed Notice of Inactive Hazardous Substance or Waste Disposal filed in Craven County real property records per North Carolina General Statutes (NCGS) 130A-310.8; and 3) deed restrictions included in any deed transferring any portion of OU5 to any non-Federal transferee.

The ICs shall be maintained to prevent unacceptable exposures to contaminated groundwater or to preserve the integrity of the remedy. The ICs shall be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unlimited exposure and unrestricted use.

The remedy may change somewhat as a result of the remedial design and construction processes. Changes to the remedy will be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences, or a ROD amendment, depending on the facts and circumstances of the change. The Navy shall not modify or terminate ICs or IC implementation actions, or cause or allow any land use inconsistent with the anticipated land use(s) identified in this ROD, unless concurrence is received from both EPA and NCDENR.

The Navy will be responsible for implementing, maintaining, inspecting, reporting, and enforcing the ICs described in this ROD in accordance with the approved RD document. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity. Should this IC remedy fail, the Navy will ensure that appropriate actions are taken to reestablish its protectiveness and may initiate legal action to either compel action by a third party(ies) and/or recover the Navy's costs for remedying any discovered IC violations.

Within 120 days of ROD signature, the Navy shall prepare and submit to USEPA and NCDENR for review and concurrence, a RD document that shall contain implementation and maintenance actions, including periodic inspections. The Navy will implement, maintain, monitor, and enforce the ICs according to the RD.

2.12.1 Summary of the Rationale for the Selected Remedy

Based on the comparative analysis, the Selected Remedy for groundwater at Site 2 is Alternative 4 - MNA with ICs. This preference is based on the ability of the alternative to eliminate the risk exposure pathway in a cost-efficient manner, by effectively restricting land use in the form of access to groundwater until the remediation goals have been achieved. MNA is expected to achieve remedial goals within a reasonable timeframe. Supporting evidence for the viability of MNA to achieve remedial goals at Site 2 includes the following:

- The presence of breakdown constituents (daughter products of parent compounds) indicates that natural attenuation is occurring.

- The low contaminant levels detected at Site 2 are amenable to natural attenuation.

- No source of ongoing contamination has been identified.

- Contaminant detections are isolated and sporadic in nature (no discernable plume).

The monitoring component provides flexibility to the alternative, allowing timely responses to changing site conditions. One such response would be terminating the IC when the Navy, USEPA and NCDENR agree that remediation goals have been achieved following sufficient consecutive sampling events. In addition, monitoring would allow new remedial alternatives to be revisited if the unlikely scenario occurs in which COC concentrations increase significantly.

The Selected Remedy is anticipated to meet the following statutory requirements of CERCLA: protection of human health and the environment, compliance with ARARs of Federal and North Carolina environmental laws, cost-effectiveness, and use of permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy because there is no contamination at Site 2 for which treatment would be practical or cost-effective. Alternative 4 provides the most cost effective approach to expediently reduce risk at Site 2. Alternative 5 may achieve reduced COC concentrations in groundwater more quickly than MNA, but the costs are significantly higher and the implementability is considerably more difficult. The infrequent occurrence and relatively low concentrations of COCs at Site 2, as well as the lack of a defined contaminant plume, do not justify the selection of a relatively high cost, active remedial option such as Alternative 5. Therefore, based on the available information and current understanding of site conditions, Alternative 4 provides the best balance with respect to the NCP evaluation criteria.

2.12.2 Description of the Selected Remedy

The Selected Remedy consists of MNA and ICs for groundwater at Site 2. MNA will be performed by collecting and analyzing groundwater samples to assess that no unacceptable contamination migration is occurring and to evaluate reductions in contaminant concentrations

through naturally occurring processes such as biodegradation, dispersion, and dilution.

Three chemicals (TCE, vinyl chloride, and benzene) were selected as COCs because they exceeded NC 2L standards[2]. ICs would be designed to restrict access to groundwater so the potential exposure pathway to these chemicals would remain incomplete. ICs will prohibit the withdrawal and/or future use of water, except for monitoring, from the surficial aquifer within the identified contaminated groundwater boundary. The ICs will also prohibit intrusive activities that encounter the water table within the extent of current groundwater contamination unless specifically concurred with by both NCDENR and USEPA. The site would be inspected periodically, and the effectiveness of the ICs would be certified by USEPA and NCDENR.

Periodic monitoring would be performed to evaluate changes in site conditions over time and to ultimately signal when remediation goals have been achieved for the unit via natural attenuation. Various groundwater parameters and physical conditions would be assessed and documented. The final COCs would be evaluated by sampling groundwater at the relevant well at Site 2 in which these compounds were detected above NC 2L standards. Annual technical memoranda would be prepared to summarize analytical results and document progress toward remediation goals.

2.12.3 Summary of the Estimated Remedy Costs

A cost estimate for the selected groundwater remedy is presented in Appendix A. The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost estimate are likely to occur as a result of new information and data collected. Major changes may be documented in the form of a memorandum in the Administrative Record file. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 percent to -30 percent of the actual project costs.

2.12.4 Expected Outcomes of the Selected Remedy

The current land use at Site 2 is expected to remain the same. In accordance with the IC objectives, groundwater use will be restricted to monitoring or remedial purposes. Groundwater quality will be assessed through monitoring to provide evidence that attenuation is occurring. When a single COC is at or below its respective remediation goal for four consecutive sampling events, this COC will no longer require monitoring, while the others will continue to be analyzed and documented in annual technical memoranda. When all COCs have achieved their goals for four consecutive sampling events (minimum quarterly sampling interval), procedures for site closure will be initiated. Once RAOs for this groundwater action have been achieved, the Site 2 area is expected to be suitable for unlimited use and unrestricted exposure. Therefore, the Navy, USEPA, and NCDENR may agree for the IC component of the Selected Remedy to be terminated at site closeout.

2 One additional constituent, chloroform, had been identified as a regulatory COC in the RI. However, as of April 1, 2005, the NC 2L standard for chloroform was raised from 0.19 µg/L to 70 µg/L. Since chloroform has not been detected at OU5 above the revised standard, it was removed from the list of final COCs.

