City: ONSLOW COUNTY  
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)  
Address: ONSLOW COUNTY, NC  
EPA ID: NC6170022580  
EPA Region: 04

Site Alias Name(s):

- USMC CAMP LEJEUNE MILITARY RESERVATION  
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)  
- USMC/BLDGS TP452 & TP451 (SITE 10)  
- USMC/HADNOT POINT BURN DUMP (SITE 3)  
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)  
- USMC/STORAGE LOTS 201 & 203 (SITE 12)  
- USMC/CAMP GEIGER DUMP (SITE 4)  
- USMC/BASE SAN LDFL (SITE 5)  
- USMC/CHEM LDFL (SITE 1)  
- USMC/BLDG PT 37 (SITE 6)  
- USMC/K-326 RANGE (SITE 8)  
- USMC/G4A RANGE (SITE 9)  
- USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/23/1992  
Operable Unit: 01  
ROD ID: EPA/ROD/R04-92/120

Media: Ground Water

Contaminant: VOCs, Metals
SITE HISTORY/DESCRIPTION: The 500-acre USMC Camp Lejeune Military Reservation is located 15 miles southeast of Jacksonville, in Onslow County, North Carolina. Within the site lies the Hadnot Point Industrial Area (HPIA), which was constructed in the late 1930's. It is composed of 75 buildings and facilities, which include gas stations, offices, storage yards, maintenance shops, and a dry cleaning plant. A transformer storage area, industrial area fly ash dump, and a fuel tank farm also are located near the HPIA. Several areas of the HPIA have been investigated for potential contamination attributed to Marine Corps activities and operations that resulted in a generation of potentially hazardous wastes. This ROD addresses an interim remedial action for the shallow aquifer at the HPIA to protect human health from exposure to VOCs and metals. Subsequent actions are planned to fully address all of the impacted media at the site; specifically, soil and the deeper aquifer. The primary contaminants of concern affecting the shallow ground water aquifer are VOCs, including benzene and TCE; and metals, including arsenic, chromium, and lead.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific ground water clean-up standards are based on SDWA MCLs and state standards and include benzene 1 ug/l; TCE 2.8 ug/l; lead 15 ug/l; arsenic 50 ug/l; and chromium 50 ug/l.

INSTITUTIONAL CONTROLS: Institutional controls will be implemented to restrict the use of ground water and prevent installation of new wells in the area.

SELECTED REMEDIAL ACTION: The selected remedial action for this site includes extracting and pretreating contaminated ground water using an oil/water separator; treating the water onsite using precipitation, chemical reduction, and sedimentation to remove inorganics, and air stripping to remove VOCs; treating emissions using carbon adsorption, based on the results of a treatability study; discharging the treated water offsite to the Hadnot Point Sewage treatment plant for ex-situ biological treatment, prior to final onsite discharge to the New River; transporting the free product to a waste oil recycler or incinerator offsite; conducting long-term ground water monitoring; and implementing institutional controls including ground water use restrictions. The estimated present worth cost for this remedial action is $7,600,000, which includes an estimated annual O&M cost of $351,500 for 30 years.

Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 01
ONSLOW COUNTY, NC
09/23/1992
FINAL

INTERIM REMEDIAL ACTION RECORD OF DECISION FOR THE SHALLOW AQUIFER AT THE HADNOT POINT INDUSTRIAL AREA OPERABLE UNIT MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA CONTRACT TASK ORDER 0017

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

Under the:
LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:
BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

SEPTEMBER 17, 1992
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Site Name and Location

Hadnot Point Industrial Area (Site 78)
Marine Corps Base Camp Lejeune
Onslow County, North Carolina

Statement of Basis and Purpose

This decision document presents the selected interim remedial action (IRA) for the shallow aquifer at the Hadnot Point Industrial Area (HPIA), Marine Corps Base (MCB) Camp Lejeune (CLEJ), Onslow County, North Carolina which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based upon the administrative record for the Site.

The Navy/Marine Corps has obtained concurrence from the State of North Carolina and the United States Environmental Protection Agency (EPA) Region IV on this interim action.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of Selected Remedy

This IRA is the first remedial action to be taken at the HPIA Operable Unit, of which the HPIA (Site 78) is a part. This IRA, which addresses only the shallow aquifer at Site 78, is being proposed to protect human health from exposure to benzene, trichloroethylene (TCE), 1,2-dichloroethene (1,2-DCE), and various metals in the shallow aquifer. This IRA addresses the threat posed by the shallow aquifer but is not the final action planned for the site. Subsequent actions are planned to fully address all of the impacted media at the site (i.e., soils, and deeper aquifers) and to address all of the sites within the HPIA Operable Unit which are not included in the scope of this IRA.

The principal threat at this time involves the potential migration of the contaminant plumes in the shallow aquifer away from the site and into the deeper (drinking water) aquifer. The primary goal of the IRA is to contain the contaminated groundwater in the shallow aquifer thereby preventing the human consumption of contaminated groundwater. Upon completion of the Final Remedial Investigation and Feasibility Study (RI/FS) for the entire HPIA Operable Unit, this interim remedy will be incorporated into the design of the final remedy specified in the Final ROD.

The major components of the selected remedy for this IRA include:

- Collecting the contaminated groundwater in the shallow aquifer at Site 78 through a series of extraction wells installed within the two groundwater plumes.
- Pretreating the extracted groundwater for oil and grease via oil/water separators and then for inorganics via a chemical removal system consisting of but not limited to precipitation units, chemical reduction units, and sedimentation systems.
- Treating the volatile compounds (i.e., TCE and benzene) via on-site air stripper, and if necessary, an activated carbon unit. The need for the activated carbon unit will be determined from the results of a laboratory bench-scale treatability study.
- Sending the treated groundwater to an existing sewage treatment plant.
(STP) located within MCB CLEJ for discharge to the New River.

. Institutional controls: restricting the use of nearby water supply wells (which are screened in the deeper aquifer), and restricting the installation of any new water supply wells in the area.

. Conducting a long-term groundwater monitoring program to monitor the effectiveness of the IRA.

Statutory Determinations

This interim remedial action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements directly associated with this action, and is cost effective. In addition, this interim remedial action utilizes permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable, given the limited scope of the action. Since this interim remedial action does not constitute the final remedy for the HPIA Operable Unit (only for the shallow aquifer at Site 78), the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed at the time of the final response action. Subsequent actions are planned to fully address the principal human health and environmental risks posed by the HPIA Operable Unit.
1.0 SITE LOCATION AND DESCRIPTION

The Hadnot Point Industrial Area (HPIA) Site is located within Marine Corps Base (MCB) Camp Lejeune (CLEJ) in Onslow County, North Carolina. The HPIA Site is approximately 15 miles southeast of Jacksonville, North Carolina and 6 miles south of North Carolina State Road 24 (Figure 1). The approximately 500 acre site is bordered by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Louis Street to the southeast, and Main Service Road to the southwest (Figure 2).

The HPIA Site (Site 78) plus two other sites make up the overall HPIA Operable Unit. The two additional sites include Site 21 (the Transformer Storage Yard), and Site 24 (the Industrial Area Fly Ash Dump). Figure 2 identifies the location of these other two sites. Sites 21 and 24 are not included in the scope of the selected Interim Remedial Action (IRA) but will be part of the Final Remedial Investigation and Feasibility Study (RI/FS) for the entire HPIA Operable Unit. In addition, please note that this document presents the Record of Decision (ROD) for only the shallow aquifer at Site 78. Upon completion of the RI/FS for the entire HPIA Operable Unit, a Final ROD will be prepared to present the selected remedial actions for all contaminated media at the operable unit.

The HPIA, constructed in the late 1930's, was the first industrial complex at MCB CLEJ. It was comprised of approximately 75 buildings and facilities including: maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, storage yards, and a dry cleaning facility. A steam plant and training facility occupy the southwest portion of the HPIA.

In addition to Sites 21, 24 and 78, a fuel tank farm (Site 22) is located within the physical boundaries of the HPIA Operable Unit. The fuel farm is an underground storage tank facility which is not being administered under Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) regulations. Therefore the site is not included as part of the HPIA Operable Unit. At the present time, a fuel recovery/groundwater treatment system is in operation at the tank farm.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Several of the areas within the HPIA have been investigated for potential contamination due to Marine Corps operations and activities resulting in the generation of potentially hazardous wastes. The investigations indicate that contamination has resulted at HPIA due to former improper waste disposal, underground storage tank leakage, solvent spills, and sludge disposal.

Since 1983, various investigation and sampling activities have been conducted at the HPIA. On October 4, 1989, Camp Lejeune was placed on the National Priorities List (NPL). The Department of the Navy (DoN), the EPA, and the North Carolina Department of Environment, Health and Natural Resources (N.C. DEHNR) entered into a Federal Facilities Agreement on February 13, 1991. The studies that have been conducted at the HPIA Site (with respect to the shallow aquifer) are briefly summarized below.

In 1983, an Initial Assessment Study (IAS) was conducted at Camp Lejeune by Water and Air Research, a consulting firm. The study identified a number of areas within Camp Lejeune, including HPIA, as potential sources of contamination.

Between 1984 and 1988, Environmental Science and Engineering, Inc. (ESE) conducted a Confirmation Study, which is analogous to an RI/FS performed for EPA on Federal Superfund sites. The Confirmation Study was divided into two investigative steps: the Verification Step and the Characterization Step.
The Verification Step took place from April 1984 through January 1985. Results of this investigation indicated the presence of volatile organic compounds (VOCs) within the shallow aquifer in the vicinity of HPIA fuel tank farm and in water supply well 602. The maximum contaminant concentrations observed in the groundwater included 17,000 ug/L of benzene and 27,000 ug/L toluene collected from the tank farm area. Benzene was also detected in supply well 602 at concentrations of 38 ug/L, which exceeds the Federal maximum contaminant level (MCL) of 5 ug/L.

Due to the results of the Verification Step, supply well 602 was closed and other wells in the area were sampled. Four additional supply wells (601, 608, 634, and 637) were found to have elevated levels of VOCs, including trichloroethylene (TCE) in wells 601 and 608 and methylene chloride in well 634.

In 1986, the Characterization Step was conducted for HPIA to determine the extent of the VOC contamination identified. During the Characterization Step, multiple tasks were completed, including: a soil gas survey to target areas identified as being potentially contaminated, installation of 27 shallow (25 foot), 3 intermediate (75 foot), and 3 deep (150 foot) monitoring wells, sampling of all HPIA monitoring wells and nearby water supply wells, and aquifer testing to evaluate the hydraulic parameters of the deep aquifer.

Results of the characterization study revealed that five of the areas within HPIA showed elevated levels of VOCs in soil gas: 1) Buildings 901, 902 and 903; 2) Building 1100; 3) Buildings 1101, 1102, 1202, 1301, and 1302; 4) Buildings 1502, 1601; and 5) Buildings 1709 and 1710. Results of the shallow monitoring well analyses revealed the presence of elevated levels of a number of petroleum related compounds, including: benzene, xylene, ethylbenzene, trans-1,2-dichloroethene (trans-1,2-DCE), TCE, oil and grease, and lead. Inorganics, including mercury, were detected in several of the deep aquifer wells, but detected levels were within Federal MCLs or ambient water quality criteria guidelines (AWQCs).

Baker Environmental, Inc. (Baker) prepared an IRA RI and an IRA FS for the HPIA during 1991-1992. These studies focused on the shallow groundwater aquifer beneath the HPIA and were based solely on data generated during previous field investigations. The purpose of the IRA RI was to consolidate currently available information on the shallow aquifer and to develop the basis and supporting documentation for preparation of the IRA FS. The deep aquifer is currently being investigated and will be addressed separately.

The IRA FS prepared by Baker considered various interim remedial actions which may be taken to contain and/or remediate contamination in the shallow aquifer at Site 78 (the HPIA).

Based on the results of the above-mentioned studies and investigations, two contaminated groundwater plumes have been identified in the shallow aquifer at the HPIA Site. The contaminants of concern contained in these plumes include: benzene, 1,2-DCE, TCE, antimony, arsenic, beryllium, chromium, lead, iron, manganese, mercury, nickel and oil & grease. One of the plumes is located in the northeast portion of the site, the other in the southwest portion of the site (Figure 2).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The IRA RI/FS and the IRA Proposed Plan for shallow aquifer at the HPIA Site was released to the public on May 14, 1992. These documents were made available to the public in the administrative record at information repositories maintained at the Onslow County Public Library and at the MCB CLEJ library. Also, all addressees on the HPIA mailing list were sent a copy of the Final Proposed Plan and Fact Sheet. The notice of availability of the Proposed Plan and RI/FS documents was published in the "Jacksonville Daily News" on May 14, 1992, and in the "Globe" (MCB Camp Lejeune newspaper) on May 7, 1992. A public comment period was held from May 14 to June 14, 1992. In addition, a public meeting was held on May 14, 1992. At this meeting, representatives from Navy/Marine Corps discussed the IRA alternatives currently under consideration and addressed community concerns. Response to the comments received during the comment period is included in the Responsiveness Summary, which is part of this IRA ROD.

This decision document presents the selected IRA for the shallow aquifer at the HPIA Site, MCB Camp Lejeune, Onslow County, North Carolina, chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the
National Contingency Plan (NCP). The decision for this Site is based on the administrative record.

4.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The proposed IRA for the HPIA Site is a component of the overall site strategy in that it restricts the migration of the contaminant plumes identified in the shallow aquifer. Implementation of this IRA will reduce the potential for the migration of the contaminated groundwater both horizontally and vertically, which in turn will reduce the risk to human exposure through continued contamination of the aquifer. In addition, this IRA will reduce any potential threat to environmental receptors. This IRA is consistent with future plans for complete remediation of the HPIA Operable Unit and will not preclude implementation of a comprehensive final remedy.

Subsequent actions are planned to fully address all of the contaminated media within the HPIA Operable Unit. The overall site remediation strategy will include the remediation of the other two sites within the HPIA Operable Unit (i.e., the Transformer Storage Area, Site 21, and the Fly Ash Dump Area, Site 24).

5.0 SITE CHARACTERISTICS

The hydrologic system at CLEJ consists of an unconfined aquifer (water table) and underlying semiconfined aquifers. The unconfined aquifer extends from the water table to the first significant confining layer, approximately 25 feet below land surface. The water table within HPIA ranged at an elevation between 8.48 and 25.56 mean sea level during January 1991. Groundwater flow in the shallow aquifer is predominantly to the southwest in the southern portion of portion of the site and to the west-southwest in the northern and central portions of the site.

As previously stated, various investigation and sampling activities have been conducted at the HPIA since 1983. During these studies, shallow, intermediate, and deep groundwater monitoring wells have been installed and sampled. The analytical results detected two plumes of groundwater contamination containing the following contaminants of concern: benzene, TCE, 1,2-DCE, and various metals including arsenic, antimony, beryllium, chromium, lead, iron, manganese, mercury, and nickel (Figure 2). Many of these compounds were detected at levels greater than the Federal Drinking Water Regulations and/or the North Carolina Water Quality Criteria for Groundwater. Table 1 presents a summary of the detected contaminants of concern for the shallow aquifer from a January 1991 sampling event. The Federal and North Carolina standards with respect to each of these contaminants are also identified on Table 1.

Since the shallow aquifer and the deep aquifer (a drinking water source) at the HPIA Site are interconnected, there is potential human and environmental exposure to the contaminants detected in the shallow aquifer. In addition, there is also potential for human exposure to the shallow aquifer contaminants due to migration towards the New River. The primary pathway of exposure would be through ingestion of contaminated water by humans, aquatic life, and/or wildlife.

6.0 SUMMARY OF SITE RISKS

The results of the IRA RI identified two contaminated plumes within the shallow aquifer at Site 78. Multiple contaminants were detected above MCLs and therefore formed the basis for proceeding with an IRA. These plumes can potentially impact drinking water supply wells in the area. In 1986, VOCs were identified in five on-site supply wells screened in the deeper aquifer (currently being addressed as part of the additional studies at the site), and subsequently, the wells were closed. It is not known whether or not the contaminants detected in the shallow aquifer have contributed to the contamination of these deeper wells.

As part of the IRA RI, a qualitative baseline risk assessment was conducted with respect to the shallow aquifer at the HPIA Site. The risk assessment identified potential human and environmental receptors to any contamination attributable to the site, identified potential pathways of exposure, quantified the exposure levels, and evaluated the potential human and/or environmental risk. The results of this qualitative risk assessment indicated that there are potential human and environmental receptors to the contamination of the shallow aquifer at
The groundwater analyses detected several organic and inorganic compounds in the shallow aquifer at Site 78. Table 2 presents a frequency summary of the compounds detected in the northern most groundwater plume with respect to Federal Drinking Water MCLs and North Carolina Water Quality Standards for Groundwater. Ten organic compounds and nine inorganic compounds exceeded at least one of the Federal or North Carolina standards. The risk assessment evaluated that TCE, antimony, arsenic, beryllium, chromium, iron, lead, manganese, and nickel are the contaminants of concern for this plume.

Table 3 presents a summary of the compounds detected in the southern most groundwater plume with respect to the Federal and North Carolina standards. Four organic compounds and nine inorganic compounds exceeded at least one of the Federal or North Carolina standards. The risk assessment determined that TCE, 1,2-DCE, antimony, arsenic, beryllium, chromium, iron, lead, manganese, mercury, and nickel are the contaminants of concern for this plume.

A quantitative risk assessment will be completed when the Final RI/FS for the entire HPIA Operable Unit is conducted.

### 7.0 DESCRIPTION OF ALTERNATIVES

Extraction and treatment of the contaminated groundwater is an element of each of the treatment alternatives evaluated for the shallow aquifer at the HPIA Site, with the exception of two "no action" alternatives. The seven interim remedial action alternatives evaluated in the IRA FS for the containment/remediation of the contaminant plumes in the shallow aquifer at the HPIA Site are:

Alternative 1: No Action
Alternative 2: No Action With Institutional Controls
Alternative 3: Biological Treatment at the Sewage Treatment Plant (STP)
Alternative 4: Physical/Chemical Treatment (Air Stripping)
Alternative 5: Physical/Chemical Treatment (Carbon Adsorption)
Alternative 6: On-site Thermal Treatment
Alternative 7: Off-site RCRA Facility

These alternatives are intended to prevent the spread of contaminated groundwater by halting the migration of the contaminated shallow groundwater plume early in the Superfund process. The final alternative for the shallow aquifer may require alteration and refinement, based on monitoring results and the evaluation of data collected during implementation of interim remedial action.

A brief overview of each of the interim remedial action alternatives is included below. All costs and implementation times are estimated.

Alternative 1: No Action

There are no costs associated with the No Action Alternative.

The No Action Alternative is required by the NCP to be considered through the nine point evaluation criteria summarized on Table 4. It provides a baseline for comparison of other alternatives. Under the No Action Alternative, no remedial measures would be undertaken at the HPIA Site at the present time. Potential health risks would remain associated with the current potential exposure by ingestion of contaminated groundwater.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) would not be met with this alternative.
<table>
<thead>
<tr>
<th>GLOSSARY OF EVALUATION CRITERIA</th>
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<tbody>
<tr>
<td>Overall Protection of Human Health and Environment addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering controls or institutional controls.</td>
</tr>
<tr>
<td>Compliance with ARARs – addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs) or other Federal and State environmental statutes and/or provide grounds for invoking a waiver.</td>
</tr>
<tr>
<td>Long-term Effectiveness and Permanence – refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.</td>
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<tr>
<td>Reduction of Toxicity, Mobility, or Volume through Treatment – is the anticipated performance of the treatment options that may be employed in an alternative.</td>
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<tr>
<td>Short-term Effectiveness – refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.</td>
</tr>
<tr>
<td>Implementability – is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.</td>
</tr>
<tr>
<td>Cost – includes capital and operation and maintenance costs. For comparative purposes, presents present worth values.</td>
</tr>
<tr>
<td>State Acceptance – indicates whether, based on its review of the RI and FS reports and the Interim Action Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.</td>
</tr>
<tr>
<td>Community Acceptance – will be assessed in the Record of Decision (ROD) following a review of the public comments received on the RI and FS reports and the Interim Action Proposed Plan.</td>
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Alternative 2: No Action With Institutional Controls

- Capital cost: $0 (Minimal)
- Annual Operation and Maintenance (O&M) Costs: $60,000 for Years 1 through 30
- Present Worth (PW): $970,000
- Months to Implement: 15

Under the No Action With Institutional Controls Alternative, the groundwater in the shallow aquifer will be left as is and no remedial actions will be implemented. This alternative includes quarterly sampling of 20 existing monitoring wells at the HPIA Site. In addition, use of the aquifer and installation of new water wells will be restricted. Like the No Action Alternative, potential health risks would remain associated with the current potential exposure by ingestion of contaminated groundwater.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) would not be met with this alternative.

Alternative 3: Biological Treatment at the STP

- Capital cost: $1.3 million
- Annual O&M Costs: $334,000 for Years 1 through 30
- PW: $6.9 million
- Months to Implement: 15

Alternative 3 includes groundwater extraction, pretreatment for oil and grease and for inorganic chemicals, treatment of VOCs at the existing Hadnot Point STP, and institutional controls.

Groundwater extraction would be accomplished through a phased approach. Initially, four extraction wells will be installed in each of the two contaminated plume areas (Figure 2). Based upon the results of groundwater monitoring following the first year of operation, additional extraction wells may be installed. Groundwater modeling may be employed at this time (following the first year of operation) to help select the appropriate number and location of extraction results. (For costing purposes only in the IRA FS, it was assumed that eight additional extraction wells would be installed during each of the first three years of operation for a total of 32 wells.)

The pretreatment system will consist of an oil/water gravity separator, an inorganic chemical removal system utilizing at least precipitation, chemical reduction, and sedimentation technologies. The biological system that will be utilized at the existing Hadnot Point STP consists of an aerated equalization lagoon, primary clarifiers, two trickling filters, secondary clarifiers, anaerobic digestors, and chlorine contact chambers. The effluent from the Hadnot Point STP discharges to the New River.

The same institutional controls (i.e., groundwater monitoring, aquifer-use restrictions, and well installation restrictions) identified in Alternative 2 will be included in this alternative.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) will be met with this alternative. This alternative may require an NPDES permit modification for the Hadnot Point STP. The modification may result in additional monitoring parameters and/or monitoring frequencies. This alternative should be able to meet these additional requirements.

OSHA and the State of North Carolina have established VOC air emission limits for the protection of human health and the environment. At the Hadnot Point STP, the major emissions source is the aerated lagoon. Preliminary results from air modeling efforts have concluded that the implementation of this alternative should be able to meet these established air emission limits.

The TCE-contaminated groundwater in the HPIA shallow aquifer is excluded from being considered a listed hazardous waste under the one part per million solvent exclusion provided under RCRA (40 CFR 261.3). Therefore, RCRA will not be applicable to the permitting or design of the HPIA sewage treatment system when the contaminated groundwater is introduced. However, since the
extracted groundwater from HPIA is expected to contain VOCs, the sludge generated from the Hadnot Point STP would be required to be analyzed for TCLP constituents. If the sludge would exceed TCLP levels, the sludge will be required to be handled as a hazardous waste in accordance with RCRA.

Alternative 4: Physical/Chemical Treatment (Air Stripping)

Capital cost: $1.0 million
Annual O&M Costs: $352,000 for Years 1 through 30
PW: $7.6 million
Months to Implement: 15

Alternative 4 is similar to Alternative 3 with the exception of the method of groundwater treatment. In general, the Air Stripping Alternative includes groundwater extraction, pretreatment for oil and grease and for inorganic chemicals, treatment for VOCs via an on-site air stripper, discharge to the Hadnot Point STP, and institutional controls. The same extraction and pretreatment systems identified in Alternative 3 and the same institutional controls identified in Alternative 2 will be included in this alternative.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) will be met with this alternative. OSHA and the State of North Carolina VOC air emission limits may be applicable for the air stripper. These ARARs should be met with this alternative. No RCRA ARARs will apply since this alternative includes on-site treatment.