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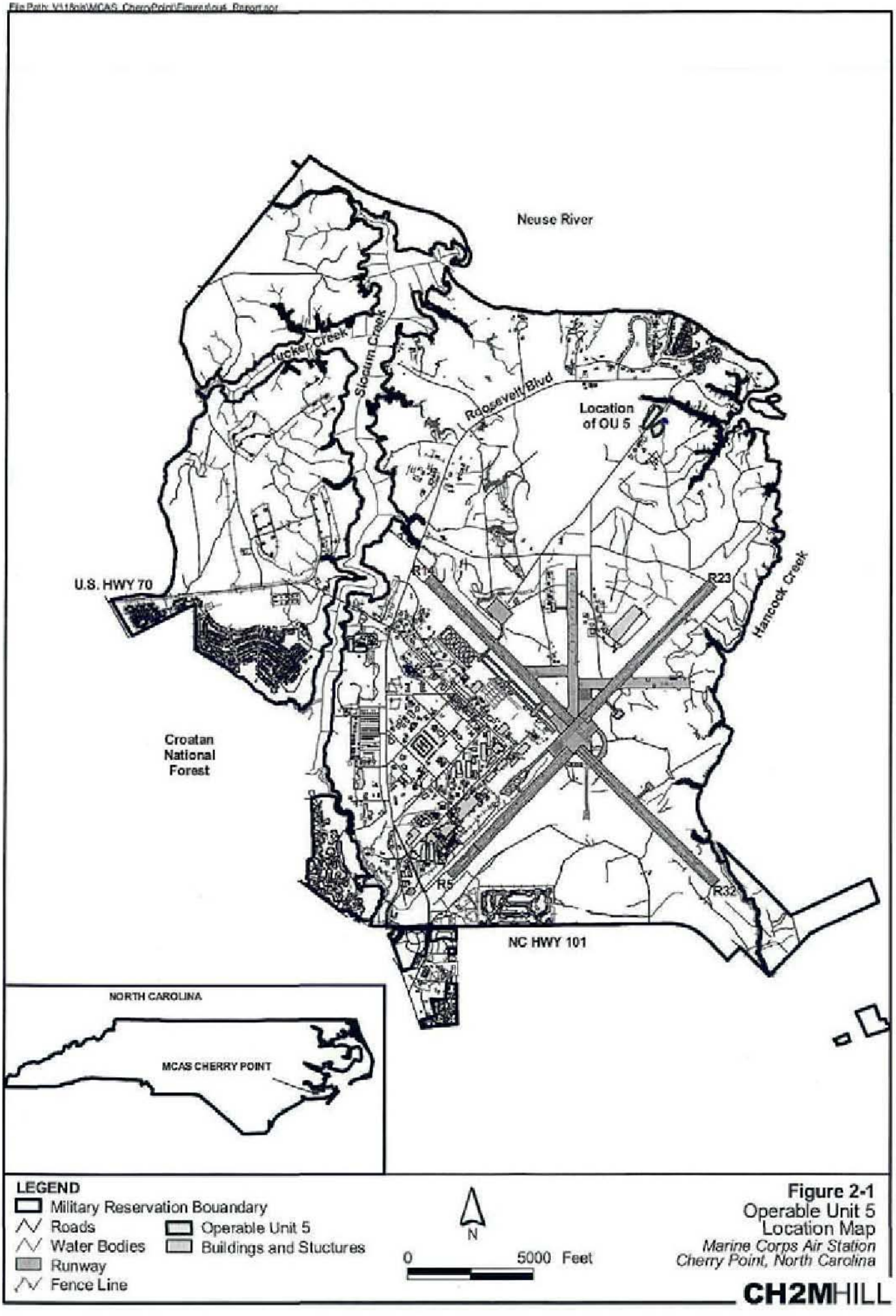

Figure 2-1
Operable Unit 5
Location Map
Marine Corps Air Station
Cherry Point, North Carolina

CH2MHILL

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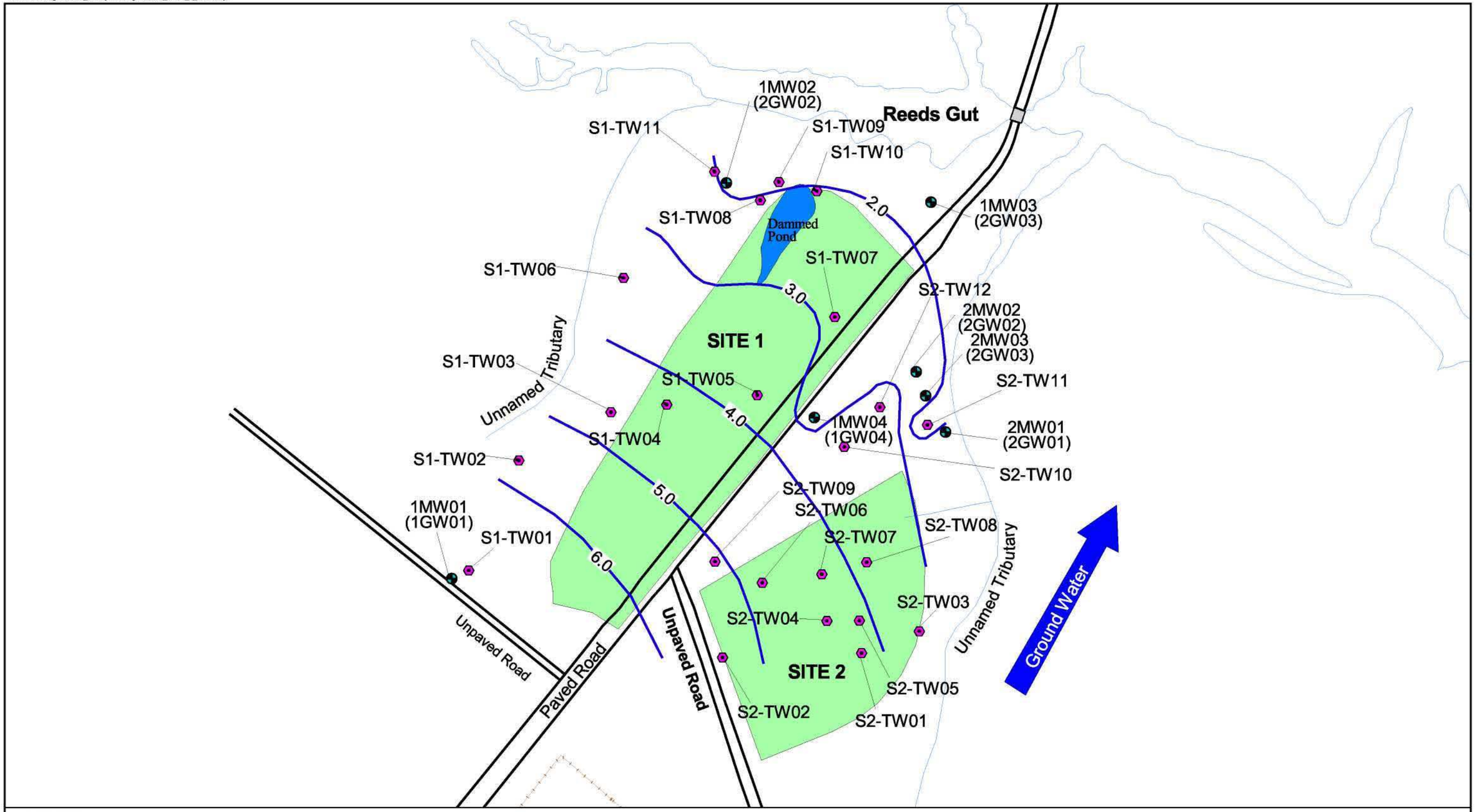

LEGEND

- Monitoring Wells
- Temporary Wells
- Potentiometric Surface Contour, June 2002
- Groundwater Flow Direction

N

0 100 200 Feet

Figure 2-2
Operable Unit 5
Potentiometric Surface Contour Map
Marine Corps Air Station
Cherry Point, North Carolina