Alternative 5: Physical/Chemical Treatment (Carbon Adsorption)

Capital cost: $940,000
Annual O&M Costs: $400,000 for Years 1 through 30
PW: $7.6 million
Months to Implement: 15

Alternative 5 is similar to Alternatives 3 and 4 with the exception of the method of groundwater treatment. In general, the Carbon Adsorption Alternative includes groundwater extraction, pretreatment for oil and grease and for inorganic chemicals, treatment for VOCs via on-site carbon adsorption units, discharge to the Hadnot Point STP, and institutional controls. The same extraction and pretreatment systems identified in Alternative 3 and the same institutional controls identified in Alternative 2 will be included in this alternative.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) will be met with this alternative. No air emission, NPDES, or RCRA ARARs will apply to this alternative.

Alternative 6: Thermal Treatment

Capital cost: $1.5 million
Annual O&M Costs: $627,000 for Years 1 through 30
PW: $11.8 million
Months to Implement: 15

Alternative 6 is similar to Alternatives 3, 4 and 5 with the exception of the method of groundwater treatment. In general, the Thermal Treatment Alternative includes groundwater extraction, pretreatment for oil and grease and for inorganic chemicals, treatment for VOCs via an on-site liquid injection incinerator, and institutional controls. The same extraction and pretreatment systems identified in Alternative 3 and the same institutional controls identified in Alternative 2 will be included in this alternative.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) will be met with this alternative. OSHA and the State of North Carolina VOC air emission limits may be applicable for the incinerator. These ARARs should be met with this alternative. No RCRA or NPDES ARARs will apply to this alternative.
Alternative 7: RCRA Facility

Capital cost: $900,000
Annual O&M Costs: $4.2 million for Years 1 through 30
PW: $68.9 million
Months to Implement: 15

Alternative 7 is somewhat similar to Alternatives 3, 4, 5 and 6 with the exception of the method of groundwater treatment. In general, the RCRA Facility Alternative includes groundwater extraction, off-site treatment at an approved RCRA facility, and institutional controls. The same extraction system identified in Alternative 3 will be included in this alternative. No pretreatment systems are included in this alternative. The same institutional controls identified in Alternative 2 will be included in this alternative.

Chemical-specific ARARs (i.e., Federal Drinking Water Standards and North Carolina Water Quality Criteria for Groundwater) will be met with this alternative. No air emission ARARs or NPDES ARARs apply to this alternative. RCRA ARARs will apply and should be met under this alternative.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the seven IRA alternatives using the nine evaluation criteria in order to select a site remedy. A brief summary of each alternative's strengths and weaknesses with respect to the evaluation criteria follows. A glossary of the evaluation criteria has previously been noted on Table 4.

Overall Protection of Human Health and the Environment

The five "pump and treat" alternatives would provide protection of human health and the environment by reducing or controlling risk through treatment, engineering controls, or institutional controls. Each of these "pump and treat" alternatives would treat the contaminants in the extracted groundwater, thereby reducing the risks associated with contact with the groundwater and minimizing the migration of contamination from the groundwater.

Since neither the No Action Alternative nor the No Action With Institutional Controls Alternative are protective of human health and the environment, they are not considered further in this analysis as an option for the HPIA Site.

Compliance with ARARs

An interim remedial action alternative need only address those ARARs applicable or relevant and appropriate to the limited-scope interim action. All of the treatment alternatives will meet the NPDES requirements for discharge to a surface water body. ARARs for the aquifer are Federal and North Carolina MCLs for drinking water and groundwater, respectively. In addition, applicable air emission ARARs (OSHA and North Carolina limits) and RCRA ARARs apply to several of the alternatives. The ultimate goal of all of the "pump and treat" alternatives is to meet all of the above-mentioned ARARs. The final remedial alternative (to be proposed after completion of additional studies) will provide additional information on the compliance with ARARs.

Long-Term Effectiveness and Permanence

This criteria is irrelevant to the interim action presented in this Proposed Plan. Long-term effectiveness and permanence will be evaluated as part of the final remedial action for the shallow aquifer.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment

All of the "pump and treat" alternatives would extract and treat the contaminated groundwater to reduce the toxicity, mobility, and volume of the contaminants in the water. The toxicity of the contaminants will be reduced through treatment. The mobility of the contaminants will be reduced by containment of the plumes via the extraction wells. Total volume of the contaminants will be reduced by the combination of pumping and treatment over the duration of the interim remedial action.
Short-Term Effectiveness

It is not expected that the implementation of any of the alternatives would cause adverse effects to human health and the environment. Workers could be exposed to contaminated soil or water during construction and installation of the extraction well systems. Implementation of appropriate worker health and safety precautions will mitigate any threat. No threats to the community are anticipated, due to the location and industrial nature of the activities at HPIA. All of the "pump and treat" alternatives will be effective in achieving the goal of reducing contaminant migration upon implementation. Alternatives 3, 4 and 5 would take approximately 15 months to implement. Alternatives 6 and 7 are also anticipated to require 15 months to implement since they are dependent on the availability of equipment and/or the capacity at an off-site facility.

Implementability

All of the alternatives have similar administrative difficulties (i.e., obtaining permits) that could delay implementation. Acquiring the necessary permits for off-site actions is feasible and should not adversely affect the implementability of any of the alternatives. Note that only the substantive technical requirements of permits must be met for a remedial action implemented on site. All of the alternatives are technically feasible and, therefore, implementable. The majority of the required equipment for each of the alternatives is readily available. Alternative 3 has an advantage with implementability since the biological system is in-place and operating at the existing sewage treatment plant within CLEJ. However, due to the unknown condition of the sewer line, this alternative may result in extensive construction time for relining or replacement of the sewer line.

Cost

Alternative 3 has the lowest present worth cost as compared to Alternatives 4, 5, 6 and 7. The present worth cost for Alternative 3 is approximately $6.9 million; Alternative 4 is approximately $7.6 million; Alternative 5 is $7.6 million; Alternative 6 is approximately $11.8 million; and Alternative 7 is approximately $68.9 million.

EPA/State Acceptance

The Environmental Protection Agency and the State of North Carolina DEHNR have concurred with the selection of this alternative.

Community Acceptance

No private citizens attended the public meeting held on May 14, 1992 or provided any comments during the 30-day comment period. The issues regarding the contaminated shallow aquifer at the HPIA may not be of a concern to the community. This lack of concern may be due to the location of the site within an industrial area and away from residential areas.

9.0 SELECTED REMEDY

The preferred interim remedial action alternative for reducing the potential for further migration of the contamination in the shallow aquifer at HPIA is Alternative 4: Physical/Chemical Treatment (Air Stripping). Based on available information, this alternative appears to provide the best balance with respect to the nine CERCLA evaluation criteria used to evaluate alternatives. The action will limit the extent of migration of the contamination in the shallow groundwater aquifer and reduce the concentration of contaminants in the groundwater. This interim remedial action will be consistent with any other remedial actions that are selected for the site. A description of Alternative 4 is included below.

In general, Alternative 4 includes groundwater extraction, pretreatment, groundwater treatment and discharge, and institutional controls. The on-site pretreatment system will consist of an oil/water gravity separator, and a combination of one of several inorganic removal technologies including but not limited to precipitation, chemical reduction, and sedimentation. Treatment of the VOCs in the groundwater will be conducted via an on-site air stripper. Based on the results of bench-scale treatability study, a carbon adsorption unit may be added to the treatment system. The treatability study will be conducted during the design of this alternative. The
existing Hadnot Point STP will be used for the off-site discharge of the treated groundwater. A long-term groundwater monitoring program will be implemented, and restrictions will be placed on the use of the shallow aquifer and on the installation of new wells. Details of each of the components making up this alternative are discussed below.

Groundwater Collection System

Groundwater in the shallow aquifer at HPIA will be withdrawn through a series of extraction wells. The details of the extraction system (i.e., number, location, and pumping rates of the extraction wells) will be determined through a phased approach. Preliminary aquifer characteristics were previously estimated, based on the results of an eight-hour pump test on two wells screened in the shallow aquifer. These estimates will be confirmed or reevaluated as extraction wells are installed and the groundwater is monitored.

Initially, four 4-inch wells will be installed at each of the two groundwater plumes and pumped at a rate of two to five gpm. Additional wells will be added to the system as dictated by monitoring results. For costing purposes only, it was assumed that eight additional extraction wells (four within each plume area) will be installed at three different times during the first few years of operation. Therefore, the complete extraction system will include 32 wells. Please note that the total number of extraction wells required to successfully implement the IRA will be determined as the wells are installed, and testing and monitoring of the groundwater will provide a means of evaluating the need for additional wells. The location of these additional wells has not been determined at this time.

Pretreatment System

Once extracted, the contaminated groundwater will be pumped to an on-site pretreatment system. A pretreatment system will be located within the area of each plume. The first step in the pretreatment system will consist of a gravity oil/water separation process for the removal of floating oils and/or oily wastes that are heavier than water. The oil/water gravity separation system will include a holding tank for retention of the extracted groundwater, and a surface skimming and bottom collection system. Baffles will be included in the design of the gravity separator in order to provide additional surface area. Collected free product will be either sold to a waste oil recycler or incinerated in a RCRA-permitted facility.

The aqueous effluent from the gravity separation system will be transferred to an inorganic chemical removal system for the removal of the inorganic contaminants of concern (e.g., chromium, lead, manganese, iron, etc.). The inorganic system will include but not be limited to the following technologies: precipitation, chemical reduction, and sedimentation.

Residuals generated from the pretreatment systems will be disposed of properly.

Treatment System

The aqueous effluent from the inorganic chemical removal system will be pumped to an on-site treatment system consisting of two air stripping units (one location within each source plume area). The on-site air stripping units will be designed for the treatment of volatile organic compounds (VOCs). Residuals generated from this process will include air emissions contaminated with organics. If required, vapor recovery equipment will be added to prevent the release of stripped organics into the atmosphere. The vapor recovery equipment will generate additional waste contaminated with organics which will require proper off-site disposal or regeneration. If necessary, an activated carbon system will be included in the groundwater treatment system. The results of a laboratory bench-scale treatability study will determine whether the activated carbon system is necessary.

Discharge to the Hadnot Point STP

The treated effluent from the air stripping systems will be pumped to the closest sanitary sewer manholes for discharge to the existing biological treatment system at the Hadnot Point STP for final discharge to the New River.

The existing Hadnot Point STP, located south-southeast of the HPIA area, has an operating capacity of 8 million gallons per day. The STP is a biological treatment system consisting of
an aerated equalization lagoon, primary clarifiers, trickling filters, secondary clarifiers, chlorine contact chamber, anaerobic digesters, and sludge drying beds.

The STP receives sanitary wastewater from both residential and industrial areas. The influent into the plant enters the aerated equalization lagoon (two million gallon capacity). The lagoon is aerated with five floating aerators. The aerated wastewater is pumped from the lagoon to the primary influent chamber and then to one of eight 80,000 gallon primary clarifiers. The resulting aqueous effluent from the primary clarifiers is pumped to the secondary treatment area consisting of two 1.3-million gallon trickling filters followed by two 300,000-gallon secondary clarifiers, followed by a 29,000-gallon chlorine contact chamber. Sludge and oil and grease collected in the primary and secondary clarifiers is pumped to one of six 140,000-gallon anaerobic digesters. Digested sludge is pumped to one of twenty-five drying beds. The final effluent from the chlorine contact chamber is discharged to the New River.

Under Alternative 4, the treated groundwater will be mixed in-line with the sewage the plant is currently receiving. Since the treated groundwater will be mixed with the current plant influent, STP effluent discharge and sludge disposal will continue to be handled by the STP in the same manner as currently used. The resulting effluent will be discharged to the New River.

Institutional Controls

In order to track the effectiveness of the "pump and treat" method, a long-term groundwater monitoring program will be implemented. The monitoring program will include periodic sampling of approximately 20 monitoring wells. Samples will be collected on a quarterly basis for 30 years and analyzed for the constituents of concern. Restrictions will be placed on the use of the shallow aquifer, the water supply wells will remain closed, and no new wells will be permitted to be installed in the area.

Estimated Costs

The estimated capital costs associated with the Physical/Chemical Treatment (Air Stripping) Alternative is approximately $1,012,000. Operation and maintenance (O&M) costs of approximately $352,000 annually are projected for the operation of the treatment system and the sampling of 20 existing monitoring wells. Assuming a monitoring period of 30 years and an annual percentage rate of 5%, this equates to a net present worth of $7.6 million. Table 5 presents a summary of this cost estimate for the major components.

10.0 STATUTORY DETERMINATIONS

This IRA alternative is part of an overall remedy for the entire HPIA Operable Unit. This IRA alternative will provide adequate protection of human health and the environment through treatment, engineering controls, and institutional controls. Specifically, this alternative will reduce and/or eliminate the potential risks posed by the contaminated shallow aquifer at the HPIA Site. In addition, implementation of this alternative will not pose unacceptable short-term risks or cross-media impacts. This interim action will be part of an overall remedy which will attain the statutory requirement of protectiveness for the entire operable unit.

This IRA alternative will comply with all Federal and North Carolina requirements (ARARs) which are applicable or relevant and appropriate to its implementation. Specifically, the alternative will meet the Federal Drinking Water MCLs and the North Carolina Water Quality Criteria for Groundwater for the contaminants of concern at the site. The alternative will also comply with Pretreatment Standards and NPDES criteria.

The selected remedy affords overall effectiveness proportional to its costs. This alternative is the second most cost effective of the "treatment" alternatives evaluated. The no action alternatives is more cost effective, but may not adequately protect human health and the environment. The Biological STP Treatment Alternative is slightly more cost effective, but due to the unknown condition of the sewer line, this alternative could result in significant cost increases for sewer line replacement.

The selected IRA alternative represents a permanent solution with respect to the principal threats posed by the contamination within the shallow aquifer at the HPIA Site. Therefore, this alternative utilizes permanent solutions for the shallow aquifer to the maximum extent.
practicable. This interim action will be part of an overall remedy which will attain the statutory requirement of utilizing permanent solutions to the maximum extent practicable for the entire HPIA Operable Unit.

Since treatment (via pretreatment and air stripping) is the principal element of this alternative, the statutory requirement with respect to preference for treatment will be attained. In addition, this interim action will be part of an overall remedy which will attain the statutory requirement of satisfying the preference for treatment that reduces toxicity, mobility, or volume as a principal element.

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The proposed remedial action plan identified Alternative 3, Biological Treatment, as the preferred alternative. Alternative 4, Air Stripping, presented in the proposed remedial action plan and the Feasibility Study Report requires an on-site air stripper to treat the extracted groundwater. The possibility of adverse effects to the sewage treatment plant (STP) was raised by the State of North Carolina. As a result, the Navy/Marine Corps, in consultation with the EPA and North Carolina, selected Alternative 4 as the alternative providing the best balance of the nine criteria. This alternative involves treatment of the extracted groundwater prior to discharging the effluent to the Hadnot Point Industrial Area STP.

12.0 RESPONSIVENESS SUMMARY

12.1 Overview

At the time of the public comment period, MCB Camp Lejeune and the Department of the Navy (DoN) with the assistance of the United States Environmental Protection Agency (EPA) and the North Carolina Department of Environment, Health, and Natural Resources (N.C. DEHNR) selected a preferred interim remedial action alternative for the contaminated groundwater plumes in the shallow aquifer at the HPIA Operable Unit located at MCB Camp Lejeune, North Carolina. The preferred interim remedial action alternative specified in the Proposed Remedial Action Plan (PRAP) involved extracting the contaminated groundwater, pretreating the groundwater, and then discharging the pretreated water to an existing sewage treatment plant (STP) at the MCB for treatment and discharge. Treatment of the groundwater at the STP would primarily involve aeration and biological treatment (trickling filters). The treated groundwater would be discharged to a receiving river.

Judging from the comments received during the public comment period and from the attendance at the public meeting, the local community does not appear to be concerned with the proposed actions to be implemented at the site. No private citizens attended the public meeting nor did they submit any comments during the comment period.

The purpose of this responsiveness summary is to identify the comments and concerns of the local community regarding the selected interim remedial action, and to document how MCB Camp Lejeune/DoN considered these comments and concerns during the selection of the interim remedial alternative. The remainder of this responsiveness summary discusses the background on community involvement, and presents a summary of the comments received during the public meeting and public comment period along with their corresponding responses.

12.2 Background on Community Involvement

No past community interest in the contamination at the HPIA Operable Unit has been documented. This may be due to the fact that the site is located within an industrial area at the MCB.

12.3 Summary of Public Comments and Responses

Comments raised during the HPIA Operable Unit public comment period and the public meeting are summarized below. The comment period was held between May 14, 1992 and June 14, 1992. The public meeting was held on May 14, 1992. The only comments received were from the Agency for Toxic Substances and Disease Registry (ATSDR) and were technical questions/concerns regarding the selected remedial action.

1. The Agency for Toxic Substances and Disease Registry (ATSDR) asked what kind of models would
be used to determine air quality at the STP.

MCB Camp Lejeune/DoN Response: An EPA air model (SCREEN) which is a very conservative model has already been used to estimate potential air emissions resulting from implementing the STP for the treatment of the groundwater. The results from the model estimated that the concentrations of the identified VOC emissions from the STP would be below the North Carolina acceptable ambient concentrations.

2. The ATSDR wanted to know how the STP would be upgraded.

MCB Camp Lejeune/DoN Response: Clarified the misunderstanding the STP would not be upgraded, instead the sanitary sewer line that is planned to be used would be upgraded if required.

3. The ATSDR was concerned if the STP could handle the groundwater for treatment.

MCB Camp Lejeune/DoN Response: It is believed that the STP will be capable of treating the groundwater, based on preliminary studies (see Final Pre-Design Report). MCB Camp Lejeune and the DoN intend to conduct treatability studies during the design of the alternative.

4. The ATSDR recommended that since the STP is in close proximity to a recreation area, air monitoring for volatile organic chemicals should be conducted for a short period of time after beginning the treatment process and again when the process is at peak capacity. Analyses should include determining concentrations of volatile organic chemicals such as benzene, vinyl chloride, and other volatiles associated with both plumes and not be confined to TCE.

MCB Camp Lejeune/DoN Response: This recommendation for air monitoring will be included in the remedial design for the site and will become a requirement during the construction start-up phase.

5. The ATSDR recommended that air monitoring stations should be at areas closest to the nearest recreational areas and should be at heights that would be representative of the breathing zone for a young child as well as an adult.

MCB Camp Lejeune/DoN Response: Air monitoring stations will be located at areas closest to the nearest recreational areas and will be at heights representative of the breathing zone for a young child as well as an adult.
**CAMP LEJEUNE MILITARY RES. (USNAVY)**

**Site Information:**

- **Site Name:** CAMP LEJEUNE MILITARY RES. (USNAVY)
- **Address:** ONSLOW COUNTY, NC
- **EPA ID:** NC6170022580
- **EPA Region:** 04

**Site Alias Name(s):**

- USMC CAMP LEJEUNE MILITARY RESERVATION
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)
- USMC/BLDGS TP452 & TP451 (SITE 10)
- USMC/HADNOT POINT BURN DUMP (SITE 3)
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
- USMC/STORAGE LOTS 201 & 203 (SITE 12)
- USMC/CAMP GEIGER DUMP (SITE 4)
- USMC/BASE SAN LDFL (SITE 5)
- USMC/CHEM LDFL (SITE 1)
- USMC/BLDG PT 37 (SITE 6)
- USMC/K-326 RANGE (SITE 8)
- USMC/G4A RANGE (SITE 9)
- USMC CAMP LEJEUNE

**Record of Decision (ROD):**

- **ROD Date:** 09/10/1993
- **Operable Unit:** 02
- **ROD ID:** EPA/ROD/R04-93/162

**Media:** None

**Contaminant:** None
Abstract: The 4-acre USMC Camp Lejeune Military Reservation (Operable Unit 4) site is part of a 170-square mile Marine Corps Training Base located approximately 15 miles southeast of Jacksonville, Onslow County, North Carolina. The site borders the New River to the east and an intermittent tributary to the north, and contains three classifications of wetland areas, and various protected species, such as the American alligator. The site, known as site 48, was identified as part of the Department of Defense's Installation Restoration Program (IRP). From 1956 to late 1966, site 48 reportedly was used for the disposal of approximately 1 gallon of mercury per year that had been drained from radar unit delay lines. OU4 was first identified in 1983 during an Initial Assessment Study (IAS) conducted at Camp Lejeune. In 1984, a subsequent investigation indicated the presence of low levels of mercury in soil and sediment. However, mercury was not detected during a 1991 onsite investigation. Those metals that were detected in onsite surface water were considered to be representative of background conditions. In 1992 and 1993, a detailed site investigation revealed low levels of organic and inorganic contaminants in onsite environmental media; however, mercury was not detected. An additional assessment indicated that onsite conditions do not pose a threat to human health and the environment. In addition, the levels of the contaminants detected were lower than their respective Federal and State standards. A 1992 ROD addressed contaminated ground water at USMC Camp Lejeune Military, as OU1. This ROD addresses the contamination in the environmental media, as OU4. Future RODs will address environmental contamination at the 10 remaining OUs at Camp Lejeune. EPA has determined that, based on the results of the health assessment, the site does not pose a current or potential threat to human health and the environment; therefore, there are no contaminants of concern affecting this site.

SELECTED REMEDIAL ACTION: The selected remedial action for this site is no further action. EPA and the State have determined that the contaminants at the site do not pose any current or potential future risks to human health or the environment and, therefore, no remediation is needed. There are no present worth or O&M costs associated with this no action remedy.

PERFORMANCE STANDARDS OR GOALS: Not applicable.

INSTITUTIONAL CONTROLS: Not applicable.
The selected remedy for Operable Unit No. 2 is the final action to be conducted at the three sites. A Time Critical Removal Action will be implemented at the operable unit for the removal of surficial and buried drums and containers identified during the remedial investigation. These drums and containers are potential sources of soil and/or groundwater contamination. This removal action is currently in the design stage. Implementation is planned prior to the end of this year. The selected remedial action included in this ROD addresses the principal threats remaining at the operable unit by treating contaminated groundwater and soils.

The principal threats include the potential ingestion of contaminated groundwater originating from Site 82, and the potential exposure to contaminated soil from limited areas throughout the operable unit. The primary goals of the selected remedy are: (1) to prevent current or future exposure to the contaminated groundwater and contaminated soils, (2) to remediate groundwater contamination for future potential use of the aquifer, and (3) to treat or remove contaminated soils from designated areas of concern.

The major components of the selected remedy for this operable unit include:
. Collecting contaminated groundwater in both the shallow and deep portions of the aquifer through a series of extraction wells installed within the plume areas with the highest contaminant levels.
. Treating the extracted groundwater for organics and inorganics removal via a treatment train which may consist of, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption.
. Discharging the treated groundwater to Wallace Creek.
. Restricting the use on nearby water supply wells which are currently inactive/closed, and restricting the installation of any new water supply wells within the operable unit area.
. Implementing a long-term groundwater monitoring program to monitor the effectiveness of the groundwater remedy and to monitor nearby supply wells that are currently active.
. Implementing in situ treatment via volatilization (or vapor extraction) of approximately 16,500 cubic yards of volatile organic compound (VOC) contaminated soils.
. Excavating approximately 2,500 cubic yards of soil primarily contaminated with polychlorinated biphenyls (PCBs) and pesticides for off-site disposal (nonhazardous).

Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 02
ONSLOW COUNTY, NC
09/10/1993
FINAL

RECORD OF DECISION
FOR OPERABLE UNIT NO. 2
(SITES 6, 9, and 82)

MARINE CORPS BASE,
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0133

Prepared For:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
SEPTEMBER 24, 1993

UNITED STATES MARINE CORPS
MARINE CORPS BASE
PSC BOX 20004
CAMP LEJEUNE, NORTH CAROLINA 28642-0004

Ms. Gena Townsend, Project Manager
United States Environmental Protection Agency
Region IV
Attention: Camp Lejeune Remedial
345 Courtland Street
Atlanta, Georgia 30365

Dear Ms. Townsend:

On September 10, 1993, Brigadier General L. H. Livingston, Commanding General, Marine Corps Base, Camp Lejeune, signed the Record of Decision for Operable Unit #3 (Site #48). The Record of Decision for Operable Unit #2 (Sites #6, #9, and #82) was signed on September 24, 1993.