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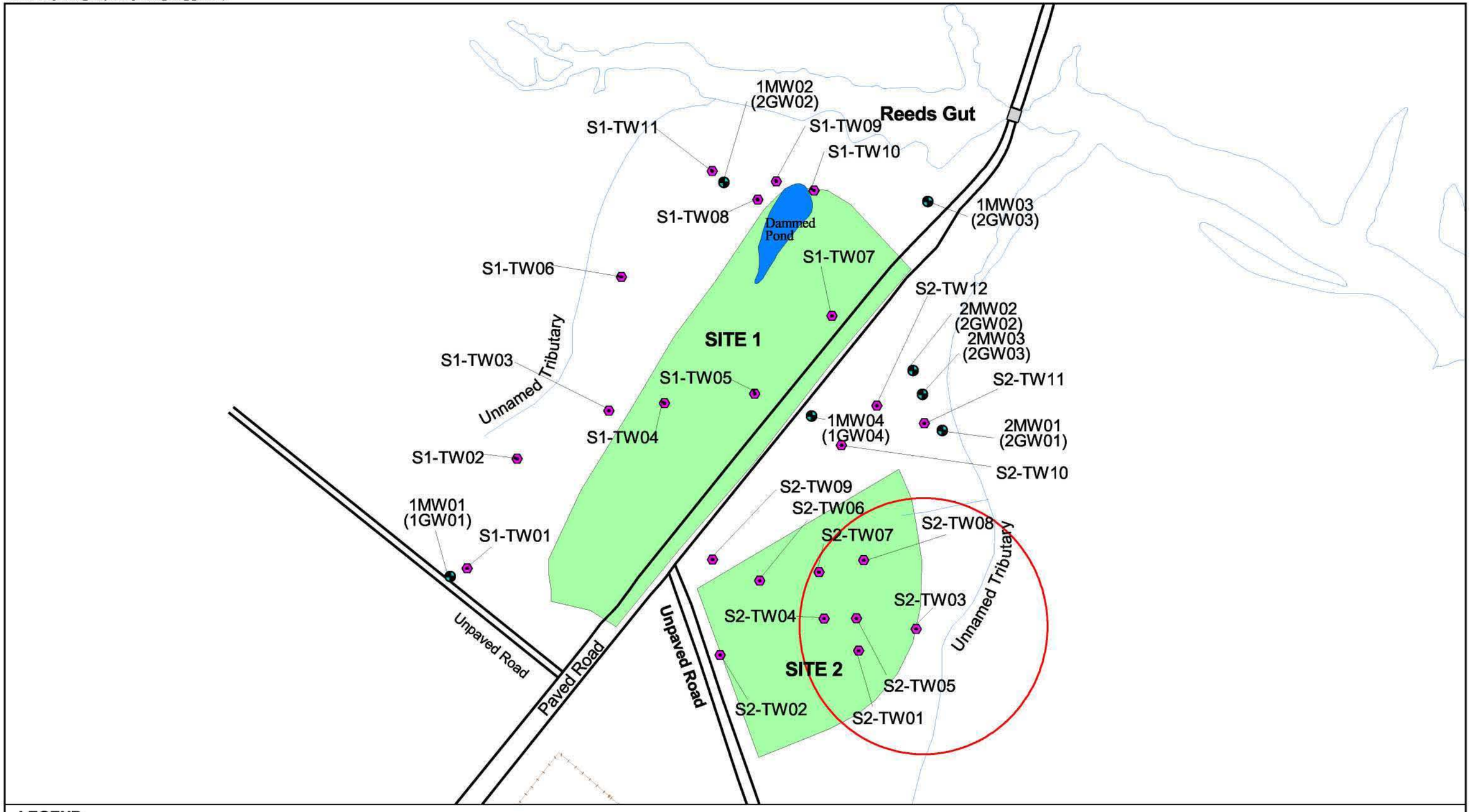

LEGEND

- Monitoring Wells
- Temporary Wells
- Institutional Controls- Restricted Land Use

N

0 100 200 Feet

Figure 2-3
Operable Unit 5
Land Use Control Boundary
Marine Corps Air Station
Cherry Point, North Carolina

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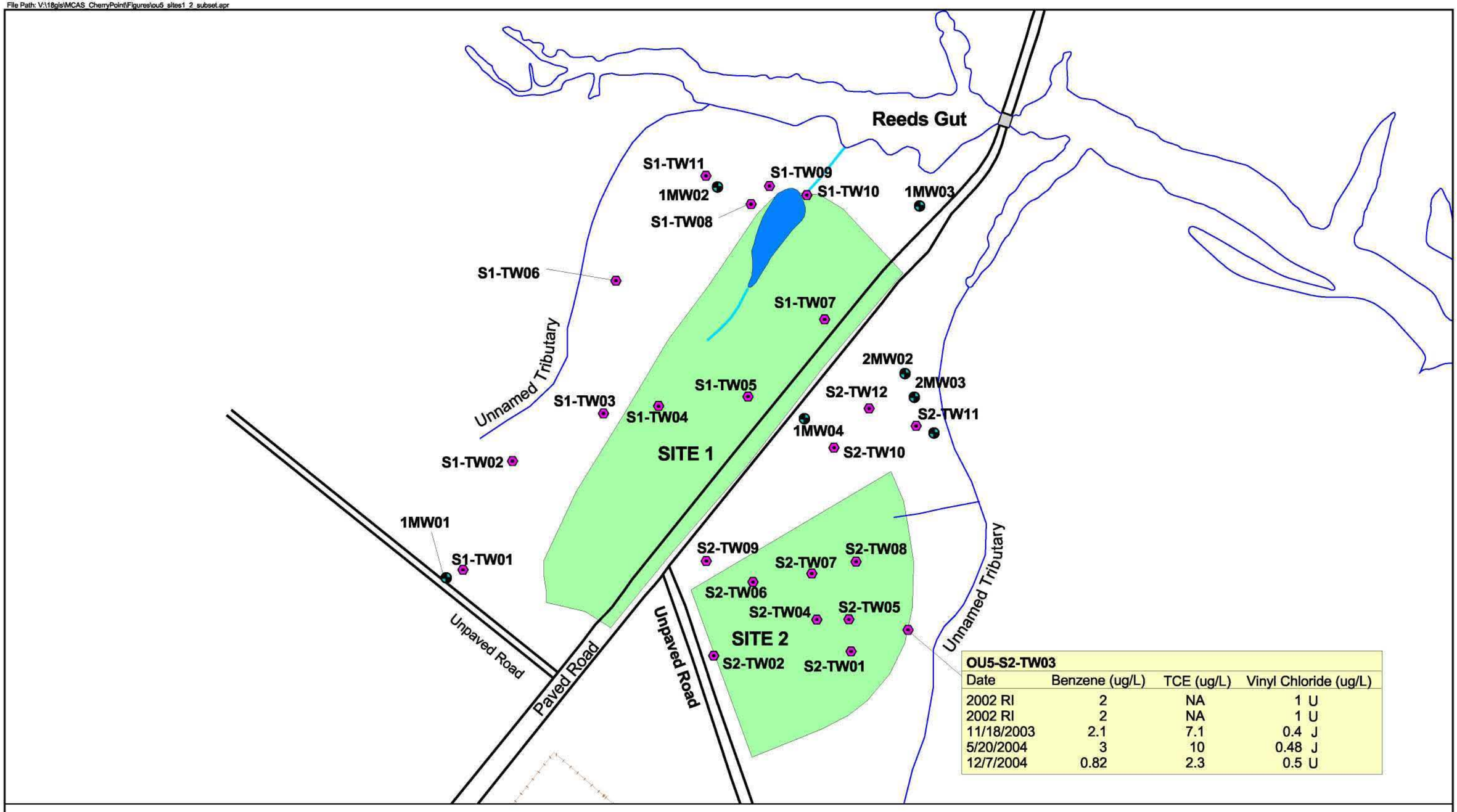

OU5-S2-TW03			
Date	Benzene (ug/L)	TCE (ug/L)	Vinyl Chloride (ug/L)
2002 RI	2	NA	1 U
2002 RI	2	NA	1 U
11/18/2003	2.1	7.1	0.4 J
5/20/2004	3	10	0.48 J
12/7/2004	0.82	2.3	0.5 U

LEGEND
- Permanent Well Locations
- Temporary Well Locations
- Pond
- Intermittent Stream
- Shoreline
- Roads

NC2L Groundwater Standards:
Benzene = 1ug/L
Trichloroethene = 2.8 ug/L
Vinyl Chloride = 0.015 ug/L

Notes:
ug/L - micrograms per liter
TCE = Trichloroethene
U = Not detected
J = Estimated concentration
NA = Not analyzed

N

0 200 400 Feet

Figure 2-4
VOC Exceedances in Groundwater at OU5
Marine Corps Air Station
Cherry Point, North Carolina

CH2MHILL

SECTION 3
Statutory Determinations

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

3.1 Protection of Human Health and the Environment

The Selected Remedy, ICs and MNA, will protect human health and the environment. ICs will prohibit use of groundwater from the surficial aquifer beneath Site 2. MNA provides groundwater quality tracking and the ICs guard against risk posed by potential groundwater use.

Under the Selected Remedy, contaminants in the aquifer will remain onsite. However, these contaminants pose little risk to human health or the environment. During the natural attenuation process it is not expected that contaminants would migrate and cause a potential risk to other areas. Based on this information, additional physical groundwater treatment is not necessary to provide a justifiable solution for the underlying aquifers. The Selected Remedy ensures the protection of human health and the environment through natural attenuation, monitoring, and aquifer use restrictions. Thus, the Selected Remedy will mitigate the potential for direct exposure, and provide overall protection of human health and the environment.