These records of decision are enclosed for your review. We appreciate your agency's concurrence and we will now proceed with the appropriate remedial designs.

If you have any questions or comments, please contact Mr. Neal Paul, Director, Installation Restoration Division, Environmental Management Department, at telephone (919) 451-5063/5068.

Sincerely,

ROBERT L. WARREN
Assistant Chief of Staff
Environmental Management Department
By direction of
the Commanding General

Encl:
(1) Record of Decision for Operable Unit No. 2
(2) Record of Decision for Operable Unit No. 3

Copy to:
COMLANTNAVFACENGCOM Code 1823 (Linda Berry)
HQMC LFL (John Burleson)
ACRONYMS AND ABBREVIATIONS

DECLARATION

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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOC</td>
<td>area of concern</td>
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<tr>
<td>ARAR</td>
<td>applicable or relevant and appropriate requirement</td>
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<td>AST</td>
<td>aboveground storage tank</td>
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<td>Baker</td>
<td>Baker Environmental, Inc.</td>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation and Liability Act</td>
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<td>COC</td>
<td>contaminant of concern</td>
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<td>cy</td>
<td>cubic yard</td>
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<td>Department of the Navy</td>
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<td>hazard quotient</td>
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<td>IAS</td>
<td>Initial Assessment Study</td>
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<td>ICR</td>
<td>incremental cancer risk</td>
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<td>Installation Restoration Program</td>
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<td>Macroinvertebrates Biotic Index</td>
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<td>Marine Corps Base</td>
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<td>MCL</td>
<td>Maximum Contaminant Level</td>
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<td>NC DEHNR</td>
<td>North Carolina Department of Environment, Health, and Natural Resources</td>
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<td>NCP</td>
<td>National Contingency Plan</td>
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<td>NPL</td>
<td>National Priorities List</td>
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<td>NPW</td>
<td>net present worth</td>
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<td>O&amp;M</td>
<td>operation and maintenance</td>
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<td>PAH</td>
<td>polynuclear aromatic hydrocarbon</td>
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<td>polychlorinated biphenyl</td>
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<td>tetrachloroethene</td>
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<td>Proposed Remedial Action Plan</td>
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<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
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<td>SVOC</td>
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<td>TCE</td>
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<tr>
<td>TCLP</td>
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<td>United States Environmental Protection Agency</td>
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<td>VOC</td>
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DECLARATION

Site Name and Location

Operable Unit No. 2 (Sites 6, 9, and 82)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit No. 2 (Sites 6, 9, and 82) at Marine Corps Base (MCB) Camp Lejeune, North Carolina which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for the operable unit.

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Assessment of the Sites

Actual or threatened releases of hazardous substances from this operable unit consisting of three sites, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of Selected Remedy

The selected remedy for Operable Unit No. 2 is the final action to be conducted at the three sites. A Time Critical Removal Action will be implemented at the operable unit for the removal of surficial and buried drums and containers identified during the remedial investigation. These drums and containers are potential sources of soil and/or groundwater contamination. This removal action is currently in the design stage. Implementation is planned prior to the end of this year. The selected remedial action included in this ROD addresses the principal threats remaining at the operable unit by treating contaminated groundwater and soils.

The principal threats include the potential ingestion of contaminated groundwater originating from Site 82, and the potential exposure to contaminated soil from limited areas throughout the operable unit. The primary goals of the selected remedy are: (1) to prevent current or future exposure to the contaminated groundwater and contaminated soils, (2) to remediate groundwater contamination for future potential use of the aquifer, and (3) to treat or remove contaminated soils from designated areas of concern.

The major components of the selected remedy for this operable unit include:

- Collecting contaminated groundwater in both the shallow and deep portions of the aquifer through a series of extraction wells installed within the plume areas with the highest contaminant levels.
- Treating the extracted groundwater for organics and inorganics removal via a treatment train which may consist of, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption.
- Discharging the treated groundwater to Wallace Creek.
- Restricting the use on nearby water supply wells which are currently inactive/closed, and restricting the installation of any new water supply wells within the operable unit area.
. Implementing a long-term groundwater monitoring program to monitor the effectiveness of the groundwater remedy and to monitor nearby supply wells that are currently active.

. Implementing in situ treatment via volatilization (or vapor extraction) of approximately 16,500 cubic yards of volatile organic compound (VOC) contaminated soils.

. Excavating approximately 2,500 cubic yards of soil primarily contaminated with polychlorinated biphenyls (PCBs) and pesticides for off-site disposal (nonhazardous).
Statutory Determinations

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. In addition, this remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on site (in terms of contaminated groundwater) above health-based levels, the five-year review will be necessary for this remedial action.
Marine Corps Base, Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 170 square miles and includes 14 miles of coastline. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

The study area, Operable Unit No. 2, is one of 13 operable units within MCB Camp Lejeune. An "operable unit" (as defined by the NCP) is a discrete action that comprises an incremental step toward comprehensively addressing site problems. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action. With respect to MCB Camp Lejeune, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented.

Operable Unit No. 2, which covers an area of approximately 210 acres, is comprised of three IRP sites: Sites 6, 9, and 82. Operable Unit No. 2 is located approximately two miles east of the New River and two miles south of State Route 24 (see Figure 1). As shown on Figure 2, the operable unit is bordered to the north by Wallace Creek, to the west by Holcomb Boulevard, to the east by Piney Green Road, and to the south by Sneads Ferry Road.

Within Site 6, there are four main areas of concern: Open Storage Lot 201; Open Storage Lot 203; a ravine; and the wooded areas which surround these storage lots (see Figure 2). Open Storage Lot 201 is a fenced lot located in the southcentral portion of Site 6. This lot is currently used to store military equipment and vehicles, lumber, hydraulic oils and lubricants, non-PCB transformers, and other supplies. Lot 201 is approximately 25 acres in size.

Open Storage Lot 203 is a fenced lot situated in the northern portion of Site 6, bordering Site 82 to the south. Based on a review of historical aerial photographs, it appears that the fenced boundaries of this lot have changed since the lot was in operation. Currently, the fenced portion of Lot 203 is approximately 41 acres in size. In the past, the storage lot was reportedly used for the disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils. Storage Lot 203 is no longer used as an active storage area. The lot still contains randomly stored scrap materials from former activities such as rubber rafts, shredded tires, communication wire, wooden pallets, metal debris, barbed wire fencing, and spent ammunition casings. Empty storage tanks were also identified on the lot. They were labeled as diesel fuel, gasoline, and kerosene. A large number of 55-gallon drums have been identified within Lot 203. The majority of the drums, if labeled, were identified as containing lubricants, petroleum products, or corrosives.

The ravine is located in the northwest section of Site 6 (along the northern boundary of Lot 203) and bisects Site 82. The upper portion of the ravine was, at one time, used as a disposal area. The presence of battery packs, drums, fencing, tires, wire cables, respirator cartridges, empty drums, commercial ovens, commodes, and other surficial debris is evidence of past disposal practices.

Woods and open fields surround both Storage Lots 201 and 203 and make up the remaining area of Site 6. These areas are randomly littered with debris including spent ammunition casings, and empty or rusted drums.

Site 9 is the "Fire Fighting Training Pit at Piney Green Road". The site covers an area of approximately 2.6 acres. Site 9 is bounded by Holcomb Boulevard on the west, Bear Head Creek approximately 500 feet to the north, Piney Green Road on the east, and Sneads Ferry Road on the south. Site 6 also borders Site 9 to the north. Figure 2 shows the general location of Site 9. Locally, the site is bounded by unnamed streets leading to various storage buildings in the vicinity. Site 9 consists of an asphalt-lined fire training pit, an oil/water separator, four aboveground storage tanks (ASTs), three propane tanks, and a fire tower (smoke house). Figure 3 identifies the general arrangement of Site 9. The fire training pit, located in the southern area of the site, is used to conduct training exercises for extinguishing fires caused by flammable liquids. The oil/water separator is located next to the fire training pit to collect water used in the training exercises and storm water that falls into the pit. The recovered
product collected in the oil/water separator is disposed of off site. Two of the ASTs at Site 9 are 2500-gallon steel tanks labeled "DO NOT USE". These tanks are not currently in use. Two additional ASTs located within a concrete containment area are currently in use. These tanks are constructed of steel and have a capacity of 500 gallons each.

Site 82, the Piney Green Road VOC Site, is located directly north and adjacent to Site 6 and encompasses approximately 30 acres (see Figure 2). The site is predominantly covered by woodlands and is randomly littered with debris such as communication wire, spent ammunition casings, and empty or rusted drums.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section of the ROD provides background information on each of the three sites' history and enforcement actions taken to date. Specifically, the land use history of each of the sites and the previous investigations which have been conducted are briefly discussed below.

Site History

Site 6 has a history of various uses, including the disposal and storage of wastes and supplies. Pesticides have reportedly been stored in the northeast and southeast portions of Lot 201. Transformers containing PCBs were reportedly stored in the southwest portion of Lot 201. Open Storage Lot 203 previously served as a waste disposal and storage area from as early as the 1940s to the late 1980s. Reports detailing disposal activities within Lot 203 are vague; there is little indication as to the types and quantities of material disposed of throughout the lot, with the exception of pesticides. Pesticides were reported to have been stored in a trailer on Lot 203 as well as in the southeast portion of the lot. Former employees at Lot 203 have reported disposal of various chemicals including PCBs, cleaning solvents, electrolytes from used batteries, and waste oils.

Site 9 has been used for fire fighting training exercises from the early 1960s to the present. Until 1981, training exercises were conducted in an unlined pit. The pit is currently asphalt lined. Flammable liquids including used oil, solvents, and contaminated fuels (unleaded) were used as accelerants during training exercises. Approximately 30,000 to 40,000 gallons of JP-4 and JP-5 fuels were also burned in the fire training part.

No organized disposal operations are documented for Site 82. It appears that the site area was used for disposal of miscellaneous debris from Lot 203, since similar items were identified at both sites. No known documentation of the quantity or the location of the disposal of VOCs.

Previous Investigations

Several of the areas within Operable Unit No. 2 have been investigated for potential contamination due to Marine Corps operations and activities. A brief summary of these investigations in chronological order is presented below.

In 1983 an Initial Assessment Study (IAS) was conducted at MCB Camp Lejeune which identified a number of areas within the facility, including Sites 6 and 9, as potential sources of contamination. As a result of this study, the DoN began to contract environmental consulting firms to further investigate these sites.

During 1984 through 1987, a Confirmation Study was conducted at Operable Unit No. 2 which focused on potential source areas identified in the IAS and the Administrative Record file. The study consisted of collecting a limited number of environmental samples (soil, sediment, surface water, and groundwater) for purposes of constituent analysis. In general, the results detected the presence of pesticides in Lot 203, VOCs in the groundwater, and VOCs in the surface water.

A soil gas survey was conducted at Lot 203 in February 1989. The purpose of this survey was to identify the presence of VOCs that may potentially affect personnel working within Lot 203. No imminent hazards were observed from the results of the survey.

On October 4, 1989, Camp Lejeune was placed on the National Priorities List (NPL). The DoN, the USEPA, and the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR) entered into a Federal Facilities Agreement on February 13, 1991.
In June 1991, a site investigation was conducted at Site 82. The investigation consisted of drilling and sampling six shallow soil borings; installing and sampling three shallow monitoring wells; and sampling surface water and sediment of Wallace Creek. Organic contamination was detected in all of the media sampled.

A Site Assessment Report was prepared in March 1992. This report contained a summary of the previously conducted Confirmation Study in addition to a preliminary risk evaluation for Site 6. This report recommended that a full human health and ecological risk assessment be performed at Site 6.

In 1992, Baker Environmental, Inc. conducted a Remedial Investigation (RI) field program at Operable Unit No. 2 to characterize potential environmental impacts and threats to human health resulting from previous storage, operational, and disposal activities. Investigation activities commenced on August 21, 1992, and continued through November 10, 1992. The field program consisted of a preliminary site survey; an unexploded ordnance survey; a geophysical survey; a soil investigation including drilling and sampling; a groundwater investigation including monitoring well installation (shallow and deep wells) and sampling; drum waste sampling; test pit investigation; a surface water and sediment investigation; and an aquatic and ecological survey. A second phase of the investigation, focused on the groundwater contamination identified at Site 82, was conducted in early 1993 and completed by April 1993. The results of the RI are summarized below.

Levels of organic contamination including PCBs, pesticides, VOCs, and semivolatile organic compounds (SVOCs) were present throughout Operable Unit No. 2 in the various media (i.e., soil, groundwater, surface water, and sediments). Pesticides, PCBs, VOCs, and SVOCs appeared to be the predominant contaminants of concern (COCs) in soils (mostly in surface soils) and sediments. VOCs appeared to be the COCs in groundwater in both the surficial (less than 25 feet in depth) and deep (greater than 100 feet in depth) portions of the groundwater aquifer. In addition, VOCs appeared to be the COCs in the surface water. Several areas were identified within Operable Unit No. 2 which exhibited significant levels of organic contamination. These areas are located within Lot 201 (PCBs, pesticides, VOCs, and SVOCs [northeastern corner of Lot]), the ravine area (PCBs, pesticides, and SVOCs), Site 82 (VOCs and SVOCs), and Wallace Creek (VOCs). Table 1 presents a listing of the organic compounds detected within Operable Unit No. 2.

Inorganic contaminants were also present throughout Operable Unit No. 2 in the various media. The predominant inorganic COCs appeared to be barium, cadmium, chromium, lead, manganese, and zinc. These contaminants were identified in soils above background levels (i.e., compared to normal background levels for Camp Lejeune soils). In some cases, the inorganic contaminants identified in groundwater were detected above the Federal drinking water standards and/or the North Carolina Water Quality Standards. Additionally, several of these contaminants were detected above ambient water quality guidelines.

Based on the results of the various environmental investigations conducted at Operable Unit No. 2 during the RI, several areas of concern were identified. Various drums, containers, and aboveground storage tanks were noted throughout Sites 6 and 82. All surficial drums/containers and known buried drums will be removed from Operable Unit No. 2 through a Time Critical Removal Action which will be conducted prior to implementing any remedial alternative at the operable unit. Over 220 drums, 5 aboveground tanks, numerous small containers, and visually contaminated soils around these drums/containers will be removed during this action.

### 3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Final Remedial Investigation (RI) and Feasibility Study (FS) Reports and the Final Proposed Remedial Action Plan (PRAP) for Operable Unit No. 2 at MCB Camp Lejeune, North Carolina were released to the public on August 23, 1993. These documents were made available to the public at information repositories maintained at the Onslow County Public Library and at the MCB Camp Lejeune Central Library. The notice of availability of the PRAP and RI/FS documents was published in the *Jacksonville Daily News* during the period August 18–24, 1993. A public comment period was held from August 24, 1993 to September 24, 1993. In addition, a public meeting was held on August 24, 1993. At this meeting, representatives from DoN/Marine Corps discussed the remedial action alternatives (RAAs) currently under consideration and addressed community concerns. Response to the comments received during the comment period is included in the Responsiveness Summary, which is part of this ROD.
This decision document presents the selected RAAs for Operable Unit No. 2 at MCB Camp Lejeune, North Carolina, chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the NCP. The selected decision for Operable Unit No. 2 is based on the Administrative Record.

4.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The selected remedy for Operable Unit No. 2 is the final action to be conducted at the three sites. A Time Critical Removal Action will be implemented at the operable unit for the removal of surficial and buried drums/containers and aboveground storage tanks identified within the operable unit which may pose a threat to human health and/or the environment. These drums and containers are potential sources of soil and/or groundwater contamination. This removal action is currently in the design stage and will be initiated prior to the implementation of groundwater or soil remedial actions.

The selected remedial action authorized by this ROD addresses contaminated groundwater (shallow and deep) originating from Site 82 and contaminated soils throughout the operable unit. The groundwater poses a potential threat to human health and the environment because of the risks from future possible ingestion, and discharge (i.e., migration) into Wallace Creek. The contaminated soils pose a threat to human health and the environment because of the risks from exposure with the soils. The goals of the selected remedy are: (1) to prevent current or future exposure to the contaminated groundwater and contaminated soils, (2) to remediate groundwater contamination for future potential use of the aquifer, and (3) to treat or remove contaminated soils from areas of concern.

Surface water and sediment will not be addressed under this action for the following reasons:

. The overall risk to human health posed by either Wallace Creek or Bear Head Creek is low.

. The remediation of contaminated groundwater and soil at Operable Unit No. 2 will mitigate further contamination of Wallace Creek and Bear Head Creek.

. Direct treatment of surface water or sediment in either creek may result in a greater risk to the environment.

Based on studies conducted at each creek, there does not appear to be a significant impact to the benthic or fish communities. Since low levels of PCBs were detected in a few of the fish samples collected from Wallace Creek, additional studies (sampling and analysis of fish/clam tissue) are planned for Wallace Creek and Bear Head Creek to determine if there may be a bioaccumulation problem. It is not known if the PCBs are related directly to the operable unit.

5.0 SITE CHARACTERISTICS

This section of the ROD presents an overview of the nature and extent of contamination at Operable Unit No. 2 with respect to known or suspected sources of contamination, types of contamination, and affected media. Based on the results of the RI, there are several potential sources of contamination throughout Sites 6 and 82. No potential sources of contamination were identified at Site 9. The nature and extent of the contamination identified at Site 6, Site 82 and the two nearby surface water bodies, Wallace Creek and Bear Head Creek, are itemized below.

Site 6

. The northeast corner of Lot 201 at the former pesticide storage area is contaminated with elevated levels of pesticides and VOCs that may be associated with former waste storage/handling activities. The extent of soil contamination is limited in area since only two sampling locations exhibited elevated contaminant levels.

. The area of Lot 203 near the former railroad spur may be associated with previous disposal activities. A limited number of surface and subsurface soil samples collected near the former railroad spur have
revealed elevated levels of PCB (Aroclor-1260) and polynuclear aromatic hydrocarbons (PAHs). Historical aerial photographs indicate significant activity (i.e., surficial anomalies) in this area of Lot 203.

- Disposal activities may have occurred in the north central portion of Lot 203 where elevated levels of PCBs were detected in subsurface soil samples. In addition to PCBs, elevated levels of PAHs were also detected in this area.

- Military training operations at Lot 203 resulted in a substantial amount of buried debris including communication wire, shell casings, battery packs, small 5-gallon containers, and bivouac wastes. No 55-gallon drums were uncovered in any of the test pit excavations. Trenches identified in historical photographs were primarily excavated as a means to dispose of military-type wastes and not for purposes of disposing hazardous wastes.

- Numerous drums on the surface of Lot 203 present a potential impact to human health and the environment. Samples collected from these drums indicate that some of the drum contents are characteristically hazardous. None of the drums were noted to be leaking.

- Groundwater quality at Lot 203 has not been significantly impacted by former disposal and storage practices. Trace levels of trichloroethene (TCE) were detected in well 6GW15, which is located in the north central portion of Lot 203 where disposal activities may have occurred. Trace levels of TCE and tetrachloroethene (PCE) were detected in well 6GW23. Well 6GW23 is located in the south central portion of Lot 203. The source of VOC contamination in well 6GW23 is unknown. Soil samples collected from this borehole as well as other nearby soil borings did not indicate a source.

- Groundwater quality in the wooded area south of Lot 203 (near the above-mentioned disposal area) has been impacted by former disposal practices. Low levels of VOCs (chloroform, chlorobenzene, phenol) were encountered in two wells.

- The presence of elevated levels of PAHs in soil and low levels of PCBs in sediment in the upper portion of the ravine (i.e., near Lot 203) is most likely due to former disposal practices. This portion of the ravine is filled with debris, including empty and partially-filled 55-gallon drums. In addition, canisters with "DDT" markings were found in the middle section of the ravine (between Lot 203 and Wallace Creek). However, no elevated levels of pesticides were detected in the ravine sediments.

- Soil contamination detected in the ravine has likely migrated to Wallace Creek via surface runoff. Wallace Creek sediments revealed the same constituents detected in ravine soils and sediments.

- PCBs were detected in surface soil near Piney Green Road east of Lot 201. Disposal activities may have occurred in this area, which once served as a training area.

- Disposal activities may have occurred in the wooded area between Lot 201 and 203. One location exhibited moderate levels of PCBs, PAHs, and pesticides in surface soil. The horizontal and vertical extent of this contamination is limited.

- A former disposal area was identified during the test pit investigation in the wooded area between Lot 201 and Lot 203. Numerous 5-gallon containers, bivouac wastes, and battery packs were
encountered. All of the containers were rusted and destroyed to the point where their contents could not be identified; however, solvent-like odors were observed by the sampling team. A sample of the sludge material near the containers revealed that the material is characteristically hazardous due to elevated levels of lead. Chloroform was also detected, but was below Toxicity Characteristics Leaching Procedure (TCLP) regulatory levels.

Site 82

- Shallow and deep groundwater exhibited elevated levels of VOC contaminants. Deep groundwater quality was found to be significantly more contaminated than shallow groundwater quality.

- The horizontal extent of shallow groundwater contamination is defined. The majority of the plume is located in the eastern half of Site 82; it also extends north of Wallace Creek and south into Lot 203. The plume appears to discharge into Wallace Creek. Contaminants have migrated into the deeper portion of the aquifer as evidenced by elevated VOC levels in deep groundwater monitoring wells.

- The horizontal and vertical extent of deep groundwater contamination has been essentially defined. The horizontal extent of off-site contamination west of Site 82 (beyond well 6GW37D), however, has not been fully evaluated. Moreover, the vertical extent has been evaluated to a depth of 230 feet. It is unknown at this time whether contamination extends below 230 feet. A clay layer is present at approximately 230 feet which may impede the vertical migration of contamination.

- A large quantity of drums and debris were observed on the surface and subsurface just near monitoring wells 6GW1S and 6GW1D. Samples collected of the waste material analyzed the waste as No. 6 fuel, which is typically used for heating. Other drums uncovered could not be identified. This area may also be a source of groundwater contamination at Site 82.

Wallace Creek

- The presence of TCE, PCE, and other VOC contaminants in Wallace Creek is due to shallow and possibly deep groundwater discharge.

- Surface runoff from the ravine has impacted sediment quality. Elevated levels of PAHs and PCBs are present in Wallace Creek. These contaminants were also detected in the ravine.

- The source of pesticide contamination may be due to either runoff from the ravine and/or historical pest control spraying practices. The highest levels of pesticides were detected in two sampling stations that were located just downstream of where the ravine discharges into Wallace Creek.

- Some of the fish collected in Wallace Creek exhibited tissue concentrations of PCBs, pesticides and TCE which may be attributable to Site 82 and the ravine area. The levels detected in the fish do not exceed the U.S. Food and Drug Administration (FDA) levels for "safe" consumption. As previously mentioned, additional fish studies are planned for Wallace Creek.

Bear Head Creek

- Sediment quality in Bear Head Creek may be impacted via surface runoff from the wooded areas. Low levels of PAHs, pesticides, and PCBs were
detected in sampling stations which border Site 6. VOC contaminants were also detected in sediment samples; however, the source of VOC contamination is unknown, given that soil and groundwater in this area was not contaminated with VOCs. Pesticides in sediment are not likely associated with disposal practices.

- Inorganic constituents detected in sediment are not likely the result of disposal practices at Sites 6 or 9.

- The fish community at Bear Head Creek appears to be healthy, based on population statistics and observations. None of the fish collected at Bear Head Creek exhibited lesions or other abnormalities that would represent adverse conditions.

- The fish community in Bear Head Creek had elevated levels of pesticides, PCBs, and zinc in tissue. Additional fish studies are planned for Bear Head Creek.

6.0 SUMMARY OF SITE RISKS

As part of the RI, a Human Health Risk Assessment (Section 6.0 of the RI Report) and an Ecological Risk Assessment (under separate cover) were conducted to evaluate the current or future potential risks to human health and the environment resulting from the presence of contaminants identified at Operable Unit No. 2. A summary of the key findings from both of these studies is presented below.

Human Health Risk Assessment

The risk assessment was conducted for several environmental media including soil, groundwater, surface water, sediments, and biota. Potential contaminants of concern (COCs) for each of these media were selected based on prevalence, mobility, persistence, and toxicity. Table 2 lists the potential COCs which were identified and assessed for each media. For soil, the potential COCs included pesticides, PCBs, PAHs, and inorganics. For groundwater, the potential COCs included VOCs, phenol, and inorganics. Surface water COCs included VOCs and inorganics. Sediment COCs included VOCs, PAHs, pesticides, PCBs, and inorganics. The potential COCs for biota included pesticides, PCBs, and a few inorganics.

The exposure routes evaluated in the risk assessment included ingestion, dermal contact, and particulate inhalation of surface soils; future potential ingestion and dermal contact of groundwater; ingestion and dermal contact of surface water and sediments; and ingestion of aquatic biota. Several exposed populations were evaluated in the risk assessment with respect to both current and future potential scenarios for the operable unit. For surface soil and groundwater, civilian personnel and future on-site residents (adults and children) were retained as potentially exposed populations. Adults and adolescents were retained for surface water and sediment exposures. For aquatic biota, adults were evaluated as the potentially exposed population.

As part of the risk assessment, incremental cancer risks (ICRs) and hazard indices (HI) were calculated for each of the exposure routes and potentially exposed populations. An ICR refers to the cancer risk that is over and above the background cancer risk in unexposed individuals. ICRs are determined by multiplying the intake level with the cancer potency factor. The risks are probabilities which are typically expressed in scientific notation (e.g., 1x10^-6 or 1E-6). For example, an ICR of 1E-4 means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at the site if no actions are conducted. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. Therefore, the HI refers to noncarcinogenic effects and is a ratio of the level of exposure to an acceptable level for all COCs. A HI greater than or equal to unity (i.e., 1.0) indicates that there may be a concern for noncarcinogenic health effects.
With respect to Operable Unit No. 2, all of the exposure routes/exposure populations evaluated had ICRs within the USEPA's target risk range of 10E-4 to 10E-6 except for groundwater and biota. USEPA considers the target risk range to be safe and protective of public health. Groundwater at Operable Unit No. 2 had calculated ICRs of 1.71E-4, 2.17E-4, and 3.87E-4 for future on-site residential children, civilian base employees, and future on-site residential adults, respectively. The individual risks from vinyl chloride, arsenic, and beryllium were estimated to contribute 80 percent to the total risk for all of the receptors. With respect to biota, adults who ingest fish obtained from Wallace Creek displayed an ICR value of 1.79E-3, which exceeds the USEPA's target risk range. Approximately 98 percent of this ICR value is due to the presence of PCB-1260 detected in one stripped mullet fillet. (Note: The stripped mullet is a migratory fish; therefore, the presence of PCB may not be due to contamination at Operable Unit No. 2.) The level of PCB-1260 detected in fish sample is below the FDA level for "unsafe" consumption. Additional studies along Wallace Creek will be conducted to better evaluate bioaccumulation of organic and inorganic contaminants.

The calculated HIs for all of the media combined ranged from 0.034 to 3.15. The individual HIs were below 1.0 except for groundwater which had HIs of 0.9, 1.31, and 3.0 for base personnel, future on-site residential adults, and future on-site residential children, respectively. Table 3 presents a summary of the site risks in terms of ICRs and HIs for each medium.

It is important to note that actual or threatened releases of hazardous substance from Operable Unit No. 2, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

Ecological Risk Assessment

An Ecological Risk Assessment was conducted at Operable Unit No. 2 in conjunction with the RI. The objectives of this risk assessment were to determine if past reported disposal activities are adversely impacting the ecological integrity of Wallace Creek, Bear Head Creek, or the ravine; and to evaluate the potential effects on sensitive environments at the operable unit such as wetlands, protected species, and fish nursery areas.

The Ecological Risk Assessment was conducted for several environmental media including soil, surface water, sediments, and fish and crab. Table 4 lists the potential COCs which were identified and assessed in this risk assessment for each media. For soil, the potential COCs included a few VOCs, PAHs, pesticides, PCBs, and inorganics. For groundwater, the potential COCs included VOCs, phenol, and inorganics. Surface water COCs included VOCs and inorganics. Sediment COCs included VOCs, PAHs, pesticides, PCBs, and inorganics. The potential COCs for the fish and crab tissues included a few VOCs, pesticides, PCBs, and a few inorganics.

The exposure routes evaluated in the risk assessment included ingestion and dermal contact of soil, surface water, sediment, and groundwater. Several exposed populations were evaluated in the Ecological Risk Assessment. For surface water and groundwater, fish, crab, benthic macroinvertebrates, birds, and other aquatic and terrestrial life were evaluated as potentially exposed populations. Bottom feeding fish, benthic macroinvertebrates, aquatic vegetation, and other aquatic life were evaluated with respect to sediment exposure. For soil, terrestrial species were evaluated as the potentially exposed population.

Significant findings from the Ecological Risk Assessment are summarized below. Based on the concentrations of several inorganics detected in the surface water and several organics and inorganics detected in the sediment samples collected from Wallace Creek, Bear Head Creek and the ravine, the potential risk for aquatic life in the creeks to be adversely affected by chronic toxicity from the COCs may be moderate to high, provided that the exposure concentration evaluated represents long-term conditions. However, based on studies conducted to date, there does not appear to be any impact on the fish or benthic communities due to site contamination.

With respect to soil quality, the effects on terrestrial life from pesticides, PCBs, PAHs, and several of the inorganics could not be addressed in the Ecological Risk Assessment because of lack of available toxicological information. The surface soil concentrations of inorganics such as arsenic, chromium, copper, and/or zinc detected within Sites 6 and 82 exceeded published toxicological values and potentially may cause adverse effects to terrestrial life.
With respect to fish, the fish community at Wallace Creek and Bear Head Creek appeared healthy, and the population statistics did not indicate that the environment was impacted by the COCs from Operable Unit No. 2. In addition, no anomalies such as lesions, or bacterial or viral infections were observed on any fish. Fish tissue samples collected from Wallace and Bear Head Creeks had elevated concentrations of pesticides, PCBs, TCE, and/or zinc. The risk assessment preliminarily concluded that due to the nature of these COCs, they may be attributed to Operable Unit No. 2; however, further studies are required to verify this conclusion.

With respect to benthic macroinvertebrates, the Macroinvertebrates Biotic Index (MBI) ranged from good/fair (6.46) in the upper reaches of Wallace Creek to poor (9.8) in the lower reaches. The MBI was poor (7.06 to 7.51) in Bear Head Creek. The risk assessment concluded that the adverse habitat in both of these creeks may be created by factors not associated with COCs from Operable Unit No. 2 (e.g., the presence of a salt wedge and low dissolved oxygen).

With respect to terrestrial receptors, such as white-tailed deer, cottontail rabbit and quail, estimates of potential risk were made by comparing total exposure of the COCs to the terrestrial reference values (TRVs) using the Quotient Index (QI) method. A QI value less than 1.0 indicates a low likelihood of adverse effects. For the COCs that had available TRVs, the QI did not exceed 1.0 for any of the terrestrial receptors evaluated.

It is important to note that actual or threatened releases of hazardous substance from Operable Unit No. 2, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

7.0 DESCRIPTION OF ALTERNATIVES

Several Remedial Action Alternatives (RAAs) have been developed to address the contaminated groundwater and/or soils at various areas of concern (AOCs) within Operable Unit No. 2. The AOCs were identified based on a comparison of the media-specific contaminant concentrations detected at the operable unit to the media-specific remediation goals developed in the FS. The AOCs identified for Operable Unit No. 2 include:

- VOC-contaminated groundwater plume (shallow and deep) originating from Site 82.
- Four small areas of groundwater contamination south and west of Open Storage Lot 203.
- Source of groundwater VOC contamination at Site 82 (referred to as Soil AOC1).
- Upper portion of the ravine at Site 6 with elevated levels of PAHs, PCBs, and metals in soil and sediment (Soil AOC2). This may be a source of contamination to Wallace Creek.
- Northcentral portion of Lot 203 with elevated levels of PCBs in soil (Soil AOC3).
- Northwestern portion of Lot 203 with elevated levels of PCBs in soil (Soil AOC4).
- Northeast corner of Lot 201 with elevated levels of pesticides in soil (Soil AOC5).
- Wooded area east of Lot 201 and adjacent to Piney Green Road with elevated levels of PCBs in soil (Soil AOC6).

Figures 4 and 5 show the general location of the above-mentioned AOCs for groundwater and soil, respectively.

No AOCs were identified within Site 9. In addition, drums and containers which have been identified at the sites are being removed from Operable Unit No. 2 through a Time Critical Removal Action. This removal action is currently in the design stage and will be conducted prior to implementing any RAA.

Based on the AOCs identified above, five groundwater RAAs and seven soil RAAs have been and evaluated. A brief overview of each of the RAAs per media is included below. All costs and
implementation times are estimated.

Groundwater RAAs

The Groundwater RAAs listed below were developed and evaluated for Operable Unit No. 2.

  - RAA No. 1 No Action
  - RAA No. 2 Limited Action
  - RAA No. 3 Containment
  - RAA No. 4 Intensive Groundwater Extraction and Treatment
  - RAA No. 5 Groundwater Extraction and Treatment

Except for the "No Action" RAA, all of the Groundwater RAAs have a few common components. RAAs 2 through 5 will include institutional controls such as a long-term groundwater monitoring, aquifer-use restrictions, and deed restrictions. The monitoring activities will be conducted to gauge the effectiveness of the selected remedy and to monitor the nearby supply wells currently active. Deed restrictions will be placed on the operable unit to prohibit the installation of any new water supply wells. Aquifer-use restrictions will be implemented to control the use of existing potable water supply wells that are contaminated. RAAs 3 through 5 include the extraction and on-site treatment of contaminated groundwater followed by discharge to Wallace Creek.

A concise description of how each groundwater alternative will address the contamination at the operable unit as well as the estimated cost and time frame to implement the alternative follows.

  - RAA No. 1: No Action

Capital Cost: $0
Annual Operation and Maintenance (O&M) Costs: $0
Net Present Worth (NPW): $0
Months to Implement: None

The No Action RAA is required under CERCLA to be evaluated through the nine point evaluation criteria summarized on Table 5. This RAA provides a baseline for comparison of other RAAs. Under this RAA, no further action at the operable unit will be implemented to prevent exposure to groundwater contamination.

Potential health risks will remain and no chemical-specific applicable or relevant and appropriate requirements (ARARs) will be met. As the contaminant plumes migrates further off site, potential risks may increase if supply wells are impacted.

  - RAA No. 2: Limited Action

Capital Cost: $0
Annual O&M Costs: $40,000
NPW: $600,000
Months to Implement: 3

RAA No. 2 will include the three institutional controls that are common with RAA Nos. 2 through 5, as previously mentioned. The long-term monitoring program will consist of semiannual sampling and analysis of the groundwater from 21 existing monitoring wells and 3 operational water supply wells. Aquifer-use restrictions will be placed on Supply Wells 637 and 651 which are both currently inactive. Deed restrictions will be implemented which will restrict the installation of any new water supply wells within the vicinity of Operable Unit No. 2.

Under this RAA, the institutional controls, if strictly enforced, will provide protection against risk from groundwater ingestion. Chemical-specific ARARs will not be met with
implementation of this RAA.

. RAA No. 3: Containment

Capital Cost: $2.6 million
Annual O&M Costs: $285,000
NPW: $7.0 million
Months to Implement: 15

Under RAA No. 3, the contaminated groundwater plumes (shallow and deep) originating from Site 82 will be contained to eliminate further contaminant migration via a network of extraction wells placed along the boundaries of the two plumes. Approximately six deep extraction wells will be installed to a depth of 110 feet and pumped at a rate of 150 gallons per minute (gpm). In addition, approximately six shallow extraction wells will be installed to a depth of 35 feet and pumped at a rate of 5 gpm. The extracted groundwater will be treated on site for the removal of organic and inorganic COCs via a combination of applicable treatment options (or a treatment train), and then discharged to either the New River or via injection wells into the Beaufort Aquifer. Groundwater will be treated to meet State and/or Federal standards for the protection of aquatic life (Ambient Water Quality Criteria or North Carolina Water Quality Standards), if discharged into the New River. The treatment train may consist of, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption. The same institutional controls included under RAA No. 2 will also be implemented under this RAA.

The overall objective of this RAA is to reduce the potential for continual groundwater contaminant migration. Even though treatment of the extracted groundwater will be conducted, the RAA will not be designed to treat all of the groundwater from all affected plume areas. Potential risks will be reduced by implementing the institutional controls and by mitigating the migration of the contaminant plumes.

. RAA No. 4: Intensive Groundwater Extraction and Treatment

Capital Cost: $1.4 million
Annual O&M Costs: $227,000
NPW: $4.9 million
Months to Implement: 12

Under RAA No. 4, the contaminated groundwater (shallow and deep) originating from Site 82 with the highest level of contamination will be extracted and treated on site. A network of extraction wells will be placed in the plume areas with the highest contaminant levels. Approximately two deep extraction wells (110 feet deep) will be installed and pumped at a rate of 150 gpm. In addition, three shallow (35 feet deep) extraction wells will be installed and pumped at a rate of 5 gpm. The extracted groundwater will be treated via a treatment train similar to the one mentioned in RAA No. 3 (with the exception of size). Groundwater will be treated to meet State and Federal standards for protection of aquatic life, and discharged to Wallace Creek. The same institutional controls included under RAA No. 2 will also be implemented under this RAA.

The overall objective of this RAA is to focus on the worst area of groundwater contamination. The rationale for this approach is that the major source areas of the groundwater contamination can be isolated and handled more feasibly than the entire area of impacted groundwater. The cones of influence created by the extraction wells are expected to reach the downgradient boundary of the plume. Groundwater extraction and treatment will be employed until the remediation goals of the aquifer are met.

. RAA No. 5: Groundwater Extraction and Treatment

Capital Cost: $3.5 million
Annual O&M Costs: $355,000
NPW: $8.9 million
Months to Implement: 15-20

Under RAA No. 5, the contaminated groundwater plumes (shallow and deep) originating from Site 82 will be remediated via extraction and on-site treatment. A network of extraction wells will be
placed along the boundaries and within the two plume areas. Approximately eight deep extraction wells will be installed to a depth of 110 feet and pumped at a rate of 150 gpm. In addition, approximately twelve shallow extraction wells will be installed to a depth of 35 feet and pumped at a rate of 5 gpm.

The extracted groundwater will be treated via a treatment train similar to the one mentioned in RAA No. 3 (with the exception of size). Treated groundwater will be discharged to either the New River or via injection wells into the Beaufort Aquifer. The effluent levels will meet State or Federal standards for the protection of aquatic life. The same institutional controls included under RAA No. 2 will also be implemented under this RAA.

The overall objective of this RAA is to reduce the COCs in the groundwater to drinking water standards for Class I aquifers, and to mitigate the potential for further migration of the existing groundwater plumes. The primary difference between this alternative and RAA No. 4 is that a shorter time frame is expected for meeting the remediation goals.

Soil RAAs

The Soil RAAs listed below were developed and evaluated for Operable Unit No. 2.

- RAA No. 1: No Action
- RAA No. 2: Capping
- RAA No. 3: On-Site Treatment
- RAA No. 4: Capping and On-Site Treatment (All AOCs)
- RAA No. 5: Off-Site Treatment/Disposal
- RAA No. 6: Capping and On-Site Treatment (Limited AOCs)
- RAA No. 7: On-Site Treatment and Off-Site Disposal

A concise description of how each soil alternative will address the contamination at the operable unit as well as the estimated cost and timeframe to implement the alternative follows.

- RAA No. 1: No Action

Capital Cost: $0
Annual O&M Costs: $0
NPW: $0
Months to Implement: None

The No Action RAA is required under CERCLA to be evaluated through the nine point evaluation criteria (Table 5). This RAA provides a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented to prevent exposure to contaminated soil. Potential health risks will remain and no chemical-specific ARARs will be met.

- RAA No. 2: Capping

Capital Cost: $2.8 million
Annual O&M Costs: $40,000
NPW: $3.4 million
Months to Implement: 6

Soil RAA No. 2 includes the excavation and consolidation of the soils from all of the Soil AOCs and placement under a fenced multilayered cap located within Open Storage Lot 203 (Site 6). Approximately 19,000 cubic yards (cy) of contaminated soil will be excavated and spread to a thickness of one to two feet in the designated cap area located within Lot 203. A multilayered cap, with the approximate dimensions of 400 feet wide by 700 feet long, will be placed over the compiled soils. The cap will consist of a vegetated top cover, a middle drainage layer, and a
low permeability bottom layer. Long-term groundwater monitoring of six existing monitoring wells will be included under this RAA. In addition, the capped area will be fenced and deed restrictions will be enforced restricting any earth-moving activities within the capped area.

The objectives of this RAA are to consolidate the contaminated soils into one area, to prevent the potential for direct contact with the soils, and to prevent the potential for the migration of contaminants via storm water infiltration. Even though the contaminated soils will not be removed from the site, potential risks due to exposure to the COCs in the soils will be reduced as long as the cap is maintained. This alternative does not satisfy the statutory preference for treatment.

. RAA No. 3: On-Site Treatment

Capital Cost: $1.5 to $6.6 million
Annual O&M Costs: $0 to $330,000 (up to five years)
NPW: $1.7 to $6.6 million
Months to Implement: 15-60 (dependent on treatment option)

RAA No. 3 includes the excavation of up to 19,000 cy of contaminated soil and treatment on site via a combination of one or more treatment options such as land treatment, in situ volatilization, chemical dechlorination, or incineration. Land treatment would be applicable to three of the AOCs at the operable unit. In situ volatilization would be applicable to only Soil AOC1 (contaminated with VOCs); whereas chemical dechlorination would only be applicable to the three AOCs with PCBs. Mobile incineration would be applicable to all of the AOCs. Table 6 presents a listing of the technologies that are applicable to each of the six soil AOCs. For purposes of the FS, four possible combinations of these treatment options were evaluated: (1) on-site incineration of soils from all of the AOCs, (2) land treatment of soil from AOCs 1, 2, and 5 with incineration of the soil from AOCs 3, 4, and 6, (3) in situ volatilization of the soil from AOC 1 with incineration of the remaining soil, and (4) in situ volatilization of the soil from AOC 1, land treatment of soil from AOCs 2 and 5, and chemical dechlorination of soil from AOCs 3, 4 and 6.

Under this RAA, excavation of the soils removes the sources of contamination, and treatment will reduce the toxicity of the COCs. This RAA will meet the chemical-specific ARARs and will be protective of human health and the environment.

. RAA No. 4: Capping and On-Site Treatment (All AOCs)

Capital Cost: $926,000
Annual O&M Costs: $30,000-$80,000
NPW: $1.6 million
Months to Implement: 12-60 (dependent on treatment option)

Under RAA No. 4, the soils at PCB-contaminated AOCs (800 cy) will be excavated and placed under a soil cover placed within Open Storage Lot 203; and the soil from the remaining AOCs (18,200 cy) will be treated on site by a combination, or by one of the four treatment options mentioned under RAA No. 3. The excavated PCB-contaminated soils will be spread to a thickness of one to two feet in the designated cap area located within Lot 203. A soil cover, with the approximate dimensions of 200 feet by 200 feet, will be placed over the compiled soils. The soil cover will consist of a vegetative cover and a low permeability layer. Long-term groundwater monitoring of six existing monitoring wells will be included under this RAA. In addition the capped area will be fenced and deed restrictions will be enforced restricting any earth-moving activities within the capped area.

The principle objectives of this RAA are to consolidate the PCB-contaminated (more difficult to treat) soils in one area and to treat the other contaminated soils on site.

Potential risks due to exposure to the COCs in the soils will be reduced as long as the soil cover is maintained. The statutory preference for treatment is partially satisfied under this RAA.

. RAA No. 5: Off-Site Treatment/Disposal
Soil RAA No. 5 includes the excavation of soil from all of the Soil AOCs (19,000 cy) and off-site treatment and/or disposal. The treatment/disposal facility will have to be permitted to accept low levels (i.e., less than 50 parts per million) of PCBs. Based on available information, it appears that the soils can be disposed as nonhazardous waste. A possible landfill is located in Pinewood, South Carolina, approximately 200 miles away.

Potential risks due to exposure to the soil COCs will be reduced under this RAA since the contaminants are removed from the sites. The statutory preference for treatment will be satisfied if the excavated soils are treated and not just disposed.

RAA No. 6: Capping and On-Site Treatment (Limited AOCs)

Capital Cost: $710,000
Annual O&M Costs: $30,000 - $80,000
NPW: $1.4 million
Months to Implement: Up to 60 months to complete

RAA No. 6 is essentially the same as Soil RAA No. 4 except that three of the Soil AOCs (Nos. 2, 3, and 6) will not be remediated. This RAA is based on a land use scenario that Operable Unit No. 2 would only be used for open storage and not residential housing (future scenario). Based on this rationale, only Soil AOC1, AOC4 and AOC5 exhibit contaminants levels exceeding the established action levels for the protection of base personnel working at the sites, and therefore, would require remediation.

Under this RAA, soils from AOC4 and AOC5 (400 cy) will be excavated and placed under a soil cover, and soils from AOC1 (16,500 cy) will be treated on site via in situ volatilization. The same soil cover and institutional controls mentioned under soil RAA No. 4 are included under this RAA. Potential risks due to exposure to the soil COCs will be reduced as long as the soil cover is maintained.

RAA No. 7: On-Site Treatment and Off-Site Disposal

Capital Cost: $1.3 million
Annual O&M Costs: $50,000 for 5 years
NPW: $1.5 million
Months to Implement: Up to 60 months to complete

Under RAA No. 7, the soils from Soil AOC1 (16,500 cy) will be treated on site via in situ volatilization and the soils from the remaining AOCs (2,500 cy) will be excavated and disposed off site. The soils should be able to be landfilled as nonhazardous waste since the levels of PCBs detected at the site were below 50 parts per million, and the soil is not characteristically hazardous. A possible landfill is located in Pinewood, South Carolina, approximately 200 miles from Operable Unit No. 2. The details of the in situ volatilization system will be determined during the design stage.

The objective of this RAA is to treat the largest area and the easiest to treat Soil AOC and to dispose of the more difficult to treat Soil AOCs off site. The low levels of PCBs detected in the soils do not justify on-site treatment. Under this RAA, potential risks due to contaminated soil exposure will be reduced.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the groundwater and soil RAAs using the nine evaluation criteria in order to select a site remedy Tables 7 and 8 present a summary of this detailed analysis for Groundwater RAAs and Soil RAAs, respectively. A brief summary of each alternative's strengths and weaknesses with respect to the evaluation criteria follows. A glossary of the evaluation criteria has previously been noted on Table 5.
Groundwater RAA Comparative Analysis

Overall Protection of Human Health and the Environment

RAA No. 1 (No Action) does not provide protection to human health or the environment. Under the Limited Action RAA (No. 2), institutional controls would provide protection to human health, although the potential for further migration of the contaminated groundwater would still exist. All of the remaining Groundwater RAAs provide some protection of human health and the environment. RAA No. 3 provides protection through preventing further migration of the contaminated groundwater plume. RAA No. 4 provides protection through removing and treating the most contaminated areas of groundwater contamination. RAA No. 5 provides the quickest method of protection since both migration is prevented and also the most contaminated areas are treated. It should be noted that RAAs Nos. 4 and 5 may result in complete restoration of the plume over time; however, remediation will continue for many years due to the magnitude and complexity of the groundwater problem.

Compliance with ARARs

RAA Nos. 1 and 2 would potentially exceed Federal and State ARARs. RAA Nos. 3, 4, and 5 would potentially meet all of their respective ARARs for the treated effluent. RAA No. 3 would not meet ARARs associated with a Class I aquifer. In time, RAA Nos. 4 and 5 would meet the remediation goals for a Class I aquifer.