3.2 Compliance with Applicable or Relevant and Appropriate Requirements and To-Be-Considered Criteria

Federal and state ARARs for OU5 are summarized in Appendix B. The Selected Remedy meets the location-specific and action-specific ARARs. The Selected Remedy does not meet chemical-specific ARARs in the short-term, but is expected to meet them over time through natural attenuation. Evidence of the natural attenuation process has been found in the detection of breakdown products of parent compounds, and will be documented in 5-year reviews. If the RAOs or ARARs are not met, additional remedial actions could be implemented in the future.

3.3 Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria. Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to represent a reasonable value for the money to be spent.

The estimated present-worth cost of the Selected Remedy is $279,100. MNA and ICs provide a cost-effective remedy for groundwater at OU5. Costs associated with the monitoring program are reasonable, and it is expected that the VOCs will naturally attenuate within 10 years (a 10-year costing period has been used). Only minimal costs associated with administrative efforts and implementation are anticipated for the ICs. Based on the nature and extent of contamination at OU5, the only treatment alternative developed that is more protective would not provide significantly more protection of human health and the environment; whereas the present worth costs estimated for that alternative are significantly higher than the selected alternative.

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

The Navy, MCAS Cherry Point, USEPA, and NCDENR determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practical manner at OU5. Of those alternatives that are protective of human health and the environment and comply with ARARs, it was determined that the Selected Remedy provides the best balance in terms of the balancing criteria, while also considering the statutory preference for treatment as a principle element and bias against off-site treatment and disposal, and considering state and community acceptance. With the infrequent occurrence and relatively low concentrations of COCs at Site 2, as well as the lack of a defined contaminant plume, the technical impracticability and cost does not justify the selection of an active remedial option.

3.5 Preference for Treatment as a Principal Element

Although the Selected Remedy does not provide for treatment as a principle element, reduction of groundwater contamination concentrations are expected over time due to degradation, dispersion, advection, and adsorption processes. The Selected Remedy represents the maximum extent to which permanent solutions and treatment are practicable at OU5 because of the following reasons.

- A small localized area of groundwater contamination has been identified.

- Treatment of the groundwater is not practicable in a cost-effective manner because of the small area of contamination and low concentrations of VOCs. There are no principal threat wastes present at OU5.

3.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, the Navy will conduct a statutory remedy review within 5 years after initiating remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Once RAOs for this groundwater action have been achieved, OU5 will be suitable for unlimited use and unrestricted exposure, and 5-year reviews may be discontinued.

3.7 Documentation of Significant Changes

Chloroform, a VOC, had been identified as a regulatory COC in the RI. However, as of April 1, 2005, the NC 2L standard for chloroform was raised from 0.19 µg/L to 70 µg/L. Since chloroform has not been detected at OU5 above the revised standard, it has been removed from the list of final COCs and does not require remedial action.

The VGM performed at OU5 since the 2002 RI has indicated that concentrations of benzene at well OU5-2MW01 have been below the NC 2L standard for four consecutive monitoring rounds. No additional constituents have been detected above NC 2L standards in this well, therefore OU5-2MW01 has been removed from the list of impacted wells. Two additional COCs, TCE and vinyl chloride were detected at OU5-S2-TW03 and have been added to the list of regulatory COCs for OU5.

The Public Meeting for OU5 was held on November 3, 2005. The Selected Remedy was the Preferred Alternative in the PRAP. No changes have been made to the Preferred Alternative identified in the PRAP, although the final COC list was revised as described above.

SECTION 4
Responsiveness Summary

In accordance with Sections 113 and 117 of CERCLA, the Navy and MCAS Cherry Point provided a public comment period from November 1 to December 15, 2005, for the proposed remedial action described in the FFS and PRAP for OU5. A public meeting to present the PRAP was held at the Havelock High School, located in Havelock, North Carolina, on November 3, 2005. Public notice of the meeting and availability of documents was placed in the Sun Journal Newspaper on Thursday, October 27th, the Carteret County News-Times on October 30th, the Havelock News on November 2nd, and the Windsock on November 3rd. The participants in the public meeting, held on November 3, 2005, included RAB members and representatives of the Navy, USEPA, and NCDENR. Most questions and concerns received during the meeting were addressed at the meeting and are documented in the meeting transcript, included as Appendix C. Additional clarification of a concern raised at the meeting is provided below. No additional written comments, concerns, or questions were received by the Navy, USEPA, or NCDENR during the public comment period.

During the public meeting, Ms. Patricia McClellan-Green asked for justification that the contaminants had not migrated out of the boundary of Site 2 as indicated on the referenced figure (Figure 2-4 of this ROD), because this well appears to be located at the very edge of the area considered Site 2.

Response:
Well S2-TW03 was installed as close as possible to the surface water body (unnamed tributary to Reeds Gut) and associated wetlands or flood plain area. Figure 2-4 appears to indicate that there is an area of land between the well at the edge of Site 2 and the unnamed tributary, as well as to the north and south along the tributary. The line on Figure 2-4 indicating the location of the unnamed tributary indicates the centerline of the water body. The area between the line and the edge of the Site 2 is part of the water body or associated wetlands and flood plain. Therefore, no wells could be installed in this area as it is considered part of the tributary. Sediment and surface water samples collected in this area did not contain any of the contaminants of concern above risk screening values. Any type of source area would be expected in the shaded area on the figure, as this area was historically disturbed, whereas the wetland area is undisturbed.

Concentrations of the three VOCs in well S2-TW03 have been low and in some cases estimated (J-flagged) because they are below the laboratory reporting limit. Recent monitoring results indicated that all three constituent concentrations are below NC 2L standards. Sampling results and NC 2L standards are indicated on Figure 2-4. These low concentrations indicate that the detections are not indicative of any type of nearby source area or wider area of contamination. Well S2-TW03 is a shallow groundwater well, screened from 2 feet bgs to 12 feet bgs, which would allow collection of surficial groundwater at approximately the same depth as would be feeding into the unnamed tributary.

SECTION 5
References

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CH2M HILL, 2005b. *Final Focused Feasibility Study for Operable Unit 5, Sites 1 and 2, Marine Corps Air Station Cherry Point, North Carolina*. Contract N62470-95-D-6007, Contract Task Order 0207. October.

CH2M HILL, 2005c. *Proposed Remedial Action Plan, Operable Unit 5, Marine Corps Air Station Cherry Point, North Carolina*. Contract N62470-95-D-6007, Contract Task Order 0207. November.

CH2M HILL, 2005d. *Site Management Plan, Fiscal Year 2006, Marine Corps Air Station Cherry Point, North Carolina. Contract Task Order 0099.* July.

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MCAS FFA, 2005. EPA Administrative Docket No. CERCLA 04-2005-3766. *MCAS Cherry Point Federal Facility Agreement*. May 12, 2005.

Water and Air Research, Inc. 1983. *Initial Assessment Study of Marine Corps Air Station Cherry Point, North Carolina*. March.

Appendix A
Cost Table

Alternative: **Alternative 4**
Name: **MNA with ICs**

COST ESTIMATE SUMMARY

Site: MCAS Cherry Point OU5
Location: Groundwater Media
Phase: Focused Feasibility Study
Base Year: 2005
Date: 10/17/2005

Description:
Institutional controls restricting groundwater during MNA.
Groundwater monitoring conducted every 6 months, and reported annually
5-year reviews conducted as required.