Low levels of VOCs and the inorganics lead, chromium, and manganese in shallow groundwater were detected at "random" locations throughout Site 6, including background wells. No source of this contamination was evident. A waiver to not meet ARARs for groundwater under Site 6 would be required on the basis that it would not be technically feasible to remediate "random" areas of groundwater contamination from an engineering perspective. These wells would be periodically monitored as part of RAA Nos. 3, 4, and 5.

Long-term Effectiveness and Permanence

RAA No. 1 would not reduce potential risks due to exposure to contaminated groundwater. Risks would be reduced under RAA Nos. 2 through 5 through the implementation of the institutional controls and/or treatment. The reliability of enforcing aquifer-use restrictions is effective. RAA Nos. 3 through 5 would provide additional long-term effectiveness and permanence because they use a form of treatment to reduce the potential hazards posed by the COCs present in the groundwater aquifer.

With respect to the adequacy and reliability of controls, the groundwater pump and treat systems included under RAA Nos. 3, 4, and 5 should be reliable and adequate. The institutional controls included under RAA Nos. 2 through 5 would be reliable and adequate if strictly enforced. RAA No. 1 does not include any type of controls.

Initially, all of the RAAs would require a 5-year review to ensure that adequate protection of human health and the environment is being maintained. RAA No. 5 would be the first RAA that would not need the 5-year review (i.e., once the remediation goals are met).

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment

RAA Nos. 3, 4, and 5 include treatment such as air stripping, activated carbon adsorption, and metals removal. RAA Nos. 1 and 2 do not include any form of treatment. RAA Nos. 3, 4, and 5 would satisfy the statutory preference for treatment and would provide reduction of toxicity, mobility and/or volume of contaminants in the groundwater.

Short-term Effectiveness

Risks to community and workers are not increased with the implementation of RAA Nos. 1 and 2. Current impacts from existing conditions would continue under these two RAAs. Under RAA Nos. 3, 4, and 5, risks to the community and workers would be slightly increased due to a temporary increase in dust production and volatilization during the installation of the piping for the groundwater treatment system (during treatment operations for the workers). In addition, aquifer
draw down would occur under RAA Nos. 3, 4, and 5. Discharge of the treated effluent to Wallace Creek under RAA No. 4 is not expected to increase risks to the aquatic habitat.

Implementability

No construction, operation, or administrative activities are associated with RAA No. 1. There are no construction or operation activities associated with RAA No. 2 other than groundwater sampling which is easily performed. The remaining RAAs would require operation of a groundwater pump and treatment system which can be labor intensive. In addition, these RAAs would be required to meet the substantive requirements of an NPDES permit for discharging the treated effluent. Under RAA No. 4, the treated effluent can be discharged to Wallace Creek without significant impacts to flow or ecological risks. However, due to the volume of flow anticipated under RAA Nos. 3 and 5, the treated effluent would need to be discharged to the New River or via deep injection wells.

Cost

In terms of cost-effectiveness, RAA No. 1 has the lowest estimated NPW ($0), followed by RAA No. 2 ($600,000), RAA No. 4 ($4.9 million), RAA No. 3 ($7.0 million), and RAA No. 5 ($8.9 million).

USEPA/State Acceptance

Both the USEPA and the NC DEHNR had concerns that the No Action Alternative (RAA No. 1) and the Limited Action Alternative (RAA No. 2) would not be protective since high levels of COCs would remain in the deeper portions of the aquifer (which is a potable water supply source). Both agencies were in favor of the treatment options involving restoration of the aquifer (i.e., RAA Nos. 4 and 5), but had concerns regarding the impacts to Wallace Creek due to the discharge. Under RAA No. 4, the impacts to Wallace Creek were not significant due to the lower discharge rate. Both USEPA and the North Carolina DEHNR concurred with the selected remedy.

Community Acceptance

Based on the comments received during the public meeting and public comment period, the public does not appear to be opposed to the remedy selected for Operable Unit No.2.

Soil RAA Comparative Analysis

Overall Protection of Human Health and the Environment

Soil RAA Nos. 3 (On-Site Treatment), 5 (Off-Site Treatment/Disposal), and 7 (On-Site Treatment and Off-Site Disposal) would provide the highest level of protection to human health and the environment since the soil contaminated at levels above the remediation goals will be excavated and/or treated. RAA Nos. 4 and 6 (Capping and On-Site Treatment) would provide the next highest degree of protection to human health and the environment since some of the contaminated soils would be treated on site and the remaining soils above the remediation goals would be capped (which will prevent exposure via direct contact). RAA No. 2 (Capping) will provide the next highest degree of protection since the potential for direct contact with the contaminated soils would be reduced via the placement of a cap. RAA No. 1 (No Action) provides no protection to human health or the environment.

Compliance with ARARs

RAA Nos. 1, 2, 4, and 6 would not meet all of the chemical-specific ARARs for the soil COCs remaining at the sites. RAA Nos. 3, 5, and 7 would meet all of the chemical-specific ARARs. Action-specific and location-specific ARARs should be met by all of the RAAs evaluated.

Long-term Effectiveness and Permanence

The treatment RAAs (Nos. 3, 5, and 7) would have the highest level of long-term effectiveness and permanence since the soils contaminated with COCs at levels above the remediation goals will be treated. The partial capping/partial treatment RAAs (Nos. 4 and 6) would have the next highest level of effectiveness and permanence since the majority of contaminated soils will be treated. Capping of soils can have long-term effectiveness if the cap or cover is adequately
designed and maintained. Capping is not considered a permanent option. Therefore, RAA No. 2 would have the next highest level of long-term effectiveness and permanence, followed by RAA No. 1 (No Action).

With respect to the adequacy and reliability of controls, RAA No. 5 (Off-Site Treatment/Disposal) would have the highest rating since only common earth moving equipment would be required at the sites. The treatment options included under RAAs 3, 4, 6, and 7 would have adequate controls. Capping included under RAA No. 2 can be a reliable control option if properly maintained. The soil cover included under RAA Nos. 4 and 6 can be a reliable control option for preventing dermal contact if properly maintained. RAA No. 1 does not include any type of controls.

RAA No. 5 would not require a 5-year review since all of the contaminated soils will be removed from the sites. RAA Nos. 3 and 7 may require a 5-year review based on the duration of the treatment process. RAA Nos. 2, 4, and 6 would require a 5-year review to ensure that adequate protection of human health and the environment is being maintained through use of the cap/cover. RAA No. 1 would require a 5-year review to ensure that the existing conditions at the sites are not deteriorating.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment

RAA No. 3 (On-Site Treatment) includes complete treatment of all soils with COCs above the remediation goals. RAA No. 5 (Off-Site Treatment/Disposal) may include complete treatment of all the excavated soils, but if applicable, this option may not include any form of treatment, only disposal (i.e., if all of the wastes are nonhazardous or if the level of contamination is below RCRA land disposal restrictions for hazardous soils). The partial treatment alternatives (RAA Nos. 4, 6, and 7) would include some form of treatment (e.g., in situ volatilization, land treatment, or incineration) for the majority of the contaminated soil. RAA Nos. 1 and 2 do not include any form of treatment.

Short-term Effectiveness

It is not expected that the implementation of any of the RAAs would cause adverse effects to human health and the environment. Workers could be exposed to contaminated soils during excavation activities which are applicable to RAA Nos. 2 through 7; installation of caps/covers which are applicable to RAA Nos. 2, 4, and 6; and operation of the treatment systems which are applicable to RAA Nos. 3, 4, 6, and 7. Implementation of appropriate worker health and safety precautions would mitigate any threat. No adverse threats to the community are anticipated. No additional environmental impacts are expected.

Implementability

All of the RAAs are technically feasible, and therefore implementable. Since no actions are associated with RAA No. 1, it would be the easiest to implement. In terms of technical implementability, the next easiest RAA to implement would be RAA No. 5 since it only requires common soil excavation and hauling activities. RAA No. 2 would be the next easiest RAA to technically implement, since it includes soil excavation and other earth moving activities (i.e., capping). The remaining RAAs (Nos. 3, 4, 6, and 7) should be relatively the same to implement. Note that RAAs 3, 4, 6, and 7 would require some type of treatability testing. In terms of administrative feasibility, RAA Nos. 5 and 7 may be more difficult to implement due to the unknown availability/capacity of an appropriate treatment/disposal facility.

Cost

In terms of cost-effectiveness, RAA No. 1 has the lowest estimated NPW ($0); followed by RAA No. 6 ($1.4 million); RAA No. 7 ($1.5 million); RAA No. 4 ($1.6 million); RAA No. 2 ($3.4 million), RAA No. 5 ($5.5 million for disposal), and RAA No. 5 ($20.4 million for treatment). The NPW for the four treatment combination options under RAA No. 3 ranged from $1.7 million to $6.6 million.

USEPA/State Acceptance

The USEPA or the NC DEHNR did not express any major concerns over any of the alternatives. They are in favor of alternatives which include some form of treatment. Both USEPA and NC DEHNR
concurring with the selected remedy for the contaminated soils.

Community Acceptance

Based on the comments received during the public meeting and public comment period, the public does not appear to be opposed to the remedy selected for Operable Unit No. 2.

9.0 SELECTED REMEDY

This section of the ROD focuses on the selected remedy for Operable Unit No. 2. The major treatment components, engineering controls, and institutional controls of the remedy will be discussed along with the estimated costs to implement the remedial action. In addition, the remediation goals to be attained at the conclusion of the remedial action will be discussed.

Remedy Description

The selected remedy for Operable Unit No. 2 is a combination of Groundwater RAA No. 4 (Intensive Groundwater Extraction and Treatment) and Soil RAA No. 7 (On-Site Treatment and Off-Site Disposal). Overall, the major components of the selected remedy include:

- Collecting contaminated groundwater in both the shallow and deep portions of the aquifer through a series of extraction wells installed within the plume areas with the highest contaminant levels. Approximately two deep extraction wells will be installed to a depth of 110 feet and pumped at a rate of 150 gpm. In addition, three shallow extraction wells will be installed to a depth of 35 feet and pumped at a rate of 5 gpm.

- Treating the extracted groundwater for organics and inorganics removal via a treatment train which may consist of, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption.

- Discharging the treated groundwater to Wallace Creek.

- Restricting the use on nearby water supply wells which are currently inactive/closed (Nos. 637 and 651), and restricting the installation of any new water supply wells within the operable unit area.

- Implementing a long-term groundwater monitoring program to monitor the effectiveness of the groundwater remedy and to monitor the nearby water supply wells that are currently active. Under this monitoring program, groundwater from 21 existing monitoring wells and 3 nearby supply wells (Nos. 633, 635, and 636) will be collected on a semiannual basis and analyzed for Target Compound List volatiles. Additional wells may be added to the monitoring program, if necessary.

- Implementing in situ treatment via volatilization (or vapor extraction) of approximately 16,500 cubic yards of VOC-contaminated soils.

- Excavating approximately 2,500 cubic yards of PCB and pesticide contaminated soils for off-site disposal (nonhazardous). A possible off-site landfill is located in Pinewood, South Carolina, approximately 200 miles away from the operable unit.

The proposed locations of the major components of the selected remedy are presented on Figures 6 and 7.

Estimated Costs

The estimated capital costs associated with the selected remedy is approximately $2.8 million. Annual O&M costs of approximately $227,000 are projected for the operation of the groundwater treatment system and the sampling of the monitoring wells and supply wells. This annual cost is
for 30 years. The annual O&M cost projected for the operation of the in situ volatilization system is approximately $50,000 for a 5 year duration. Assuming an annual percentage rate of 5 percent, these costs equate to a NPW of approximately $6.5 million. Table 9 presents a summary of this cost estimate for the major components of the selected remedy.

Remediation Goals

The selected remedy will be operated until the remediation goals developed in the FS are met. The remediation goals for the groundwater COCs and the soil COCs are listed on Table 10. Where applicable, the groundwater remediation goals were based on Federal Maximum Contaminant Levels (MCLs) and North Carolina groundwater standards. In the absence of the above-mentioned criteria, a risk-based action level (based on an ICR of 1.0E-4 and an HI of 1.0) was developed. The soil remediation goal for PCBs was based on the Toxic Substance Control Act (TSCA) guidance for non-residential use (i.e., industrial area). The other soil remediation goals were based on risk-based action levels for an ICR of 1.0E-4 and an HI of 1.0.

For groundwater, the semiannual monitoring results of the groundwater plumes will determine when the remedial action has met the remediation goals. For the soils to be treated via in situ volatilization (AOC1), the results from routine sampling of the treated soils will determine when the treatment is complete. Confirmation soil sampling results during excavation activities will be used for the remaining soils to be removed from the operable unit.

Prior to discharging the treated groundwater to Wallace Creek, effluent levels which are protective of aquatic life and/or human health will be met. The effluent criteria for the COCs are presented on Table 11. The criteria is based on the following standards: the North Carolina Ambient Water Quality Criteria for Tidal Saltwaters (Aquatic or Human Health), North Carolina Ambient Water Quality Criteria for Freshwater Classes, Federal Ambient Water Quality Criteria for Protection of Marine Life (Acute), and Federal Maximum Contaminant Level (MCL).

10.0 STATUTORY DETERMINATIONS

A selected remedy must satisfy the statutory requirements of CERCLA Section 121 which include: (1) be protective of human health and the environment, (2) comply with ARARs (or justify an ARAR waiver), (3) be cost-effective, (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The evaluation of how the selected remedy for Operable Unit No. 2 satisfies these requirements is presented below.

Protection of Human Health and the Environment

The selected remedy provides protection to human health and the environment through extraction and treatment of groundwater, implementation of groundwater related institutional controls, the in situ treatment of VOC-contaminated soils, and the excavation and removal of PCB and pesticide contaminated soils. The institutional controls, which include aquifer use restrictions, well placement restrictions, and groundwater monitoring, will reduce the potential for ingestion of contaminated groundwater. The volatilization of the VOC-contaminated soil will eliminate the threat of exposure to the most mobile contaminants from direct contact with or ingestion of the contaminated soil, as well as migration of contaminants to the water table. By removing and disposing the PCB and pesticide contaminated soils off site, the potential risks associated with exposure to these contaminants is eliminated.

Compliance With Applicable or Relevant and Appropriate Requirements

The selected remedy will either comply with all ARARs or have the appropriate waivers. Specifically, the remedy will meet (or be waived from) the Federal Drinking Water Maximum Contaminant Levels, the North Carolina Water Quality Criteria for Groundwater, Clean Water Act discharge criteria, and TSCA PCB regulations. In addition, the selected remedy will comply with the appropriate parts of the Department of Transportation Rules for Transportation, the Fish and Wildlife Coordination Act, the Federal Endangered Species Act, the Protection of Wetlands Order, and the Floodplain Management Order.
Cost-Effectiveness

The selected remedy affords overall effectiveness proportional to its costs. With respect to the groundwater-related remedial actions, the selected remedy is the most cost-effective of the "treatment" alternatives. The only Groundwater RAAs that are more cost-effective than the selected remedy are the Limited Action (i.e., institutional controls only) and the No Action RAAs. With respect to the soil-related remedial actions, the selected remedy is the most cost-effective RAA that includes remediation of all of the Soil AOCs, with the exception of the No Action RAA.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy represents a permanent solution with respect to the principal threats posed by the groundwater and soil contamination. Therefore, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The groundwater treatment system represents a permanent solution. The in situ volatilization of the VOC-contaminated soils represents both a permanent solution and an alternative treatment technology.

Preference for Treatment as a Principal Element

By treating the extracted groundwater and the VOC-contaminated soils (which accounts for the majority of the contaminated soil), the selected remedy addresses two of the principal threats posed by the operable unit through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

11.0 RESPONSIVENESS SUMMARY

Overview

At the time of the public comment period (August 24 through September 23, 1993), the Department of Navy/Marine Corps had already selected a preferred alternative for Operable Unit No. 2 (Sites 6, 9, and 82). The preferred alternative addresses soil and groundwater contamination problems throughout Operable Unit No. 2. The preferred alternative specified in the ROD involves the following: pump and treat of contaminated shallow and deep groundwater; in situ treatment via vapor extraction of volatile organic compounds in soil (Area of Concern No. 1); and excavation and off-site disposal of pesticide- and PCB-contaminated soil at Area of Concern Nos. 2 through 6. Treatment of the groundwater would involve metals removal, air stripping, and carbon adsorption. The treated groundwater would be discharged into Wallace Creek.

Judging in part from the lack of written comments received during the public comment period, and the comments received from the audience at the public meeting of August 24, 1993, the EPA Region IV and the NC DEHNR support the preferred alternatives for addressing soil and groundwater contamination. Members of the community who attended the public meeting on August 24, 1993 did not appear to have any opposition to the preferred soil or groundwater alternatives.

Background On Community Involvement

A record review of the MCB Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and base/community clubs. The file search did not locate written Installation Restoration Program concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Sites 6, 9, and 82). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants for the August 1993, community relations interviews. Neither group was available for the interviews.

Community relations activities to date are summarized below:
Conducted additional community relations interviews, February through March, 1990. A total of 41 interviews were conducted with a wide range of persons including base personnel, residents, local officials, and off-base residents;

Prepared a Community Relations Plan, September, 1990;

Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-base residents, military and civilian interests;

Prepared a revised Preliminary Draft Community Relations Plan, August 1993;

Established two information repositories;

Established the Administrative Record for all of the sites at the base;

Released PRAP for public review in repositories, August 1993;

Released public notice announcing public comment and document availability of the PRAP, August 18 - 24, 1993;

Held Technical Review Committee meeting, August 24, 1993, to review PRAP and solicit comments; and

Held public meeting on August 24, 1993 to solicit comments and provide information. Approximately 10 people attended. The public meeting transcript is available in the repositories.

Summary of Comments Received During the Public Comment Period and Agency Responses

As previously mentioned, no comments (written) were received during the public comment period. However, several questions/comments were generated at the August 24, 1993 public meeting. The public meeting was held to discuss the Department of Navy/Marine Corps’ preferred alternatives. Many of the questions pertained to matters that are not related to the preferred alternatives (e.g., a member of the audience asked whether the consultant was obtaining good soil profiles of the entire base and region). These types of questions and answers will not be addressed as part of this Responsiveness Summary; however, specific answers to these questions are documented in the transcript to the public meeting. The transcript has been included in the Administrative Record. A summary of comments pertaining to the proposed alternatives and site investigations is given below.

Impacts to the Value of Wallace Creek from Treated Groundwater Discharge

(1) One member of the audience at the public meeting questioned what impact the discharge of treated groundwater would have on Wallace Creek.

Navy/Marine Corps Response: The discharge of treated groundwater into Wallace Creek should have no significant impact for several reasons: (1) the creek already receives a significant amount of groundwater discharge; (2) the effluent quality will be protective of aquatic life; and (3) Wallace Creek is believed to be large enough (from a flow and volume standpoint) to support the additional effluent loading.

Contamination in Buried Drums at Operable Unit No. 2 and Mode of Disposal

(1) One member of the audience at the public meeting wanted clarification with respect to "threatened releases" as stated in the feasibility study report.

Navy/Marine Corps Response: The contents remaining in the buried drums, which will be remediated as part of a Time-Critical Removal Action, constitute a threatened release of contaminants to the environment. In addition, it is believed that the contents of the drums have in some cases migrated from the drums via corrosion and into subsurface soil and possibly groundwater. Therefore, the drum contents are a threat to the environment.
One member of the audience asked what will the Navy/Marine Corps do with the drums once they are excavated and removed.

**Navy/Marine Corps Response:** Drums excavated from the former disposal areas will be overpacked (placed within a new, secure container and sealed) and taken to either a landfill for disposal, or to an incinerator, depending on the contents of the drum. If the contents are hazardous and require treatment, the drums will be incinerated, if technically feasible. If the contents are nonhazardous, the drums may be disposed of in a landfill without treatment.

**Long-Term Impacts to Human Health, Animals, and Plant Life via Bioaccumulation**

(1) A few members of the audience were concerned with long-term impacts to human health (e.g., liver damage or cancer) from possible exposure to site contaminants.

**Navy/Marine Corps Response:** This assessment was not performed as part of the remedial investigation or human health risk assessment. The risk assessment goes as far as estimating the potential or risk of acquiring carcinogenic and noncancerous diseases under no action scenario. This is known as the "baseline risk assessment." However, the baseline risk assessment does not address actual impacts (e.g., cancer rates of former workers at Storage Lot 203) to former workers or other individuals who may have been exposed to contaminated soil or groundwater. The Agency for Toxic Substances and Disease Registry (ATSDR) is a Federal public health agency affiliated with the U.S. Department of Health and Human Services. ATSDR is performing a Public Health Assessment to evaluate whether exposure to site contaminants is resulting in impacts to human health. As part of this assessment, ATSDR will look at community-wide rates of illness, disease, and death and compare these with national and state rates.

(2) A few members of the audience asked about contaminant uptake in wildlife (other than fish) and plant life. Specifically, are animal studies being conducted to assess bioaccumulation?

**Navy/Marine Corps Response:** Performing ecological risk assessments is in the infancy stage as compared to performing human health risk assessments. To date, collecting animals for chemical uptake analysis is not the norm with the exception of fish and shellfish. However, this appears to be changing. Some studies are now being considered by the ecological community that include analysis of earthworms and field mice that will help assess ecological impacts. As more studies are completed, newer guidance from EPA will likely result. It is possible that future ecological investigations will put more emphasis on plant and animal uptake. At present, the ecological investigations are performed by comparing the contaminant concentrations in soil, surface water, or sediment with literature values to estimate potential impacts to aquatic or terrestrial life. As in the case of Operable Unit No. 2, fish and shellfish samples were submitted for chemical analysis to evaluate whether site contaminants are bioaccumulating.

**Remaining Concerns**

There were no issues or concerns with respect to the preferred alternatives that the Department of the Navy/Marine Corps were unable to address. Therefore, there are no remaining issues to resolve.
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC

EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL (SITE 5)
USMC/CHEM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/24/1993
Operable Unit: 03
ROD ID: EPA/ROD/R04-93/161

Media: Soil, GW

Contaminant: VOCs, Other Organics, Metals
Abstract: The 210-acre USMC Camp Lejeune Military Reservation (Operable Unit 3) site is part of a 170-square mile Marine Corps Training Base located approximately 15 miles southeast of Jacksonville, Onslow County, North Carolina. The site borders Wallace Creek to the north and lies two miles east of the New River, and consists of three sites (sites 6, 9, and 82) that were identified as part of the Department of Defense's Installation Restoration Program (IRP). From the 1940s to the late 1980s, the 177-acre site 6 reportedly was used for the disposal and storage of wastes, supplies, and transformers containing PCBs. Wastes also reportedly disposed of at the site include PCBs, cleaning solvents, electrolytes from used batteries, and waste oils. The wooded areas surrounding the open storage areas are littered randomly with debris, including communication wire, spent ammunition casing, and empty or rusted drums. Currently, part of the site is used to store military vehicles and equipment, lumber, and other supplies. The upper portion of a ravine at site 6 also was reportedly used as a disposal area. Battery packs, drums, fencing, tires, wire cables, respirator cartridges, empty drums, and other surficial debris are present at the site, confirming this report. The 2.6-acre site 9 borders site 6 to the south and is approximately 500 feet south of Bear Head Creek. Since the early 1960s, site 9 has been used as a fire fighting training area and until 1981, onsite training exercises were conducted in an unlined pit. The site currently contains an asphalt-lined fire training pit, an oil/water separator, four above-ground storage tanks (ASTs), three propane tanks, and a fire tower. Flammable liquids used in training activities include used oil, solvents, contaminated unleaded fuels, and 30,000 to 40,000 gallons of JP-4 and JP-5 fuels. The oil/water separator is located next to the fire training pit and is used to collect the water used in the training exercises and storm water that falls into the pit. The free product recovered in the oil/water separator is disposed of offsite. Site 82 forms the north border of site 6 and contains about 30 acres of woodlands. This area is littered randomly with debris, including communication wire, spent ammunition casings, and empty or rusted drums. However, there is no known documentation of the quantity or location of the disposal of VOCs. In 1983, an Initial Assessment Study (IAS) identified a number of areas within the facility, including sites 6 and 9, as potential sources of contamination. From 1984 to 1987, subsequent investigations identified the presence of pesticide contamination at site 6, and VOC contamination in ground water and surface water. A 1991 investigation at site 82 revealed organic contamination in soil, sediment, ground water, and surface water. In 1992, a detailed site investigation revealed organic contamination consisting of PCBs, pesticides, VOCs, and SVOCs, and inorganic contamination consisting of barium, cadmium, chromium, lead, manganese, and zinc in soil, ground water, surface
water, and sediment. In addition, various drums, containers, above-ground storage tanks (ASTs), and other debris were noted throughout sites 6 and 82. A time critical removal action will be implemented at OU3 to address the surficial debris. During this action, over 220 drums, 5 ASTs, and numerous small containers will be removed. In 1992 and 1993, further analyses of contamination at OU3 and OU4 were conducted, respectively. This ROD addresses a final remedy for contaminated shallow and deep ground water originating from site 82 and contaminated soil, as OU3. Future RODs will address environmental contamination at the 9 remaining OUs at Camp Lejeune. The primary contaminants of concern affecting the soil and ground water are VOCs, including benzene, PCE, and TCE; other organics, including PCBs and pesticides; and metals, including arsenic, chromium, and lead.

SELECTED REMEDIAL ACTION: The selected remedial action for this site includes excavating and disposing of 2,500 yd$^3$ of soil contaminated with PCBs and pesticides offsite; treating approximately 16,500 yd$^3$ of VOC-contaminated soil onsite using in-situ vapor extraction; extracting and treating ground water from the areas of the plume onsite using a treatment train that may consist of filtration, neutralization, precipitation, air stripping, and carbon adsorption; discharging the treated water onsite to surface water; implementing a long-term ground water monitoring program; and implementing institutional controls, including deed and ground water use restrictions. The estimated present worth cost for this remedial action is $6,500,000, which includes an estimated annual O&M cost of $277,000 for years 1-5 and $227,000 for years 6-30.

PERFORMANCE STANDARDS OR GOALS: The chemical-specific soil cleanup standard for PCBs is based on TSCA guidance for an industrial area and is 10,000 ug/kg. The other chemical-specific soil cleanup standards are based on attaining a cancer risk level of 10$^{-4}$, and include arsenic 23,000 ug/kg; benzene 5.4 ug/kg; cadmium 39,000 ug/kg; DDT 60,000 ug/kg; manganese 390,000 ug/kg; PCE 10.5 ug/kg; and TCE 32.2 ug/kg. Chemical-specific ground water remediation standards are based on the more stringent of Federal MCLs and State ground water standards. In the absence of the above-mentioned criteria, the performance standard is based on attaining a cancer risk level of 10$^{-4}$ and a noncancer hazard index (HI) of 1. The chemical-specific ground water standards include arsenic 50 ug/l; barium 1,000 ug/l; beryllium 4 ug/l; chromium 50 ug/l; 1,2-DCA 0.38 ug/l; trans-1,2 DCE 70 ug/l; ethylbenzene 29 ug/l; lead 15 ug/l; manganese 50 ug/l; mercury 1.1 ug/l; PCE 0.7 ug/l; TCE 2.8 ug/l; vanadium 80 ug/l; and vinyl chloride 0.015 ug/l.

INSTITUTIONAL CONTROLS: Deed and ground water use restrictions will be implemented to prevent the use of the nearby,
inactive, water supply wells and the installation of any new water supply wells within the operable unit area.

**Remedy:** The remedial investigation (RI) and the risk assessments (RAs) conducted for Site 48 support a no action remedial alternative. The RI and RAs addressed all media at the site, and therefore, no other actions will be considered for Site 48.

**Text:** Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID:  NC6170022580
OU 03
ONSLOW COUNTY, NC
09/24/1993
FINAL RECORD OF DECISION
FOR OPERABLE UNIT NO. 3
(SITE 48)

MARINE CORPS AIR STATION, NEW RIVER
JACKSONVILLE, NORTH CAROLINA

CONTRACT TASK ORDER 0133

Prepared For:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
Dear Ms. Townsend:

On September 10, 1993, Brigadier General L. H. Livingston, Commanding General, Marine Corps Base, Camp Lejeune, signed the Record of Decision for Operable Unit #3 (site #48). The Record of Decision for Operable Unit #2 (Sites #6, #9, and #82) was signed on September 24, 1993.

These records of decision are enclosed for your review. We appreciate your agency's concurrence and we will now proceed with the appropriate remedial designs.

If you have any questions or comments, please contact Mr. Neal Paul, Director, Installation Restoration Division, Environmental Management Department, at telephone (919) 451-5063/5068.

Sincerely,

ROBERT L. WARREN
Assistant Chief of Staff
Environmental Management Department
By direction of
the Commanding General

Encl:  
(1) Record of Decision for Operable Unit No. 2
(2) Record of Decision for Operable Unit No. 3

Copy to:
COMLANTNAVFACENGCOM Code 1823 (Linda Berry)
HQMC LFL (John Burleson)
Staff Section: Assistant Chief of Staff, Environmental Management

Subj: INSTALLATION RESTORATION SITE #48 RECORD OF DECISION

Encl: (1) Site #48 location map
(2) Site #48 site map

Background/Discussion: Installation Restoration site #48 is situated between Longstaff Road and the New River, aboard the Marine Corps Air Station (refer to enclosures). From 1956 to 1966, this area of concern was utilized to dispose of mercury, by either burial or dumping activities, from radar unit delay lines.

From August 1992 through the spring of 1993, a Remedial Investigation/Feasibility Study (RI/FS) was conducted at site #48. This analysis consisted of the installation of monitoring wells, in addition to the collection of surface water, groundwater, soil, fish, and stream sediment samples to detect the presence and extent of mercury contamination. Due to the lack of mercury detected in these media, the Environmental Protection Agency, Region IV and the State of North Carolina Superfund Section have approved the implementation of a "no action" remediation alternative. Both regulatory agencies agree the site possesses no human health or environmental hazard. This option consists of executing no remedial action and allowing the site to remain in its present condition.

On July 26, 1993 Baker Environmental Inc., in cooperation with Marine Corps Base, Camp Lejeune, the Environmental Protection Agency, and the State of North Carolina, finalized a "No Action" Record of Decision (ROD) for site #48.

Recommended Action: It is recommended that Marine Corps Base, Camp Lejeune endorse the ROD via your signature on the document. This will allow for the expeditious completion of all investigative and administrative activities with respect to this site.
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LIST OF ACRONYMS AND ABBREVIATIONS

ARARs Applicable or Relevant and Appropriate Requirements
bgs below ground surface
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CRDL Contract Required Detection Unit
DoN Department of the Navy
EPIC Environmental Photographic Interpretation Center
FS Feasibility Study
IAS Initial Assessment Study
MCAS Marine Corps Air Station
MCB Marine Corps Base
MCL Maximum Contaminant Level
MCLG Maximum Contaminant Level Goal
msl mean sea level
NC DEHNR North Carolina Department of Environment, Health and Natural Resources
NCP National Contingency Plan
NCWQS North Carolina Water Quality Standard
NPL National Priorities List
PAH polynuclear aromatic hydrocarbon
PRAP Proposed Remedial Action Plan
RA Risk Assessment
RCRA Resource Conservation and Recovery Act
RI Remedial Investigation
ROD Record of Decision
SARA Superfund Amendments and Reauthorization Act
TCE trichloroethene
USEPA United States Environmental Protection Agency
Site Name and Location
Operable Unit No. 3
Site 48, Marine Corps Air Station Mercury Dump
Marine Corps Air Station, New River
Jacksonville, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Marine Corps Air Station (MCAS) Mercury Dump, Site 48, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record for Site 48.

The Department of the Navy (DoN)/Marine Corps has obtained concurrence from the State of North Carolina and the United States Environmental Protection Agency (USEPA), Region IV on this action.

Description of the Selected Remedy

The remedial investigation (RI) and the risk assessments (RAs) conducted for Site 48 support a no action remedial alternative. The RI and RAs addressed all media at the site, and therefore, no other actions will be considered for Site 48.

Declaration

The selected remedy 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. The statutory preference for treatment is not satisfied because no treatment was necessary for the protection of human health and the environment. Contaminant levels detected in the media at the site were found to present no imminent or substantial threat to human health or the environment. A five-year review will not be necessary for this site.
1.0 INTRODUCTION

Marine Corps Base (MCB) Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on October 4, 1989 (54 Federal Register 41015, October 4, 1989). The United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Department of the Navy (DoN) then entered into a Federal Facilities Agreement for MCB Camp Lejeune in February 1991. The primary purpose of the Federal Facilities Agreement was to ensure that environmental impacts associated with past and present activities at the MCB were thoroughly investigated and appropriate CERCLA response/Resource Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect public health and the environment.

Operable Unit No. 3 (Site 48), the Marine Corps Air Station (MCAS) Mercury Dump, has been the subject of a remedial investigation (RI). The feasibility study (FS), which normally develops and examines remedial action alternatives for a site, will not be performed at Site 48 since the results of the RI and risk assessments (RAs) indicated that no remedial action is required at the site.

This Record of Decision (ROD) has been prepared to summarize the remedial alternative selection process and to present the selected remedial alternatives.

2.0 SITE LOCATION AND DESCRIPTION

The study area, Operable Unit No. 3 (Site 48) is one of 12 operable units located within MCB Camp Lejeune and MCAS New River. Separate investigations are being conducted for the other 11 operable units. Figure 1 shows the location of Site 48. Site 48 is the only site included under Operable Unit No. 3. All media at the site are represented by the operable unit.

In general, Site 48 is bordered by Longstaff Road to the west, an intermittent tributary of the New River to the north, the New River to the east, and Building AS-811 to the south (see Figure 2). The study area covers approximately 4 acres. As shown on Figure 2, the majority of the land within Site 48 is grass covered. The grassed area is maintained and extends to the banks of the New River. At the edge of the New River and the intermittent tributaries, heavy vegetation and young saplings are present. No stressed vegetation has been noted.

Buildings AS-804, AS-805, and AS-807 are located within the Site 48 study area boundary. Building AS-804 was constructed in 1955 and was used as the Administration Office and Photographic Laboratory from 1955 to 1990. The building was vacant for a few months in 1990, but is currently being used as the Nuclear, Biological, and Chemical instruction classroom. The uses of the other two buildings on the site are not known. An above ground storage tank is located behind Building AS-804. This tank replaced an underground storage tank which had contained diesel fuel for a generator inside Building AS804.

With respect to topography, Site 48 is a predominantly flat area located approximately 5 to 10 feet above mean sea level. The site elevations drop off sharply at the bank of the New River east of the site and at the intermittent tributary north of the site. The terrain of the area around Site 48 indicates that drainage would be towards the New River.

Site 48 lies on the west bank of the New River. The surface waters surrounding Site 48 are tidally influenced. Surface water runoff at Site 48 tends to drain to the New River which discharges to the Atlantic Ocean, and to an intermittent tributary that borders the site on the north. The intermittent tributary flows into the New River. The Atlantic Ocean is approximately 17 miles south of the site. A portion of the surface water runoff is collected in the storm water sewers located along Longstaff Road and Curtis Street.

3.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

During the ten year period between 1956 and 1966, mercury was reportedly drained from delay lines of radar units and periodically disposed at Site 48. Approximately one gallon of mercury per year was reportedly hand carried and dumped or buried in small quantities at random areas around Building AS-804. The general disposal area was thought to be a 100- to 200-foot wide corridor extending from the rear of Building AS-804 to the bank of the New River. Review of
aerial photographs recently received from the USEPA Environmental Photographic Interpretation Center (EPIC) appear to indicate that the disposal activities may have occurred at other areas within the site (north and west of Building AS-804). The aerial photographs date back to 1956.

In 1983, an Initial Assessment Study (IAS) was conducted at MCB Camp Lejeune and MCAS New River by a consulting firm. The study identified a number of areas within MCB Camp Lejeune and MCAS New River, including Site 48, as potential sources of contamination.

In 1984, a Confirmation Study was conducted at Site 48 which focused on the potential source areas identified in the IAS. The study consisted of collecting a limited number of soil samples and sediment samples which were analyzed for mercury. The results of this sampling indicated that low levels of mercury were detected in both media.

On October 4, 1989, Camp Lejeune was placed on the NPL. The DoN, the USEPA, and the NC DEHNR entered into a Federal Facilities Agreement on February 13, 1991.

A Supplemental Characterization Investigation was conducted at Site 48 in January 1991. This investigation consisted of surface water and sediment sampling and analysis. Mercury, the primary contaminant of concern, was not detected in any sample collected during this investigation.

In 1991, a Site Assessment Report was prepared for the site. The assessment was based on the results of the IAS, the Confirmation Study, and the Supplemental Characterization Investigation. No additional sampling was conducted. A preliminary risk evaluation for the site was also included in the Site Assessment. The risk evaluation did not indicate that mercury was a contaminant of concern at the site. The risk evaluation results indicated that the only potential contaminants of concern appeared to be cadmium, copper, nickel, and silver in surface water. The risk evaluation indicated that the detected concentrations of these four metals of concern may be representative of background levels for the area.

Baker Environmental, Inc. conducted an RI for Site 48 during 1992 and 1993 in accordance with the requirements of the Federal Facilities Agreement. The field program at Site 48 was initiated to characterize potential environmental impacts and threats to human health resulting from previous mercury disposal activities. Soil, groundwater, surface water, and sediment samples were collected during the RI. Figure 3 identifies the soil boring and groundwater sampling locations. Figure 4 identifies the surface water and sediment sampling locations. A summary of the contaminants detected per media and their concentration ranges are presented on Table 1.

As shown on Table 1, the primary suspected contaminant of concern, mercury, was not detected in any media sampled. The parameters detected in the surface soil samples included pesticides and inorganics. These parameters do not appear to be related to disposal activities. In addition, the detected concentrations do not pose a threat to human health or the environment. The detected parameters in the subsurface soil samples were inorganics. The contaminant levels of the inorganics detected in both the surface and subsurface soil samples were generally similar. The contaminant levels detected in the soil samples were either similar to background levels or else were detected infrequently and at low levels. In addition, these compounds are not a result from previous disposal activities at the site.

In general, the groundwater samples contained low levels of organics including trichloroethylene (TCE), phenol, acenaphthene, and two common laboratory contaminants: methylene chloride and bis-(2-ethylhexyl) phthalate. In addition, groundwater samples contained inorganics such as aluminum, calcium, chromium, iron, manganese, sodium and zinc. Table 2 presents a comparison of the parameters detected in the groundwater samples to Federal Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) and to North Carolina Water Quality Standards (NCWQS) for groundwater. As shown on Table 2, one detection of methylene chloride exceeded both the MCL and NCWQS. This detection of methylene chloride is most probably the result of laboratory contamination and not a site-related contaminant. The detected concentrations of TCE, phenol, acenaphthene, and bis (2-ethylhexyl) phthalate were extremely low (all 3 ug/L or less) and did not exceed any MCL/MCLG or NCWQS, where applicable. Five detects of iron and three detects of manganese were above the NCWQS. However, elevated levels of iron and manganese are reportedly present throughout MCB Camp Lejeune and MCAS New River and, therefore, may be naturally occurring in the environment.
With respect to the surface water samples collected at Site 48, two fuel-related compounds (toluene and xylene) were detected at low levels. Since these two constituents were also present in the New River upstream of the site, their presence is probably not related to any release at Site 48, and no fuel related activities are suspected to have occurred at Site 48. In addition, inorganics such as aluminum, calcium, iron, lead, magnesium, manganese, potassium, and sodium were detected in the surface water. The detected inorganics were not at elevated levels.

The detected organics found in the sediment samples included pesticides such as DDD, DDE, and DDT, and polynuclear hydrocarbons (PAHs) such as phenanthrene, fluoranthene and pyrene. Detected inorganics included: aluminum, arsenic, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, sodium, vanadium, and zinc. Based on the results of the Risk Assessments conducted for Site 48, the detected concentrations of the above-mentioned compounds do not pose a threat to human health or the environment.

The results of the benthic macroinvertebrate study and fish study conducted as part of the RI did not indicate adverse impacts to the ecology of the New River or the marsh. The results of these studies were comparable to the White Oak River, which was included in the study as a reference station. Fish and crab samples collected for chemical analysis did not exhibit mercury. Low levels of pesticides and inorganics were present in fish.

Since there were some contaminants detected at Site 48, a baseline RA was conducted as part of the RI to identify media that are receiving or may be receiving site-related contamination. Based on the analytical data, no source areas of contamination have been identified at Site 48. The detected organic compounds were identified in only a few samples per media and at concentrations that do not present a risk to human health or the environment. Although various inorganic compounds were detected at the site in all of the media, no specific areas of concern have been noted that would present a risk to human health or the environment. As stated previously, the expected contaminant of concern, mercury, was not detected in any sampled media at the site.

4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI report and Proposed Remedial Action Plan (PRAP) for Operable Unit No. 3 (Site 48), the MCAS Mercury Dump, were released to the public on June 7, 1993 and June 18, 1993, respectively. These two documents were made available to the public in the administrative record at information repositories maintained at the Onslow County Public Library and at the MCB Camp Lejeune Library. Also, all addressees on the Site 48 mailing list were sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI document was published in the "Jacksonville Daily News" on June 14-20, 1993. A public comment period was held from June 21, 1993, to July 21, 1993. In addition, a public meeting was held on June 21, 1993, to respond to questions and to accept public comments on the PRAP for Site 48. The public meeting minutes have been transcribed and a copy of the transcript is available to the public at the aforementioned libraries. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms and new relevant information received during the comment period. Upon signing this ROD, MCB Camp Lejeune and the DoN will publish a notice of availability of this ROD in the local newspaper, and place this ROD in the information repository located in the Onslow County and MCB Camp Lejeune libraries.

5.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The proposed remedial action identified in this document is the "No Action Alternative". This decision is the only remedial action identified for Site 48. No future actions are proposed for the site. No previous removal or interim actions have been conducted. Operable Unit No. 3 encompasses all of the media at Site 48.

Note that Operable Unit No. 3 is one of 12 operable units at MCB Camp Lejeune and MCAS New River. Separate investigations are being conducted for the other 11 operable units. Therefore, this ROD is applicable to Operable Unit No. 3 (Site 48 only).

6.0 SITE CHARACTERISTICS

A brief overview of the site characteristics related to Site 48 is presented below. Site
characteristics include land use, meteorology, surface features, hydrology, geology, hydrogeology, and ecology.

With respect to land use, there are no housing areas with the boundaries of Site 48. Buildings within the site area are currently used for military operations.

Camp Lejeune’s average yearly rainfall is approximately 52 inches. Measurable amounts of rainfall occur on 120 days per year, on average. Prevailing winds are generally from the south-southwest ten months of the year, and from the north-northwest during September and October. The average wind speed for coastal observation points in North Carolina is 12 miles per hour.

The topography of Site 48 is predominantly flat with ground surface elevations between 5 feet above mean sea level (msl) and 10 feet above msl. The site elevations drop off sharply at the bank of the New River east of the site, and at the intermittent tributary north of the site.

The terrain around Site 48 indicates that surface water drainage would be toward the New River. The site is approximately 17 miles north of the New River’s outlet into the Atlantic Ocean. A marsh area exists north of Site 48 and drains into the New River. The surface waters surrounding Site 48 are tidally influenced. Site 48 lies above the 100-year flood plain, which is 3 feet above msl.

With respect to geology, the site is underlain by unconsolidated deposits of silty clay, silty sand, and silt with clay and sand being the predominant soils. These soils represent the Quaternary “undifferentiated” formation which characterize the surficial aquifer.

Based on the drilling activities conducted at the site and based on published information, the surficial aquifer (water table aquifer) at the site extends to an average depth of 45 feet below ground surface (bgs) at MCB Camp Lejeune and MCAS New River. The main water supply aquifer underlying the site is the Castle Hayne. Groundwater was encountered during the investigations at approximately five to ten feet bgs. Groundwater flow was found to be toward the northeast in the general direction of the New River.

With respect to ecology, Site 48 has three classifications of wetlands, and various protected species such as the American alligator. No other sensitive environments have been identified within the boundaries of Site 48.

7.0 SUMMARY OF SITE RISKS

During the RI, a baseline human health RA and a baseline ecological RA were conducted to evaluate the actual or potential risks to human health or the environment resulting from the presence of contaminants identified at Site 48. A summary of the results of the baseline RAs is presented below.

Human Health Risk Assessment

The baseline human health RA evaluated the potential for chemicals to affect human health, both now and in the future, under a no action scenario. The baseline RA identified chemicals of concern and corresponding environmental concentrations at the site with respect to the physical characteristics of the study area. This information was used to estimate the extent of potential exposure to hypothetical receptors. Finally, theoretical chemical intakes were determined for each receptor. Each potential exposure route was then compared with the most recent toxicological data to inferentially estimate the potential human health effects.

The components of the baseline RA include: identification of chemicals of concern; the exposure assessment; the toxicity assessment; risk characterization; and uncertainty analysis.

Human receptors at Operable Unit No. 3 (Site 48) could be potentially exposed to contaminants of concern in more than one medium and through multiple exposure pathways associated with each medium. Under current and future land use conditions, Site 48 does not pose an unacceptable risk to any potential receptor group by USEPA or NC DEHNR standards. This is primarily because of the types of contaminants detected on site, as well as the low concentrations present in each medium. Therefore, the quantitative RA concluded that the existing use and potential future use
of the site would not pose a threat to human health or the environment.

Ecological Risk Assessment

The Ecological RA conducted at Site 48 consisted of: evaluating fish and benthic macroinvertebrates for population statistics, and collecting fish and crabs for tissue analysis. The study was conducted in the New River and in the marsh area north of Site 48. The results of the Ecological RA indicated that the ecology in the New River and the marsh area appeared to be healthy. No mercury was detected in any fish or crab samples. Pesticides and several inorganics were detected in the fish samples. Based on the RA, the detected levels of these compounds do not pose a threat to human health or the environment. The RA concluded that these compounds were not site related. The results from the Ecological RA indicated that the ecology of the New River and marsh area appears to be healthy and is comparable to other similar waters (i.e., the White Oak River).

Risk Assessment Conclusions

Based on the results of the RI and the human health and ecological RAs, the current or future land uses at Site 48 are protective of human health and the environment. Based on current data, neither soil nor groundwater were impacted from any release or suspected release of contaminants at the site. Contaminants detected in surface water and sediment do not appear to be related to Site 48. No further environmental investigations are recommended for this site. The sampling and analysis performed is sufficient to characterize the site and develop conclusions with respect to potential impacts to the public health and the environment.

No remedial response actions are justifiable at Operable Unit No. 3, since the site media pose no current or potential adverse impacts to public health or the environment.

8.0 DESCRIPTION OF THE "NO ACTION" ALTERNATIVE

From an analysis of all available and pertinent information for Site 48, MCAS Mercury Dump, it is concluded that remedial actions are not necessary for the protection of human health or the environment. Therefore, the selected remedial alternative for the site is No Action. This alternative will consist of leaving the site as is. No additional sampling or monitoring will be necessary since the conditions at the site are protective of human health and the environment. This remedial alternative will have no costs associated with it.

9.0 STATUTORY DETERMINATIONS

A summary of the statutory determinations is outlined below.

. Protection of Human Health and the Environment

The selected remedy is protective of human health and the environment, as conditions at Site 48 were shown in the risk assessments to pose no threat.

No unacceptable short-term risks or cross-media impacts will be caused by this remedy.

. Attainment of Applicable or Relevant and Appropriate Requirements (ARARs)

The selected remedy will attain all ARARs.

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

No alternatives were developed for Site 48 as the risk assessments showed there was no risk to human health or the environment. The No Action Alternative is protective, effective, attains ARARs, and is the most cost effective solution for Site 48. Therefore, treatment at this site is impracticable.