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
Groundwater Use Restrictions					Includes GIS land use control layer update
Implementation	1	LS	$18,000	$18,000	
Work Planning					
Health and Safety Plan	1	LS	$2,500	$2,500	
Monitoring Plan	1	LS	$10,000	$10,000	
Monitoring Well Installation					
Utility Clearance	1	LS	$1,000	$1,000	
Mobilization/Demobilization	1	LS	$500	$500	
Drilling, Installation, and Development of 25' well	1	LS	$3,000	$3,000	
Payment and Performance Bond	1	LS	$660	$660	
Survey	1	LS	$1,000	$1,000	
IDW Disposal	1	LS	$600	$600	
SUBTOTAL				$37,260	
Contingency	20%			$7,452	
Project Management	15%			$5,589	
TOTAL CAPITAL COST				**$50,301**	

OPERATIONS AND MAINTENANCE COST

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
GW Sampling - 2 events					
GW Samples (incl. QC)	8	EA	$150	$1,200	Method SW 8260B
Labor	50	HRS	$85	$4,250	2 people
Equipment - pumps and meters	2	LS	$300	$600	
Consumables	2	LS	$275	$550	
IDW Characterization and Disposal	2	LS	$1,200	$2,400	
Data Validation & Reporting	1	LS	$10,000	$10,000	
SUBTOTAL				$19,000	
Contingency	20%			$3,800	
Project Management	15%			$2,850	
TOTAL ANNUAL O&M COST				**$25,650**	

PERIODIC COSTS

DESCRIPTION	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
5 year Review	5	1	LS	$10,000	$10,000	
5 year Review	10	1	LS	$10,000	$10,000	
				Total	$20,000	

PRESENT VALUE ANALYSIS

Discount Rate = 3.5%

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (3.5%)	PRESENT VALUE	NOTES
CAPITAL COST	0	$50,301	$50,301	1.000	$50,301	
ANNUAL O&M COST	1 to 10	$256,500	$25,650	8.317	$213,321	10 year O&M period
PERIODIC COST	5	$10,000	$10,000	0.84	$8,420	
PERIODIC COST	10	$10,000	$10,000	0.71	$7,089	
		$326,801			$279,131	
TOTAL PRESENT VALUE OF ALTERNATIVE					**$279,100**	

Disclaimer:
The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost estimates are likely to occur as a result of new information and data collected during the engineering design or implementation of the remedial alternatives. This is an order-of-magnitude cost estimate that is expected to be within -30 to +50 percent of the actual project costs.

Appendix B
ARARs Table

TABLE B-1
Action-Specific ARARs for Groundwater at OU5
Marine Corps Air Station Cherry Point, North Carolina

Standard	Action	General Citation
RCRA	Excavation, Groundwater Diversion	40 Code of Federal Regulations (CFR) 264, 268
	Treatment	40 CFR 264, 265, 268; 42 United States Code (USC) 6924;
		51 Federal Regulation (FR) 40641;
		52 FR 25760
Clean Water Act	Discharge to Water of United States	40 CFR 122, 125, 136
	Direct Discharge to Ocean	40 CFR 125
	Discharge to Publicly-Owned Treatment Works (POTW)	40 CFR 403, 270
NC Groundwater Corrective Action	Regulations for cleanup of contaminated groundwater	15A NCAC 2L .0106
NC Well Construction Standards	Construction and abandonment requirements for water wells	15A NCAC 2C .0100
NC Hazardous Waste Management Rules	Design and treatment requirements for hazardous waste	15A NCAC 13A
NC Solid Waste Management Rules	Design and monitoring requirements for solid waste disposal sites	15A NCAC 13B
NC Air Pollution Control Requirements	Regulates air quality and establishes emissions standards	15A NCAC 2D, 2H .0600, 2Q

TABLE B-2
Location-Specific ARARs for Groundwater at OU5
Marine Corps Air Station Cherry Point, North Carolina

Potential Location-Specific ARAR	General Citation	ARAR Evaluation
Fish and Wildlife Coordination Act – requires action to protect fish and wildlife from actions modifying streams or areas affecting streams.	16 USC 661-666	Creeks are located near and within the operable unit boundaries. If remedial actions are implemented that modify any creeks, this will be an ARAR.
Federal Endangered Species Act – requires action to avoid jeopardizing the continued existence of listed endangered species or modification of their habitat.	16 USC 1531, 50 CFR 200, and 50 CFR 402	The American Alligator and the Bald Eagle are threatened species sighted on MCAS Cherry Point. Therefore, this act will be considered an ARAR.
North Carolina Endangered Species Act – per the North Carolina Wildlife Resources Commission. Similar to the Federal Endangered Species Act, but also includes state special concern species, state significantly rare species, and the state watch list.	NCGS 113-331 to 113-337	Because the American Alligator has been sighted within MCAS Cherry Point, this will be considered an ARAR.
NC Hazardous Waste Management Rules	15A NCAC 13A	Location requirements and land disposal restrictions for hazardous waste excavated, stored, and/or treated onsite.
NC Recordation of Inactive Hazardous Substance or Waste Disposal Sites	NCGS 130A-310.8	State requirement for recordation of inactive hazardous waste sites.
NC Coastal Management	15A NCAC 7H	Guidelines for areas of environmental concern.

Appendix C
PRAP Public Meeting Transcript: November 3,2005

PROPOSED REMEDIAL ACTION PLAN
OPERABLE UNIT 5
PUBLIC MEETING

HAVELOCK HIGH SCHOOL
101 WEBB BOULEVARD
HAVELOCK, NORTH CAROLINA 28532
NOVEMBER 3, 2005

CAROLINA COURT REPORTERS, INC.
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Greenville, North Carolina 27858
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MEETING BEGAN AT 6:07 P.M.

MR. JEFF CHRISTOPHER: Thank you all for coming. We're going to have the public meeting for the Proposed Remedial Action at Operable Unit 5. My name is Jeff Christopher. I have here Bill Friedmann from CH2M HILL, who will be doing the presentation; Doug Bitterman, who's also from CH2M HILL; and George Lane, with the State of North Carolina; Gena Townsend with the USEPA; Rodger Jackson with the Navy; George Radford, Environmental Affairs Department; and Mike Barton with the Public Affairs Office out of Cherry Point. Bill?

MR. WILLIAM J. FRIEDMANN, JR.: Thank you all for coming. We just went through the introductions. The purpose of this meeting for Operable Unit 5 for the Proposed Remedial Action Plan, or PRAP, is to provide background information leading to the remedial alternatives for cleanup evaluated in the Feasibility Study, which we call an FS. And I'll try to make sure that I just don't acronym everyone all the time, so if there's a question, please, raise your hand. I'm also going to present the rationale for the preferred alternative, and then, as this is a public meeting, solicit any questions you may have during this 45-day public comment period, which will end on December 15, 2005. The format for this meeting is, again, feel free to ask questions at any time during the

presentation. We'll take them at any time. When you ask your question, before so, if you could state your name so that the recorder can get it down, that would be very helpful. In order to make the proposed remedial action plan, we have some documents that led us up to this document, and we're calling them reference documents. Two of the critical documents are known as the Final Remedial Investigation Report, or RI report, which was finalized in August of 2005, as well as the Final Feasibility Study, or FS, which was finalized in November of this year. These documents as well as other documents that relate to Operable Unit 5 are located in the Havelock Public Library. I want to go over very briefly the CERCLA process; CERCLA, which stands for Comprehensive Environmental Response Compensation and Liability Act, which is also known in many terms as Superfund. There are several processes or steps that you go through in the CERCLA process, and they all start off with the Preliminary Assessment, or PA. They move on to a Site Investigation, followed by a Remedial Investigation, or RI; a Feasibility Study; what we have now, the Proposed Remedial Action Plan, or PRAP. The next step after the PRAP is called a Record of Decision, or a ROD. And then a remedial design or a remedial action, followed by a site close-out. The content of the PRAP contains the following portions, or sections, in it. There is a site background and summary of