. Preference for Treatment as a Principal Element

The preference for treatment as a principal element was not satisfied, due to the No Action
Alternative having been determined to be the best solution for the site.

10.0 RESPONSIVENESS SUMMARY

Overview

MCB Camp Lejeune and the DoN, with the assistance of USEPA, Region IV and the NC DEHNR, selected a preferred alternative for Site 48, the MCAS Mercury Dump at MCAS New River, Jacksonville, North Carolina. The preferred remedial action alternative specified in the PRAP was the No Action Alternative.

Judging from the lack of comments received during the public comment period and from the attendance at the public meeting, the local community does not appear to be concerned with the proposed No Action Alternative for the site. No private citizens attended the public meeting, and no comments were received during the comment period.

The purpose of this responsiveness summary is to identify the comments and concerns of the local community regarding the selected alternative, and to document how MCB Camp Lejeune/DoN considered the comments and concerns during the selection of the alternative.

Background on Community Involvement

No past community interest in the potential contamination at the MCAS Mercury Dump (Site 48) has been documented. This may be due to the fact that the site is located within the Marine Corps Air Station, and therefore, does not present concern to the community.

Summary of Comments Received During the Public Comment Period and Responses

No comments were raised during the Operable Unit No. 3 (Site 48) public comment period or during the public meeting. Therefore, no responses to comments have been included in this responsiveness summary. The comment period was held between June 21, 1993 and July 21, 1993. The public meeting was held on June 21, 1993.
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC
EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

- USMC CAMP LEJEUNE MILITARY RESERVATION
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)
- USMC/BLDG TS452 & TP451 (SITE 10)
- USMC/HADNOT POINT BURN DUMP (SITE 3)
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
- USMC/STORAGE LOTS 201 & 203 (SITE 12)
- USMC/CAMP GEIGER DUMP (SITE 4)
- USMC/ BASE SAN LDFL (SITE 5)
- USMC/ CHEM LDFL (SITE 1)
- USMC/ BLDG PT 37 (SITE 6)
- USMC/ K-326 RANGE (SITE 8)
- USMC/ G4A RANGE (SITE 9)
- USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/15/1994
Operable Unit: 10
ROD ID: EPA/ROD/R04-94/193

Media: soil

Contaminant: Gasoline, diesel fuel, kerosene, diazinon, chlordane, DDT, lindane, malathion, mirex, 2 and 4-D silvex
Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The 236 square mile U.S. Marine Corps Camp Lejeune site is located in Onslow County, NC. The water body receiving overland surface drainage is Brinson Creek. The aquifer at the site is referred to as the water table aquifer. Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The site was used from 1945 until the present and is currently active.

Operable Unit 10 refers primarily to five 15,000 gallon aboveground storage tanks, a pump house, and a fuel loading pad.

Operable Unit 5, primarily Site 2, is approximately five acres and is bordered to the north by a wooded area that generally drains north toward Overs Creek; to the west by Holcomb Boulevard; and to the east by a water treatment plant. Within the site are two areas of concern. Building 712, which is the mixing and lawn areas, and the former storage area.

OU1 covers an area of approximately 690 acres. OU1 is located approximately one mile east of the New River and two miles south of State Route 1. The operable unit is bordered by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Main Service Road to the southwest, and woodlands and Cogdels Creek to the southeast.

Site 21 has had a history of pesticide usage and reported transformer oil disposal. One portion of the site was used as a pesticide mixing area and as a cleaning area for pesticide application equipment from 1958 to 1977. Chemicals reportedly stored at this site included diazinon, chlordane, lindane, DDT, malathion, mirex, 2,4-D, silvex, and dalapon. The Former Transformer Oil Disposal Pit was located in the NE portion of the site. The pit was reportedly used as a disposal area for transformer oil during a one year period between 1950 and 1951. The pit reportedly measured 25 to 30 feet long by 6 feet wide by 8 feet deep. The quantity of oil disposed in this pit is unknown.

Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980.
With respect to Site 78, the Hadnot Point Industrial Area (HPIA) was the first developed area at MCB, Camp Lejeune. It was comprised of approximately 75 buildings and facilities including: maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, and storage yards. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks, drums, and uncontained waste storage areas. It appears that several general building areas within Site 78 may be potential source areas of contamination.

The aboveground storage tanks (AST) at Site 35 are currently used to dispense gasoline, diesel, and kerosene to government vehicles and to supply underground storage tanks in the area. A leak in the underground line from the ASTs to the dispensing island was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period. The leaking line was subsequently sealed and replaced. The leaking line was subsequently sealed and replaced. Reports of a release from an underground distribution line near one of the ASTs date back to 1957. The leak occurred as a result of damage to a dispensing pump, and it was estimated that thousands of gallons of fuel were released. Interceptor trenches were excavated and the captured fuel was ignited and burned. In addition, in April 1990, an undetermined amount of fuel was discovered along the unnamed drainage channels located to the north of the site. This fuel was believed to be an unauthorized discharge from an unidentified tanker truck. The Fuel Farm was scheduled to be decommissioned in 1994.

From 1945 to 1958, Building 712 was used for storing, handling, and dispensing of pesticides. Building 712 was later used as a children's day care center. Currently the building houses administrative offices. Chemicals known to have been used include chlordane, DDT, diazinon, and 2,4-D. Chemicals known to have been stored on site include dieldrin, lindane, malathion, silvex, and 2,4,5-T. Contamination at the site is believed to have occurred as a result of small spills, washout and excess product disposal. During operation it is reasonable to assume several gallons of product used per year. The estimated quantity involved is on the order of 100 to 500 gallons of liquid containing various concentrations of product. Solid residues in cracks and crevasses may total 1 to 5 pounds. The former storage area was used to store bulk materials and vehicles.

In 1983, an Initial Assessment Study was conducted at the site.
Confirmation Studies were conducted for multiple sites requiring further investigation, including OU 10, Site 35, between 1984 and 1987. A Focused Feasibility Study was conducted in 1990 in the area north of the Fuel Farm, including the installation of several monitoring wells. A Comprehensive Site Assessment (CSA) was completed in the fall of 1991, and a follow-up report to the CSA was submitted as an addendum to the original CSA to provide further characterization of the extent of ground water contamination. The Interim Remedial Action Remedial Investigation/Feasibility Study (RI/FS) for OU 10 was completed in December of 1993, while a comprehensive RI/FS was conducted to evaluate other potentially impacted media. Two USTs located near the Fuel Farm have been the subject of previous investigations.

The response action is termed an Interim Remedial Action. It represents only one phase of a comprehensive investigation and remediation program at Site 35. The interim phase is limited to contaminated soil at Site 35. The objective of the remedy is to reduce risks associated with exposure to contaminated soil. Treatment will be the primary remedy at this site for the principal threats in the soil.

**Remedy:**

Excavating petroleum hydrocarbon contaminated soil located above the seasonal ground water table exhibiting levels of total petroleum hydrocarbons (TPH) in excess of 40 mg/kg; staging excavated soil on site in piles designated as "clean" or "contaminated" in order to allow for sampling and verification analysis; transporting the contaminated soil off-site to a permitted soil recycling facility; backfilling the excavated areas with clean soil.

**Text:**

Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID:  NC6170022580
OU 10
ONSLOW COUNTY, NC
09/15/1994
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Prepared For:

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

Under:
LANTDIV CLEAN Progrmn
Contract N62490-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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APPENDIX

A Transcript: Public Meeting, July 26, 1994

LIST OF ACRONYMS AND ABBREVIATIONS

ARAR/TBC Applicable or Relevant and Appropriate Requirement/To Be Considered (Criteria)
AST aboveground storage tank
Baker Baker Environmental, Inc.
bgs below ground surface
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR Code of Federal Regulations
COPC contaminant of potential concern
CSA Comprehensive Site Assessment
DOD Department of Defense
DON Department of the Navy
EPA United States Environmental Protection Agency
ESE Environmental Science and Engineering, Inc.
FFS Focused Feasibility Study
FS Feasibility Study
IAS Initial Assessment Study
Site Name and Location

Operable Unit No. 10 (Site 35)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for contaminated soil 35), Marine Corps Base (MCB), Camp Lejeune, North Carolina which was chose accordance with the Comprehensive Environmental Response, Compeneation, an Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthori (SARA), and, to the extent practicable, the National oil and Hazardous Sub Contingency Plan (NCP). This decision is based on the Administrative Reco unit.
The Department of the Navy (DON) and the Marine Corps have obtained concur with the State of North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) on the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this operable unit by implementing the response action selected in this Record of Decision (ROD) may pose an unreasonable potential threat to public health, welfare, or the environment.

Description of Selected Remedy

Six Remedial Action Alternatives (RAAs) were evaluated as part of an Interim Action Remedial Investigation/Feasibility Study (RI/FS). RAA 3 (Source Treatment) and RAA 5 (Source Removal and off-Site Soil Recycling) were roughly equivalent when compared using the established criteria. RAA 5 was the preferred alternative because there are more off-site soil recycling facilities in the Camp Lejeune area than off-site biotreatment facilities. The availability of off-site soil recycling facilities should make RAA 5 easier to implement. RAA 3 has been identified as a possible alternative, subject to approval and modification of the Interim ROD.

The selected remedy, which is limited to contaminated soil, is an Interim Remedial Action for Site 35. The level of petroleum hydrocarbons in soil identified at the site is below the North Carolina guidelines. Furthermore, the contaminated soil represents a potential threat to other media including groundwater, surface water, and the soil.

The selected remedy addressed in this ROD provides for the removal and treatment of contaminated soil to reduce the levels of contamination to below state guidelines and mitigate the potential threat of future contamination. The major components and 6 include:

- Excavating petroleum hydrocarbon contaminated soil located above the groundwater table which exhibit levels of total petroleum hydrocarbons in excess of 40 mg/kg as determined via EPA Method 5030/8015 or 160 m determined via EPA Method 3550/8015.
- Staging excavated soil on site in piles designated as "clean" or "contaminated" to allow for sampling and verification analysis.
- Transporting the contaminated soil off site to a permitted soil recycling facility (RAA 5).
- Backfilling the excavated areas with clean fill.

Declaration

This interim action is protective of human health and the environment, conforms to all applicable or relevant and appropriate requirements (ARARs) and considered (TBCs) directly associated with this action, and is cost-effective.
utilizes permanent solutions and alternative treatment technologies to the practicable, given the limited scope of the action. Because this action does not represent the final remedy for Site 35, the statutory preference for remedies that employ technologies that reduce toxicity, mobility, or volume as a principal element for other media will be addressed at the time of action. Subsequent actions are planned to address fully the principal threat to Site 35.

Signature (Commanding General, MCB Camp Lejeune) Date

1.0 SITE LOCATION AND DESCRIPTION

Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 Operable Units (OU). MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville is located north of the Base (See Figure 1).

Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune. The main entrance to Camp Geiger is off U.S. Route 17, approximately southeast of the City of Jacksonville, North Carolina. Operable Unit (OU) Camp Geiger Area Fuel Farm, refers primarily to five, 15,000-gallon aboveground tanks (ASTs), a pump house, and a fuel unloading pad situated within Camp Geiger. The intersection of Fourth and "G" Streets (See Figure 2). To date, this area has been roughly bounded to the west by D Street, to the north by Second Street, and to the south midway between Fourth and Fifth Streets. Site 35 comprises part of 13 operable units within MCB Camp Lejeune. An "operable unit" as defined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is that component of a site that comprises an incremental step toward comprehensively addressing site contamination.

The surface topography at Site 35 is generally flat to the south and west, and the ground surface dips rapidly to the north and east in the direction of Brinson Creek. The shallow soil stratigraphy at Site 35 consists of fine to medium-grained sand, underlain by colitic, fossiliferous limestone (6 to 20 feet thick) underlain by a unit of silty sand. Shallow groundwater flow direction is generally west to east across the site, converging with Brinson Creek. The top of groundwater is encountered roughly 8 to 10 feet below the ground surface (bgs) across the net portion of the site and at lesser depths as it converges with Brinson Creek.

<IMG SRC 0494193>
2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Construction of Camp Geiger was completed in 1945, four years after construction of Camp Lejeune was initiated. Originally, the ASTs were used for the storage of diesel fuel, but were later converted for storage of other petroleum products including diesel fuel, and kerosene. The date of their conversion is not known. The ASTs at Site 35 are currently used to dispense gasoline, diesel and kerosene to government vehicles and to supply USTs in use at Camp Geiger and the nearby Marine Corps Air Station. The ASTs are supplied by commercial carrier trucks product to fill ports located on the fuel unloading pad at the southern end short-run (120 feet maximum), underground fuel lines are currently utilized product from the unloading pad to the ASTs. Product is dispensed from the underground piping.

Reports of a release from an underground distribution line near one of the 1957-58 (ESE, 1990). Apparently, the leak occurred as the result of damage to the fuel unloading pad. At that time the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released although records of the incident cannot be located. The fuel migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned.

Another abandoned underground distribution line extended from the ASTs to Hall Heating Plant, located adjacent to "D" Street, between Third and Four underground line dispensed No. 6 fuel oil to an UST which fueled the Mess Hall, located across "D" Street of the west, was demolished along with the building in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp along the unnamed drainage channels north of the Fuel Farm. Apparently, the fuel, believed to be diesel or jet fuel, was an unauthorized discharge from a fuel storage tank. The Activity reportedly initiated an emergency clean up which included the removal of approximately 20 cubic yards of soil.

The Fuel Farm is scheduled to be decommissioned in 1994. Plans are currently to empty, clean, dismantle, and remove the ASTs along with all concrete foundations, berms and associated underground piping. The Fuel Farm is being replaced by a new fuel farm.
way for a four lane divided highway proposed by the North Carolina Departm
Transportation (NCDOT).

Previous environmental investigations performed at Site 35 include the foll
Initial Assessment Study

In 1983, an Initial Assessment Study was conducted in which 76 potentially
areas of concern were identified at the base (Water and Air Resources, 198
identified as one of 23 sites warranting further investigation. Sampling
environmental media was not conducted during the Initial Assessment Study.

Confirmation Study

ESE performed Confirmation Studies of the 22 sites requiring further inves
investigated Site 35 between 1984 and 1987 (ESE, 1990). During this study
three hand-auger borings and collected groundwater and soil samples from e
Soils were analyzed for lead and oil and grease. Groundwater samples were
oil and grease, and volatile organics. Lead was detected in soil samples
auger borings at concentrations ranging from 6 to 8 mg/kg. Oil and grease
concentrations ranging from 40 to 2,200 mg/kg.

In 1986, ESE collected sediment and surface water samples from Brinson Cre
tree permanent monitoring wells: two east of and one west of the Fuel Fa
and sediment samples collected from nearby Brinson Creek were analyzed for
grease and ethylene dibromide.

Lead and oil and grease were detected in samples taken from the three perm
wells. Volatile organics were not detected at these well locations. Thea
after installation and again in 1987.

Focused Feasibility Study

A Focused Feasibility Study (FFS) was conducted in 1990 in the area north
by NUS Corporation. The investigation included the installation of four gr
monitoring wells. Results of laboratory analysis revealed that groundwater
soil cuttings from two borings were contaminated with petroleum hydrocarbo
aqueous product was not observed.

A geophysical investigation was conducted by NUS as part of the FFS in an
underground storage tanks (USTs) at the site of the former gas station. Th
the presence of a geophysical anomaly to the north of the former gas stati

Comprehensive Site Assessment

Law Engineering, Inc. (Law) conducted a Comprehensive Site Assessment (CSA
fall of 1991 (Law, 1992). The CSA involved the drilling of 18 soil boring
from 15 to 44.5 feet. These soil borings were ultimately converted to nes
the water table aquifer along two zones. The shallow zone, or water table
extends from 2.5 to 17.5 feet bgs. The deeper zone monitored by the neste
ranges from 17.5 to 35 feet bgs. Five additional soil borings were dril
were hand-augered to provide data regarding soil contamination in the vado
Additional groundwater data was provided via 21 drive-point groundwater or samples. A "Tracer" study was also performed to investigate the integrity and underground distribution piping.

Soil and groundwater samples obtained under the CSA were analyzed for both inorganic compounds. Groundwater analyses included purgeable hydrocarbons purgeable aromatics and methyl-tertiary butyl ether (MTBE) (EPA 602), poly aromatic hydrocarbons (EPA 610), and unfiltered lead (EPA 239.2). Soil analysis was limited to total petroleum hydrocarbons (TPH) (SW846 3rd Edition, 5030/355 (SW846 3rd Edition, 6010). Ten soil samples were analyzed for ignitability.

The results of the CSA identified areas of impacted soil and groundwater. contamination included both halogenated (i.e., chlorinated) organic compounds (e.g., trichloroethene, trans-1,2-dichloroethene, and vinyl chloride) and nonhalogenated petroleum-based constituents (e.g., TPH, MTBE, benzene, toluene, ethylbenzene). The contamination encountered was typically identified in both shallow (2. and deep (17.5 to 35 feet bgs) wells.

The soil contamination identified under the CSA was located northwest of the ASTs along a pear-shaped area extending from the Explosive Ordnance Disposal Office and Supply Building (G-480) northeast toward Brinson Creek.

In general, contaminant concentrations in soil were greatest in those samples below the water table. Law concluded that this soil contamination at Site 35 was located as a dissolved phase groundwater plume and seasonal fluctuations.

Law also identified several plumes of shallow groundwater contamination in plumes comprised primarily of petroleum-based constituents (e.g., BTEX) and comprised of halogenated organic compounds (e.g., TCE). The plumes are along Fourth Street and east of E Street except for a portion of a TCE plume that extends beyond the corner of Fourth and E Streets.

A follow-up to the CSA was conducted by Law in 1992. Reported as an Addendum (Law, 1993), it was designed to provide further characterization of the petroleum contamination in shallow groundwater. Three monitoring wells were obtained from which additional soil samples were obtained for TPH analysis. A par pump test was performed to estimate the hydraulic characteristics of the aquifer. An approximate hydraulic conductivity of 100 feet/day was determined for the surficial aquifer.

Interim Remedial Action Remedial Investigation/Feasibility Study

Based on the results of previous investigations at Site 35 and occasional odors along an adjoining section of Brinson Creek, Baker Environmental, Inc. was retained to conduct an Interim Remedial Action Remedial Investigation/Feasibility Study (RI/FS) in December of 1993. An additional seven soil borings were located...
groundwater contaminant plume areas identified during the CSA. In addition to soil borings, 13 shallow soil samples were taken along Brinson Creek to determine contamination emanating from Site 35. Two of these shallow soil samples were taken upstream along Brinson Creek to provide background information on TPH and other contaminants.

In addition to soil sampling, a second round of groundwater level measurements were conducted for comparison to those presented in the CSA.

The most prevalent contaminants detected in soil samples taken during the Action RI were benzene, toluene, ethylbenzene, xylenes, naphthalene, and 2-methylnaphthalene. These constituents are commonly associated with fuel contamination. TPH (gasoline and diesel) and oil and grease were also observed, in addition to occurrences of chromium, vanadium, and arsenic.

Analytical results, in general, confirm the hypothesis that contamination in the identified soil is associated with a dissolved petroleum hydrocarbon concentration in shallow groundwater. Oil and grease results observed in shallow soil samples obtained along the banks of Brinson Creek approximately 1/2-mile upstream and a lack of detectable levels of fuel-related volatile organics in elevated levels of oil and grease.

Comprehensive Remedial Investigation/Feasibility Study

Concurrent with the Interim Remedial Action RI/FS which is focused on containing contamination at Site 35, Baker is conducting a comprehensive RI/FS as a separate study to evaluate the potential for impact to site media including groundwater, surface water, and on-site and off-site activities for the full RI/FS were initiated in April 1994.

Other Investigations

Two USTs located near the Fuel Farm have been the subject of previous investigations conducted under an Activity-wide UST program. The two USTs include a No. 1 UST situated adjacent to the former Mess Hall Heating Plant and a No. 2 fuel oil UST situated adjacent to the Explosive Ordnance and Disposal Armory, Office, and Supply Site.

Comprehensive Remedial Investigation

Environmental investigations performed by ATEC Associates, Inc. and Law. ATEC, Inc. removed the No. 1 UST in January 1994 and is reported to be scheduled for an upcoming comprehensive remedial investigation.

3.0 HIGHLIGHT OF COMMUNITY PARTICIPATION

The Final Interim Remedial Action RI/FS Report and the Final Interim Propo Action Plan (PRAP) for Site 35 were released to the public in July, 1994. These documents were made available to the public at the information repository maintained by the Onslow County Library and Building 67, MCB, Camp Lejeune. The notice of availability of this report was published in the "Jacksonville Daily News" during the period 7/26/94 to 8/26/94. A public comment period was held from July 26 to August 26, 1994. At this meeting, representatives of the US Army Corps discussed the remedial action alternatives (RAAs) currently under consideration.
addressed community concerns. Response to the comments received during th
period is included in the Responsiveness Summary, which is part of this RO

This decision document presents the three RAAs (3, 5, and 6) which have be
remediation of petroleum hydrocarbon contaminated soil at Site 35. These
chosen in accordance with the Comprehensive Environmental Response, Compen
Liability Act (CERCLA), as amended by the Superfund Amendments and Reautho
(SARA) and, to the extent practicable, the NCP. The selected RAAs for Sit
Administrative Record.

4.0 SCOPE AND ROLE OF THE INTERIM REMEDIAL ACTION

The response action presented in this document is termed an Interim Remedi
it represents only one phase of a comprehensive investigation and remedi
Site 35. This interim phase is limited to contaminated soil at Site 35.
including groundwater, surface water, and sediments are concurrently being
part of a comprehensive site-wide RI/FS.

The results of the environmental investigations performed to date at Site
presence of soil areas contaminated with petroleum hydrocarbons at levels
state of North Carolina guidelines. The purpose of the selected remedy is
existing state guidelines and to mitigate the contaminated soil areas as p
future contamination of other media including groundwater, surface water,

5.0 SITE CHARACTERISTICS

This section of the Interim ROD presents an overview of the nature and ext
hydrocarbon soil contamination at Site 35. The analytical data generated
Interim Remedial Action RI and data generated during previous investigatio
Site 35 identified the presence of TPH contaminated soil in the vicinity o
and to the north and northwest of the Fuel Farm in a broad area extending
UST adjacent to the Explosive Ordnance Disposal Building to the vicinity o
MW-25. In general, the analytical data suggests that the majority of the
present along a narrow zone that begins just above the top of the shallow
In essence, this contaminated soil is an extension of groundwater contami
been identified under the previous investigations and, particularly under
by Law. It can be assumed that seasonal fluctuations in the contaminated
has resulted in the contamination of soil just above the groundwater table
groundwater elevation data obtained to date is insufficient to afford an e
of groundwater fluctuation at Site 35. This is supported by data which ch
contamination present in soil located more than a foot or two above the sh
table as measured on two separate dates by Law and Baker. Contaminated so
encountered in soil samples obtained about two or more feet above the meas
surface at well MW-21 and MW-25 and at borings B-5.

Four areas of soil contamination requiring remediation have been identifie
depicted on Figure 3. The first area is located in the vicinity of the Fu
second area is associated with a UST formerly located on the north side of
other two areas are located north of the Fuel Farm and Building G-480. Th
other two areas is located along "F" Street and is based primarily on cont
samples located above the seasonal high groundwater table obtained from ha
HA-7, soil boring MW-21, and soil boring SB30. The smaller area is based
soil samples obtained from soil boring MW-25. Baker has estimated that ap cubic yards (5,100 tons) of contaminated soil is present in these four are

6.0 SUMMARY OF SITE RISKS

The baseline risk assessment conducted at Site 35 examined the potential f health effects to occur subsequent to exposure to contaminated surface soil present summaries of the frequencies of detection and comparisons to USEPA commercial/industrial and residential risk-based concentrations (RBCs) whi select the contaminants of potential concern (COPCs) for surface and subsu respectively. Benzene and arsenic were identified as COPCs. Benzene was 20 soil samples at a maximum concentration of 23 mg/kg. Arsenic was detec soil samples at a concentration of 8 mg/kg. Results of the baseline risk that the unacceptable cancer risks and adverse noncacinogenic health eff potential on-site worker exposures will not occur. On-site workers were c potential human receptors because of the proximity of soil contamination t and proposed plans to construct a highway through the site. Results of th assessment indicate that a no action remedy would be adequately protective No ecological risk assessment was conducted as part of the Interim Remedia because of the depths of the soil contamination limits possible ecological contaminated soil. An ecological risk assessment will be conducted as par comprehensive RI/FS that is being performed concurrently at Site 35.