previous investigations. There is a site characteristic and discussion of the nature and extent of the contamination. There is also a part in the PRAP called the summary of site risks; also, the remedial action objectives; a summary and evaluation of the remedial alternatives; a preferred alternative rationale; an outline for this public participation; and then, at the end, a glossary which defines many of the terms that you'll find in the PRAP. Right now I'd like to go over a background of Operable Unit 5. OU5, which is located up in the northeastern part -- portion -- of the base, which you will also see on these boards over to the side here -- they are broken -- Operable Unit 5 is broken up into two individual sites, Site 1 and Site 2. You'll see geographically the water body that's just to the north of these sites is Reeds Gut, which will flow into Hancock Creek and then northward to the Neuse River. Some detailed information on Operable Unit 5. Operable Unit 5 is approximately 8 acres in size; both Site 1 and Site 2 are approximately 4 acres each. Site 1, which is located on the northern side of the gravel road. Site 2 is located on the south side of the gravel road. The history of Site 1 and Site 2 is that they were former borrow pits, where they were basically removing earthen material to be used at other locations in the base. And then they were filled in with debris. And in this case, mostly construction waste of

unknown quantities and possibly some chemical waste. OU5 was in operation for an unknown period of time starting sometime in the 1950's. And both sites are currently forested areas. This is a topographic map of Operable Unit 5 -- a little bit close up -- Site 1 and Site 2. Again, with Reeds Gut flowing from west to east. You can see the general elevation ranges approximately 20 feet down to 5 or zero feet down to the water's edge. The surface water body, which is Reeds Gut, is the primary surface water body. It is approximately 80 to 120 feet in width. It is a low flow of volume or systems. It's very slow moving. And it receives runoff from the surrounding areas such as Operable Unit 5 as well as the surficial aquifer, or groundwater, which will feed into the surface water body. What I'd like to do now is just go over, review the Remedial Investigation results for Operable Unit 5. During the RI phase, surface soil, subsurface soil, groundwater, surface water, sediment samples were collected and analyzed. The other word we used for these types of things -- surface water, soil, groundwater -- we call commonly "media." So, these media were sampled and analyzed for volatile organic compounds. These were typically cleaners, stuff that will evaporate. Next compound is semi-volatile organics, more likened to greases that you will find in the environment. And then we have pesticides and polychlorinated biphenyls, or PCBs. And then the last

compounds analyzed were what we call inorganics, or metals. The results of the Remedial Investigation showed that in soil -- that's surface and subsurface soils -- there were no compounds that exceeded screening criteria, risk criteria or any background concentrations. For groundwater, there were three volatile organic compounds, or VOCs, that were identified that exceeded the North Carolina groundwater quality standards, and these are known as the NC2Ls. The three compounds, the three VOCs that exceeded the North Carolina 2Ls, included benzene; trichloroethylene, or TCE; and vinyl chloride. In surface water, no compounds exceeded any of the risk screening criteria. And in sediment, no compounds exceeded risk criteria. So, that was the results of the remedial investigation for Operable Unit 5. This map shows the exceedances, the location of the exceedances of volatile organic compounds. They occurred at one well at Site 2 only. It was well S2TW03, and again, the three compounds were benzene, trichloroethylene, and vinyl chloride. The RI investigation also includes what we call human health risk assessment. And in that human health risk assessment, we were basically looking at human receptors. We did a review of the data and we determined that all constituents fell within the U.S. EPA's acceptable risk range for all current and potential receptors. A receptor in a human health risk environment is a worker, a trespasser, a

resident -- so that's what we mean by a receptor. And also, no individual media risks were greater than the U.S. EPA target levels for current or future land use. In addition to the human health risk assessment, there's also an ecological risk assessment conducted. And the results of the ecological risk assessment concluded that there were no significant risks to ecological receptor populations, and when we're talking about ecological receptors, we're talking about on-land things such as what would be worms, squirrels, terrestrial creatures; and, in the water, fish, turtles, as well as also bird species, as well. It also concluded that no further ecological evaluation was needed or required. Following the Remedial Investigation, the next phase we moved into is what we called the Feasibility Study, or FS. And the purpose of the FS is to develop cleanup alternatives and goals that will be protective to both human health and the environment. The FS also compares these alternatives and evaluates the different options. A Feasibility Study has what we call a remedial action objective, or RAO. The RAOs in the Feasibility Study include prevention of human exposure to groundwater from the VOCs in excess of the North Carolina 2L standards. Also, to reduce the concentrations of the VOCs -- the volatile organic compounds -- to meet the North Carolina 2L standards. That's basically our cleanup goal. And then to achieve site closure with a reasonable approach

and within a reasonable time frame. In the Feasibility Study, five remedial action alternatives, or cleanup alternatives, were developed for the OU5 FS. The first alternative considered was no action, where you do nothing. The second alternative was institutional controls, where basically you're keeping people away from the exposure of the groundwater. Monitor natural attenuation is where you're looking to see if the concentrations are naturally degrading over time. Then the fourth alternative is what we call MNA and ICs, which is a combination of the other two, which is monitor natural attenuation and institutional controls, so you're putting those two alternatives together. And then the final remedial action/alternative we considered was groundwater pump and treat and discharge to surface water body. And the following slides will give a little more detail about what each of these alternatives entail. The first alternative, which is called a no-action alternative -- it's retained through the Feasibility Study as a basis of comparison. It's basically our baseline comparative. The no-action leaves the impacted groundwater in place with no restrictions to site activities. We've done nothing, we will do nothing to the site. Natural attenuation, which again is the natural degradation of these compounds over time due to biological activities. They're expected to occur, however, because we're not doing anything, we have no idea what degree

because it's unknown what we've accomplished because we're not taking any samples. If we're not taking any groundwater samples over time, we don't know if the levels are dropping. When we have a no-action, we're also -- there's a potential human health risk posed by the VOCs because these VOCs are still in place. There are also no provisions to ensure that the impacted groundwater will not be consumed in the future, because we have no controls to keep the people away from the groundwater. The no-action alternative has no capital or operation and maintenance expense to it. The next alternative we looked at was called institutional controls, or ICs. The institutional controls basically restrict access to groundwater. That's all they do. People are not allowed to dig, or you're not allowed to install monitoring wells or drinking water wells. Workers are not supposed to encounter the groundwater. There is very little cost with this. Mostly it's administrative costs, as well as routine site inspections involved with the institutional controls. The third alternative is monitored natural attenuation. In this case, the volatile organic compounds are naturally degraded. We will periodically monitor them over time until the cleanup goals have been met. When the concentrations fall below the cleanup goals for four consecutive sampling events, site closure -- the closing of the site -- is initiated. The costs for this are low operation and maintenance costs.

Basically, that's the cost of doing the sampling, which is down below (pointing), but it's also maintaining the monitoring wells in good condition so you can continue the sample. There's also sampling and analysis costs as well as a reporting cost. When you take the samples, you have to send them off to a laboratory, have them analyzed; you need to review the data, and then you need to report that to everyone. The fourth alternative is called monitored natural attenuations, with institutional controls. Again, this is a combination of the second and third alternative. It combines the action of those two. The benefit of these two combined is that you can monitor components that lets you know whether cleanup goals have been met. And then you're also keeping people away from the exposure of the groundwater until you're able to achieve cleanup, and terminate the monitoring as well as the institutional controls. And then you can move into site closure. The last alternative is called pump and treat, and discharge to a surface water body. This is where groundwater is extracted, and above-ground treatment of the groundwater occurs. And that water is then discharged into Reeds Gut. There is periodic monitoring of the treatment system of the discharge going into the surface water as well as the groundwater to see, one, if you're removing the components from the groundwater as well as being protective of the surface water being discharged into Reeds Gut. Like

other of the alternatives, when the concentrations fall below the cleanup goals for four consecutive sampling events, then site closure is begun. The thing about pump and treat discharge is that the cost is very high. You have to basically put in a system which removes the groundwater, treats the groundwater, then discharges it into the surface water body. So, it's a very high capital cost, as well as operation and maintenance, because you have pumps going, and you need to make sure that they're constantly moving, that you don't have any breakdowns. So, those are the five alternatives that we evaluated during this feasibility study. The results of our comparison is that no action -- the no-action alternative -- does not meet any of the criteria. The contamination is still in place. We don't know if the concentrations are reducing over time. And we have no mechanism to keep people away from the groundwater. The institutional controls keeps people away from exposure, but it does not provide evidence that cleanup has occurred. We don't know if concentrations are degrading over time. Monitoring natural attenuation, the next alternative, does not restrict exposure, so we are monitoring to see if groundwater concentrations of the volatile organic compounds are reducing over time, but it does not keep people from coming into contact with the groundwater. The fifth alternative which we talked about, pump and treat, is not

efficient for such low concentrations that we encountered at Operable Unit 5. The Preferred Alternative for Operable Unit 5 is the fourth alternative we spoke of, which is monitored natural attenuation with institutional controls. And the reason why this was selected as the Preferred Alternative is that it is protective because the exposure is restricted through institutional controls; it achieves cleanup goals, because we can measure those drops in groundwater levels and the concentrations. And it also provides the ability to reevaluate the site conditions and make necessary changes. In other words, if there does happen to be a case where some groundwater concentrations move up or go up, we're able to go back, revisit, and see if this is still the appropriate alternative. So, it gives us flexibility in maybe making changes in the future. Some closing comments. The reference documents, as mentioned earlier, used in the preparation for this PRAP are located in the Havelock Public Library. The PRAP, which we have available for everyone to take home -- there is a section where you can write your comments in there, as well as basically fold it in half, put a stamp on it, and send it in, so you can provide your comments in writing. We're more than happy to take any questions or comments at this time.

MS. PATRICIA McCLELLAN-GREEN: I had one.

MR. FRIEDMANN: Yes?

MR. CHRISTOPHER: Your name.

MS. McCLELLAN-GREEN: Oh, excuse me. Pat McClellan-Green. You found the contaminants only in one well in Site 2 of OU5, right? Well, that well was right on the edge of Site 2. Are you sure that's the only place, and it hasn't migrated out of your boundaries, considering we seem to have that problem elsewhere on the base?

MR. FRIEDMANN: I'm sorry. I'm not sure I follow.

MS. McCLELLAN-GREEN: Go back in your slides to where you're showing the wells. Right there. You said it was only at S2-TW03?

MR. FRIEDMANN: Yes.

MS. McCLELLAN-GREEN: Okay. Since that's on the edge of Site 2, how do you know it's not elsewhere to the right of that?

MR. FRIEDMANN: In other words, past this unnamed tributary?

MS. McCLELLAN-GREEN: Not past the tributary, but right up to the tributary, because your site is not right on it.

MR. FRIEDMANN: Well, basically, I believe this well was installed adjacent to the surface water body. As close as you can get without being actually in the wetland area or the flood plain of that. So, it's put as close as we could to that tributary. And this being something of a schematic

diagram versus an actual area photograph, we believe that this well would be as close to the surface water body as possible.

MS. McCLELLAN-GREEN: Okay, but how do you know it's not in the groundwater elsewhere besides just that one spot?

MR. FRIEDMANN: In this area?

MS. McCLELLAN-GREEN: Yes. Well, no, either there or towards the unnamed tributary.

MR. FRIEDMANN: Again, you're asking about basically the space between this well and this tributary.

MS. McCLELLAN-GREEN: Yeah. Or even slightly north of the well.

MR. FRIEDMANN: Up this way? In this direction?

MS. McCLELLAN-GREEN: Yeah.

MR. FRIEDMANN: Well --

MS. McCLELLAN-GREEN: I mean, granted, it's a very small amount, but how do you know?

MR. FRIEDMANN: Well, we don't know exactly unless you put more wells right up to the water body. But there's a limit to where you put your groundwater monitoring wells to the surface water body. I understand what you're asking. I mean, do we know what's happening between the unnamed tributary and that well? No, we don't.

MR. GEORGE RADFORD: Basically, though -- George Radford -- basically, the surficial groundwater flow is going

to be toward the surface water body anyway. It's going to migrate that way, and it's marshy up there, best I remember. And I think what's representative of that one well is not going to vary very much between there and the surface water body.

MR. RODGER JACKSON: Rodger Jackson, from the Navy. We also got sediment in surface water data at Site 2, and it looks like it is -- it's in that unnamed tributary. And we did not -- that fell out of the human health and eco risks.

MS. McCLELLAN-GREEN: Okay. So, there's nothing coming up out of the groundwater that's going in, but it's in the groundwater there. I'm just trying to get a picture of this in my mind. That's why I'm asking.

MR. JACKSON: Right. It's in the groundwater there, and the sediment -- I mean, that -- the unnamed tributary just to the east of there, we've got sediment; we've got two surface water -- well, three surface water and three sediment locations to the right of that. A couple of them just to the north of that from what this looks like, and maybe one to the south of that.

MS. McCLELLAN-GREEN: Okay.

MR. JACKSON: And we did not pick up any of those contaminants that we found there -- those volatiles.

MS. McCLELLAN-GREEN: Well, what depth is that well? How deep did you sample?

MR. JACKSON: I would think it's at the same level as the unnamed tributary, because the groundwater's feeding -- correct me if I'm wrong -- groundwater's feeding that unnamed tributary.

MS. McCLELLAN-GREEN: Okay.

MR. JACKSON: So, that well is screened roughly at the same level. And we can confirm that. But roughly at the same level as the unnamed tributary. We didn't find the benzene, the trichloroethylene and the vinyl chloride in the sediment in surface water, so it gives you a lot more confidence that there is no migration --

MS. McCLELLAN-GREEN: Uh-huh. Out of the well.

MR. JACKSON: -- into the tributary, since we didn't find it in there.

MR. DOUG BITTERMAN: Doug Bitterman. A final point also is that the concentrations in that well are very, very low. Barely above detection limits. So, it's not exactly evidence of a major area of contamination. They were very, very low with estimated flags because they were below even the quantitation limit. So, you know, there's that point; there is the fact that there is no area of land east of that well because the -- it is a wetland area there. That line shows sort of the center line of the flow area, but there was not any space in between there and the stream.

MS. McCLELLAN-GREEN: Okay. You said it's below the

quantitation limit?

MR. BITTERMAN: What they call the reporting limit, which is the -- it's not the true detection limit of the lab, but it's the level at which they felt comfortable stating unequivocally what the concentration is.

MS. McCLELLAN-GREEN: Okay. So, if it's below their reporting limit, then how can you justifiably say it's above the North Carolina 2L standards? Are those normally below their quantitation recording limits?

MR. BITTERMAN: Many of them are.

MS. McCLELLAN-GREEN: See, I don't know what the limits are on these.

MR. BITTERMAN: I know that the limit for benzene is 1, and the detection was 2. TCE -- I believe 7 is the standard. I don't know off the top of my head what the concentration was, but it was very close to that. And the limit for vinyl chloride is something like .17. It's very low. It's a fraction. It's less than 1. I believe it's .17 if I'm not mistaken. But it's in that range. And I believe the detection was 1 or 2 parts per million.

MS. McCLELLAN-GREEN: Okay, so basically you're saying you'll never be able to close that site because your reporting limits are already above the North Carolina standards? So, every time you send it in to be analyzed, it's going to be above the North Carolina standards.

MR. BITTERMAN: Well, but a lab will report a result below the reporting limit, but they will flag it with a J, which means that it's estimated, that the best they can do is estimate it below that reporting limit. So, you're in that area --

MS. McCLELLAN-GREEN: That gray area.

MR. BITTERMAN: -- where it's very tough just because of technology -- the limits of technology to --

MR. GEORGE LANE: Yeah. George Lane with the State. The labs also will give you a non-detect if they don't see it.

MS. McCLELLAN-GREEN: Okay.

MR. LANE: So, that's one way we can say --

MS. McCLELLAN-GREEN: When it goes from a detect to a non-detect, then it's clean?

MR. LANE: Yes, basically. And it's important to note that the area of Site 2 is the part that's been disturbed. To the east of that it doesn't appear to be disturbed. So, we don't believe -- if there is a source, it's inside that green area, and it's moving towards the water. And it has to be fairly small, since it's such a low level of contamination.

MS. McCLELLAN-GREEN: Well, I thought they said it wasn't moving towards the water because it wasn't in the surface water and it's not in the sediment.

MR. BITTERMAN: Any movement into the stream -- it's either diluted -- there's not enough of it to be measurable in the stream --

MS. McCLELLAN-GREEN: Oh, okay. I see.

MR. BITTERMAN: -- because I made the point that the concentrations were so low that it doesn't show up in the stream, which is not unexpected. Just because of natural entropy, you would not expect to see it at those concentrations.

MR. ROBERT MEADOWS: My name is Robert Meadows. I have two questions. There was a reference to background concentrations. What does that mean? What is that?

MR. FRIEDMANN: That at some point during sampling at other areas that are known to be undisturbed at Cherry Point, that we take groundwater samples. Those would be basically considered a background concentration that we would use to compare at other sites that we believed to have contamination. It kind of gives us a baseline to determine if there is contamination going on.

MR. MEADOWS: My other question is that are there shellfish populations in that stream, or out in Reeds Gut, and if there are, have there been significant changes in those populations over the past 10 years?

MR. FRIEDMANN: I'm not sure about the shellfish population in the unnamed tributary or Reeds Gut.

MR. BITTERMAN: Doug Bitterman. There most certainly are populations, but the way the process works is you do this ecological risk assessment, which has very conservative thresholds, and if the result of that assessment doesn't indicate that conservatively there's a likelihood that these populations would be impacted, then you don't go to that step of actually sampling the -- you need to show that there's kind of a chance it would be impacted. Then you would go and evaluate it.

MR. MEADOWS: So, that would not be a restricted area so far as the North Carolina Fisheries Division?

MR. BITTERMAN: Not because of this site activity. There may be some other reason.

MS. McCLELLAN-GREEN: I know there is Rangia clams there in the Hancock right near where these two -- where the unnamed tributary and Reeds Gut come into Hancock, there's a whole little community of Rangia clams. There's not any oysters that I noticed, except some small ones on the pilings, because we have sampled that there as a class.

MR. BITTERMAN: There's a description in the Remedial Investigation document of what the ecological system consisted of. It mentions some of the species that were observed during reconnaissance. But there was no actual sampling of those. You would need to show that -- the risk assessment would need to show some cause for concern that

they would be impacted. Then you go to that step, and there was not any projected impact from the risk assessment, which is a conservative process using the most conservative variables.

MS. McCLELLAN-GREEN: But you-all didn't do an invertebrate assay. You only did vertebrate animals.

MR. BITTERMAN: There was not an assay performed.

MS. McCLELLAN-GREEN: In your ecological risk assessment, you didn't do invertebrates.

MR. RODGER JACKSON: This is Rodger Jackson from the Navy. We used -- the first step when we do this we use a model. We use a model.

MS. McCLELLAN-GREEN: Oh, that's right. You did the mysid model. That's right. I'm sorry.

MR. JACKSON: And if it passes the model -- at the end of the model, you either exit with this is a problem, or it's not a problem. If it's a problem, then you can go to the next step. And that next step would be to refine your model. And you put in more realistic data in there. If it fails that, then you start getting into your -- your latter steps is where you start doing toxicity tests, and then you take representative species that are in the area. In this case, the first part of the model, it passed. There was no problem at the end of that -- at that step of the model, so that's when we exit the process and say there's no ecological

risk. Because that model's very conservative, so we go from a very, very conservative start, to a more realistic model, then to actually doing toxicity tests. So, that's why we can say with confidence that there's no ecological risk, because of all the conservative inputs into the model.

MS. McCLELLAN-GREEN: Okay. That's right. I'd forgotten. You-all said you did a mysid test.

MR. RAY SILVERTHORNE: My name is Ray Silverthorne. I was just going to say earlier when we were talking about the well location, to display it -- if you were to overlay it with an ortho photograph, it might be an easier way for folks to see it.

MR. FRIEDMANN: For people to see it, right.

MS. McCLELLAN-GREEN: Pat McClellan-Green again. Are you-all going to close Site 1 and just divorce it from Site 2 as far as OU5, or are you going to keep the whole area closed off?

MR. JACKSON: Actually we were just talking about that. This is Rodger Jackson. Site 1 is actually -- there's going to be no further action because there were no contaminants. We were just talking about that. We didn't even have that on the slides. That will be a no-further-action site in the ROD.

MS. McCLELLAN-GREEN: Okay.

MR. JACKSON: But Site 2 will be groundwater, MNA

with institutional controls on groundwater.

MS. McCLELLAN-GREEN: So, you'll fence off Site 2 but not Site 1?

MR. JACKSON: Correct.

MS. McCLELLAN-GREEN: Okay.

MR. JACKSON: Well, I don't know if there's going to be a fence. It won't be a fence, but --

MS. McCLELLAN-GREEN: Yeah, well, it would be restricted access.

MR. RADFORD: George Radford again at Cherry Point. We'll use our institutional controls, which is our master planning, and when we get ready to build or do construction, there will be a screening that nothing can happen at that site.

MS. McCLELLAN-GREEN: Okay.

MR. FRIEDMANN: Anything else? Okay.

MR. MEADOWS: I have one question. Robert Meadows. During heavy rains or bad storms, is this area flooded?

MR. FRIEDMANN: There are some of the areas that were on the banks that would flood, but the general elevation -- probably, the upper portions are much higher, so these entire sites will not flood, but more of the areas adjacent right to the unnamed tributary, or down near Reeds Gut.

MR. BITTERMAN: That pond also might get larger as it receives some rainwater. There's a dam at the upper end of

it. That little pond there -- the topography doesn't allow the water to drain out until it reaches a certain level. If it rained really hard that pond would probably increase in size to the southwest.

MS. McCLELLAN-GREEN: Was that a constructed dam or a beaver dam?

MR. BITTERMAN: I believe it was man-made -- it was related to the grading of the borrow pit -- as people took borrow material, they ended up creating a low spot there.

MS. McCLELLAN-GREEN: Oh, okay.

MR. MEADOWS: Would the flooding impact these contaminants?

MR. FRIEDMANN: No, not directly. With the flooding it's more of a surface water phenomenon versus the groundwater. There are some concerns that periodic flooding might transport contaminants, dilute it or increase it, but the storm events usually tend to be very quick and rapid type of events. And groundwater response is generally very slow, so we would expect not to really see any impact to periodic flooding.

MS. McCLELLAN-GREEN: Do you ever get saltwater intrusion following the hurricanes?

MR. FRIEDMANN: Into the groundwater?

MS. McCLELLAN-GREEN: Yeah. `Cause you'll get saltwater backing up into these creeks.

MR. FRIEDMANN: Yeah, I'm not sure of the salinity of Reeds and the unnamed tributary. I imagine there is some type of salinity that changes with the tide as well as different storm events. When we have a large surface water run-off, which could happen during a hurricane, it'll introduce more freshwater, which will drop your salinity, but there are other events where you're pushing water into the Neuse River that will flood this and increase your salinity potentially.

MS. McCLELLAN-GREEN: Okay.

MR. CHRISTOPHER: Thank you, Bill.

MR. FRIEDMANN: Thank you.

MR. CHRISTOPHER: I'd like to kind of restate that, should you have any more questions you think of later, you still have up to November -- excuse me, December 15th to write your questions and you can submit them to Rodger Jackson on your pre-printed comment sheet. Other than that, I'd like to thank you all for coming, and that will conclude our meeting. Thank you.

MEETING CONCLUDED AT 6:46 P.M.