Based on the results of the risk assessment, unacceptable human health ris at Site 35. However, soil contaminated with elevated levels of petroleum identified at several areas across the site. Results of TPH and oil and g performed to date on soil samples from Site 35 are presented on Tables 4 a goals for the remediation of petroleum hydrocarbon contaminated soil were on NC DEHNR guidelines for soil remediation. The NC DEHNR guidelines addr presence of low and high boiling point petroleum hydrocarbons and oil and Remediation goals based on the NC DEHNR guidelines were developed by perfo Sensitivity Evaluation (SSE). Based on the SSE remediation goals were dev

TPH (via EPA Method 5030/8015: low boiling point) = 40 mg/kg
TPH (via EPA Method 355018015: high boiling point) = 160 mg/kg
Oil and grease (via EPA Method 8071) = 800 mg/kg

Oil and grease was subsequently excluded from the remediation goals becaus in background surface soil samples (BCSB11 and BCSB1B) located approximat

TABLE 1
## DETECTED ORGANIC AND INORGANIC CONTAMINANTS IN SURFACE SOIL
### COMPARISON TO COPC CRITERIA
### INTERIM RECORD OF DECISION
### SITE 35 - CAMP GEIGER AREA FUEL FARM
### MCB CAMP LEJEUNE
### JACKSONVILLE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Frequency of Detection</th>
<th>Maximum Concentration (mg/kg)</th>
<th>RBC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>7/11</td>
<td>1.3J</td>
<td>10</td>
</tr>
<tr>
<td>Anthracene</td>
<td>1/11</td>
<td>0.28J</td>
<td>31</td>
</tr>
<tr>
<td>bis(2-ethylhexyl)phthalate</td>
<td>5/11</td>
<td>0.35J</td>
<td></td>
</tr>
<tr>
<td>di-n-octyl phthalate</td>
<td>3/11</td>
<td>0.29J</td>
<td>2</td>
</tr>
<tr>
<td>Aluminum</td>
<td>11/11</td>
<td>4840L</td>
<td>10</td>
</tr>
<tr>
<td>Barium</td>
<td>3/11</td>
<td>31.9J</td>
<td>7</td>
</tr>
<tr>
<td>Calcium</td>
<td>11/11</td>
<td>23,600</td>
<td></td>
</tr>
<tr>
<td>Chromium III</td>
<td>11/11</td>
<td>8.2L</td>
<td>10</td>
</tr>
<tr>
<td>Copper</td>
<td>1/11</td>
<td>8J</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>11/11</td>
<td>6,350</td>
<td>--</td>
</tr>
<tr>
<td>Lead</td>
<td>3/11</td>
<td>69.2</td>
<td>*</td>
</tr>
<tr>
<td>Magnesium</td>
<td>11/11</td>
<td>1630L</td>
<td>--</td>
</tr>
<tr>
<td>Manganese</td>
<td>11/11</td>
<td>105</td>
<td>510</td>
</tr>
<tr>
<td>Mercury</td>
<td>11/11</td>
<td>0.27K</td>
<td>31</td>
</tr>
<tr>
<td>Nickel</td>
<td>3/11</td>
<td>8.3J</td>
<td>2,000</td>
</tr>
<tr>
<td>Potassium</td>
<td>2/11</td>
<td>433L</td>
<td>--</td>
</tr>
<tr>
<td>Selenium</td>
<td>1/11</td>
<td>0.25L</td>
<td>510</td>
</tr>
<tr>
<td>Sodium</td>
<td>5/11</td>
<td>1,730L</td>
<td>--</td>
</tr>
<tr>
<td>Vanadium</td>
<td>8/11</td>
<td>18.1L</td>
<td>720</td>
</tr>
<tr>
<td>Zinc</td>
<td>11/11</td>
<td>88.5</td>
<td>31,000</td>
</tr>
</tbody>
</table>

### Notes:
- * RBCs for these constituents are not currently available.
- (1) Not retained because of nutritional essentiality.

### TABLE 2
### DETECTED ORGANIC AND INORGANIC CONTAMINANTS IN SATURATED SOIL AND COMPARISON TO COPC CRITERIA
### TABLE 3

**DETECTED ORGANIC AND INORGANIC CONTAMINANTS IN SATURATED SOIL AND COMPARISON TO COPC CRITERIA**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Frequency of Detection</th>
<th>Maximum Concentration (mg/kg)</th>
<th>RBC Value</th>
<th>Commertor Industry (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>4/5</td>
<td>0.51J</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Ethybenzene</td>
<td>1/5</td>
<td>6.8</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>2/5</td>
<td>0.007J</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Xylenes</td>
<td>1/5</td>
<td>13</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Dibenzofuran</td>
<td>1/5</td>
<td>3.1J</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Fluorene</td>
<td>1/5</td>
<td>5.6J</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Phenanthrene</td>
<td>1/5</td>
<td>6.7J</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>3/5</td>
<td>0.16J</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Di-n-octylphthalate</td>
<td>3/5</td>
<td>0.10J</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>4/5</td>
<td>1.1J</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>2-Methyl naphthalene</td>
<td>1/5</td>
<td>3.4</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Aluminum</td>
<td>5/5</td>
<td>4300L</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Beryllium</td>
<td>1/5</td>
<td>0.08L</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Chromium (III)</td>
<td>5/5</td>
<td>6.2L</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Magnesium</td>
<td>3/5</td>
<td>133L</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Manganese</td>
<td>2/5</td>
<td>3.2</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Mercury</td>
<td>2/5</td>
<td>0.08K</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Vanadium</td>
<td>1/5</td>
<td>7.8L</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Zinc</td>
<td>1/5</td>
<td>20.4</td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

**Notes:**

* RBCs for these constituents are not currently available.

(1) Not retained because of nutritional essentiality.
## TABLE 4

SOIL TPH RESULTS FROM THE CSA (LAW, 1992 INTERIM RECORD OF DECISION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>SAMPLE DEPTH (bgs) TO LOCATION</th>
<th>PID</th>
<th>SAMPLE DEPTH</th>
<th>READING ANALYZED</th>
<th>TPH</th>
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</thead>
<tbody>
<tr>
<td>TABLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPTH (bgs) TO LOCATION</td>
<td>PID</td>
<td>SAMPLE DEPTH (ft)</td>
<td>DEPTH (ppm)</td>
<td>DIESEL</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----</td>
<td>------------------</td>
<td>-------------</td>
<td>--------</td>
</tr>
<tr>
<td>MW-8</td>
<td></td>
<td>1.5-2.0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5-4.0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.5-6.0</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.5-8.0</td>
<td>9100</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.5-10.0</td>
<td>9100</td>
<td>ND</td>
</tr>
<tr>
<td>MW-9</td>
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<td>1.5-2.0</td>
<td>ND</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>3.5-4.0</td>
<td>ND</td>
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<td>5.5-6.0</td>
<td>ND</td>
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<td>7.5-8.0</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>9.5-10.0</td>
<td>ND</td>
<td></td>
</tr>
<tr>
<td>MW-10</td>
<td></td>
<td>1.5-2.0</td>
<td>&gt;2000</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5-4.0</td>
<td>220</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.5-6.0</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>MW-11</td>
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<tr>
<td></td>
<td></td>
<td>5.5-6.0</td>
<td>30</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-10.5</td>
<td>31</td>
<td>*</td>
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<td>MW-12</td>
<td></td>
<td>0-1.5</td>
<td>&gt;2000</td>
<td>*</td>
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<td></td>
<td></td>
<td>1.5-3.0</td>
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<td></td>
<td></td>
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<td>*</td>
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<tr>
<td></td>
<td></td>
<td>8.5-10</td>
<td>45</td>
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<tr>
<td></td>
<td></td>
<td>10.0-10.5</td>
<td>ND</td>
<td>*</td>
</tr>
</tbody>
</table>

Notes:
ppm – parts per million
* – Indicates which sample interval was for laboratory analysis
ND – Not detected
NA – Not available
bgs – below ground surface
(1) – Water level measurements obtained by Baker

TABLE 4 (Continued)

SOIL TPH RESULTS FROM THE CSA (LAW, 1992 INTERIM RECORD OF DECISION SITE 35 – CAMP GEIGER AREA FUEL FARM MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>DEPTH (bgs) TO LOCATION</th>
<th>PID</th>
<th>SAMPLE DEPTH (ft)</th>
<th>DEPTH (ppm)</th>
<th>DIESEL</th>
<th>GASOLINE</th>
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<tbody>
<tr>
<td>MW-14</td>
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<td>0-1.5</td>
<td>ND</td>
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<td></td>
<td></td>
<td>1.5-3.0</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>3.0-4.5</td>
<td>60</td>
<td>*</td>
<td>0.3</td>
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<td></td>
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<td>8.5-10.5</td>
<td>16</td>
<td></td>
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<td>13.5-15.0</td>
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</tr>
<tr>
<td>LOCATION</td>
<td>DEPTH (bgs) TO</td>
<td>PID</td>
<td>SAMPLE</td>
<td>ANALYTICAL RESULTS (mg/kg)</td>
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<td>---------------</td>
<td>-------</td>
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<tr>
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<td>5.5-6.0</td>
<td>ND</td>
<td>*</td>
<td>ND</td>
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<td>*</td>
<td>3500</td>
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Notes:
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

TABLE 4 (Continued)

SOIL TPH RESULTS FROM THE CSA (LAW, 1992)
INTERIM RECORD OF DECISION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>SAMPLE</th>
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<th>PID</th>
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</tr>
<tr>
<td></td>
<td>3.0-4.5</td>
<td>150</td>
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<td></td>
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<td>*</td>
<td>8900</td>
<td>540</td>
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<tr>
<td>MW-23</td>
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<td>*</td>
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<td>Depth (bgs)</td>
<td>PID</td>
<td>Sample</td>
<td>Analytical Results (mg/kg)</td>
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</tr>
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<td>*</td>
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<td>5.5-6.0</td>
<td>45</td>
<td>*</td>
<td>5700</td>
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<td>10.0-10.5</td>
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<td>3.0-4.5</td>
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<tr>
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<td>9.5-11.0</td>
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</table>

Notes:
- ppm - parts per million
- * - Indicates which sample interval was for laboratory analysis
- ND - Not detected
- NA - Not available
- bgs - below ground surface
- (1) - Water level measurements obtained by Baker

TABLE 4 (continued)
SOIL TPH RESULTS FROM THE CSA (LAW, INTERIM RECORD OF DECISION)
SITE 35 - CAMP GEIGER AREA FUEL F
MCB CAMP LEJEUNE, NORTH CAROLINA

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<th>Sample</th>
<th>Depth (bgs)</th>
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<th>Sample</th>
<th>Analytical Results (mg/kg)</th>
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<td>1.5-3.0</td>
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<td>ND</td>
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<td>6.0-7.5</td>
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<td>PW-28</td>
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<td>3.0-4.5</td>
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<td>9.5-11.0</td>
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<td>1.5-3.0</td>
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<td>HA-9</td>
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</table>

Notes:

ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker
ppm - parts per million
* - Indicates which sample interval was for laboratory analysis
ND - Not detected
NA - Not available
bgs - below ground surface
(1) - Water level measurements obtained by Baker

### TABLE 5
SOIL TPH, OIL AND GREASE RESULTS (BAKER, 19)
INTERIM RECORD OF DECISION
SITE 35 - CAMP GEIGER AREA FUEL FARM
MCB CAMP LEJEUNE, NORTH CAROLINA

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<tr>
<td><strong>Depth (ft)</strong></td>
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<td>8-10</td>
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<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
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**TOTAL PETROLEUM HYDROCARBONS**

<table>
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<tr>
<th></th>
<th>Gasoline</th>
<th>Diesel</th>
<th>OIL AND GREASE</th>
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</thead>
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<td>mg/kg</td>
<td>mg/kg</td>
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<td><strong>Depth (R)</strong></td>
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**TOTAL PETROLEUM HYDROCARBONS**

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<th>Diesel</th>
<th>OIL AND GREASE</th>
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</thead>
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<td>1600</td>
</tr>
<tr>
<td><strong>Units</strong></td>
<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
</tr>
</tbody>
</table>

**Notes:**
ND - Not detected

mile upstream of the Fuel Farm at levels on the order of 1610 mg/kg and 11 respectively, or more than twice the remediation goal based on the SSE. Such measurements indicate the locations of the upstream surface soil samples at reach of tidal influences and, consequently, indicate that high levels of organic chemicals are present in the soil adjacent to Brinson Creek and in high oil and grease results. Although other surface soil samples obtained.
Remedial Action RI indicated the presence of oil and grease at levels as high as 3,000 mg/kg. Only one of the surface soil samples (BSCB01) exhibited both detectable contaminants: 60 mg/kg oil and grease. The discrepancy is likely due to the gravimetric analysis which is highly subject to interference from naturally-occurring organic chemicals that tend to be present in the frequently flooded soils adjacent to Brinson Creek.

Based on the remediation goals, soils exhibiting TPH levels in excess of 4 by EPA Method 5030/8015 and 160 mg/kg as measured by EPA Method 3550/8015 are subject to remediation.

7.0 DESCRIPTION OF ALTERNATIVES

Various technologies and process options were screened and evaluated under Remedial Action FS. Ultimately, six Remedial Action Alternatives (RAAs) were listed as follows:

- RAA 1 - No Action
- RAA 2 - Source Removal and Off-Site Landfill Disposal
- RAA 3 - Source Removal and Off-Site Biotreatment
- RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration
- RAA 5 - Source Removal and Off-Site Soil Recycling
- RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption

A brief description of each alternative as well as the estimated cost and implementation time are as follows:

**RAA 1 - No Action**
- Capital Cost: $0
- Annual Operation and Maintenance (O&M) Cost: $0
- Months to Implement: 0

The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no actions will be performed to reduce the toxicity, mobilize contaminant volume of the contaminated soil at Site 35. This alternative assumes that remediation will occur via biodegradation and other natural attenuation processes and that contaminant levels will be reduced over an indefinite period of time.

**RAA 2 - Source Removal and Off-Site Landfill Disposal**
- Capital Cost: $527,390
- Annual O&M Cost: $0
- Months to Implement: 2

Under RAA 2, contaminated soil located above the seasonal high groundwater will be excavated and transported off site to an appropriately permitted off-site landfill.

**RAA 3 - Source Removal and Off-Site Biotreatment**
- Capital Cost: $558,366
RAA 3 involves the excavation of contaminated soil above the seasonal groundwater table and biological treatment at an off-site commercial landfarming facility. Biological treatment is a process whereby natural microorganisms are stimulated to consume petroleum hydrocarbons as if with the resulting byproducts being carbon dioxide and water.

RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration

Capital Cost: $455,304
Annual O&M Cost: $0
Months to Implement: 2

RAA 4 involves the excavation of petroleum hydrocarbon contaminated seasonal high groundwater table for remediation via on-site, ex-site this process the excavated soil is vigorously agitated at a staging release volatile hydrocarbons from the soil to the atmosphere.

RAA 5 - Source Removal and Off-Site Soil Recycling

Capital Cost: $558,366
Annual O&M Cost: $0
Months to Implement: 2

RAA 5 involves the excavation of contaminated soil located above the groundwater table and transport to an off-site commercial soil recycling processes utilize the soil for the production of basic mat and asphalt.

RAA 6 - Source Removal and On-Site Low Temperature Thermal Desorption

Capital Cost: $613,542
Annual O&M Cost: $0
Months to Implement: 2

RAA 6 involves the excavation of contaminated soil located above the groundwater table for remediation via on-site low temperature thermal desorption process is commercially available from contractors that utilize heat wastes to between 200 and 600 degrees Fahrenheit. The heat vol contaminants which are then either collected in activated carbon, de catalytic oxidation, or released to the atmosphere.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the RAAs using the nine evaluation criteria to select a site remedy. Table 6 presents a summary of this detailed analytical comparison of each alternative's strengths and weaknesses with respect to the evaluation criteria. A glossary of the evaluation criteria is noted on Table 7.

Overall Protection of Human Health and the Environment
All of the RAAs except the No Action RAA will provide for an increase in the protection of human health and the environment. The greatest degree of protection provided by RAAs 2, 3, and 5 which involve source removal and disposal/treatment facility. Under these alternatives, after the contaminated soil is removed from the site, clean borrow will be used as backfill. RAAs 4 and 6, on the other hand, treat the soil on site as backfill material. It is likely that some residual contamination will persist after these alternatives are implemented.

### TABLE 6

**SUMMARY OF ALTERNATIVES EVALUATION**  
**INTERIM RECORD OF DECISION, CTO-0160**  
**SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEU, CAROLINA**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
<th>Overall Protection of Human Health and Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: No Action</td>
<td>No reduction in potential risks. Eliminates contaminated soil from site thereby eliminating potential exposure to and health and environment contaminants.</td>
<td>Removes contaminated soil from site thereby eliminates potential exposure to and health and environment contaminants.</td>
</tr>
</tbody>
</table>

**Compliance with ARARs**

<table>
<thead>
<tr>
<th>Chemical-Specific ARARs</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not meet NC DEHNR guidelines for soil remediation.</td>
<td>Will comply with NC DEHNR guidelines for soil remediation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location-Specific ARARs</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contaminated soils left in place under risks to wetlands, could impact wetlands and, in turn, flora, the floodplain, and endangered species in the wildlife area.</td>
<td>Source removal will reduce risks to wetlands, thereby reducing potential exposure to wetlands and other wildlife.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action-Specific ARARs</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not relevant. There are no actions.</td>
<td>Will comply with NC DEHNR guidelines for soil remediation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Long-Term Effectiveness and Permanence</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source remains in place. Natural attenuation may reduce contaminant levels, but is unpredictable.</td>
<td>Contaminated soil as a source is permanently removed from site.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reduction of Toxicity, Mobility,</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural attenuation may reduce contamination levels.</td>
<td></td>
</tr>
</tbody>
</table>
volume of soil removed. Total reduction equal to volume of soil removed.

or Volume levels, but is unpredictable.

Short-Term Effectiveness No increased risk to community and no

release VOCs Excavation and handling would release VOCs

workers because no remedial action is 2 to atmosphere. Work to be completed in 1 to 2

implemented.

Implementability Nothing to Implement.

Standard construction operation. Easy to implement. Commercial vendors available.

Costs

Capital $0

O&M $0

USEPA/State Acceptance USEPA and state will likely not prefer
to favor USEPA has a Federal mandate to favor

alternative.
treatment over disposal options. State has

for on-site versus off-site treatment.

TABLE 6 (Continued)

SUMMARY OF ALTERNATIVES EVALUATION
INTERIM RECORD OF DECISION, CTO-0160

SITE 35 - CAMP GEIGER AREA FUEL FARM, MARINE CORPS BASE, CAMP LEJEUNE CAROLINA

Alternative 4: Source Removal and On-Off-Site

Alternative 6: Source Removal and On-Site Situ Soil Aeration

Temperature Thermal Desorption

Overall Protection of Human Risks reduced, but not perhaps not to from site, thereby

Health and Environment Risks reduced, but not perhaps not to the degree of other alternatives because treated

and of other alternatives because treated soil is used as backfill.

Compliance with ARARs

Chemical-Specific ARARs Will comply with NC DEHNR guidelines for

DEHNR guidelines for TPH soil remediation.

remediation.

Location-Specific ARARs Will reduce risks to wetlands, the flo

risks to wetlands,
the area, but not perhaps to degree of other alternatives because treated soil is used as backfill.

Action-Specific ARARs
Will comply with NC DEHNR guidelines for disposal/treatment.

Long-Term Effectiveness and Permanence
Reductions in contaminant achieved via on-site treatment will be permanent. No long-term monitoring required.

Reduction of Toxicity, Mobility, Volume
Total reduction is equal to volume of soil removed. Total reduction is equal to volume of soil treated and total reduction of contaminant levels.

Short-Term Effectiveness
Excavation, handling, and treatment would release VOCs to atmosphere during 2 to 3 construction. Work to be completed in 1 to 2 years.

Implementability
Standard construction operation for excavation and treatment. No special equipment required. Commercial vendors available.

Costs
Capital: $455,304
O&M: $0

USEPA/State Acceptance
Potential objections regarding unrestricted VOC emissions during treatment. Engineering controls may be required. USEPA has a Federal mandate to favor on-site versus off-site treatment. State has preference for on-site versus off-site treatment.

**TABLE 7**

**GLOSSARY OF EVALUATION CRITERIA**
Overall Protection of Human Health and Environment - addresses whether or not an alternative provides adequate protection and describes how risks through each pathway are eliminated, reduced, or controlled through engineering controls or institutional controls.

Compliance with ARARs/TBCs - addresses whether or not an alternative will provide grounds for invoking a waiver.

Long-term Effectiveness and Permanence - refers to the magnitude of risks and the ability of an alternative to maintain reliable protection and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume through Treatment - entails anticipated performance of the treatment options that may be employed in an alternative.

Short-term Effectiveness - refers to the speed with which the alternative provides adequate protection, as well as the remedy's potential to create adverse impacts on health and the environment that may result during the construction and implementation period.

Implementability - entails the technical and administrative feasibility of the alternative, including the availability of materials and services needed to implement the solution.

Cost - includes capital and operation and maintenance costs. For comparison purposes, presents present worth values.

USEPA/State Acceptance - Evaluates the technical and administrative issues concerns the USEPA and State have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and PRAP have been received.

Community Acceptance - Evaluates the issues and concerns the public may have regarding each of the alternatives. This criterion is addressed in the comments on the RI/FS report and the PRAP have been received.

Compliance with ARARs

A summary of ARARs/TBCs that pertain to the Interim Remedial Action are presented in Table 8. All of the RAAs except the No Action RAA will comply with all of the ARARs. The source removal actions must be executed to comply with NC DEHN which TBCs were identified as chemical-specific ARARs/TBCs and used as the remediation goals established under this FS. In addition, NC DEHNR guidelines and disposing of contaminated soil are action-specific ARARs/TBCs. It is

contaminants will remain in the post-treated soil although the levels, by the remediation goals established in the FS. Consequently, the post-treat will not provide as great a degree of overall protection as the clean back RAAs 2, 3, and 5. However, the difference may largely be insignificant given that a highway will be constructed over the site.

Compliance with ARARs

A summary of ARARs/TBCs that pertain to the Interim Remedial Action are presented in Table 8. All of the RAAs except the No Action RAA will comply with all of the ARARs. The source removal actions must be executed to comply with NC DEHN which TBCs were identified as chemical-specific ARARs/TBCs and used as the remediation goals established under this FS. In addition, NC DEHNR guidelines and disposing of contaminated soil are action-specific ARARs/TBCs. It is
commercial vendors contracted to treat the soil either on site or off site will be pre-approved, appropriately permitted, or otherwise in compliance with NC DEHNR rules and guidelines. Under RAA 2, it is assumed that the proposed treatment will be permitted to accept non-hazardous, petroleum contaminated soil. The excavation contractor proposed under RAA 4 will likely be performed by the excavation contractor does not appear to be available locally as a specialized service. It is probable that the treatment will not be completely effective and that some portion of the contaminated soil must be disposed/treated by an alternative means in order to comply with ARARs.

Long-Term Effectiveness and Permanence

All of the RAAs except the No Action RAA provide for an effective and permanent soil cleanup which does not require any long-term soil monitoring.

Reduction of Toxicity, Mobility, or Volume of Contaminants

All of the RAAs except the No Action RAA provide for the reduction of toxicity, mobility, or volume of contaminants. Under RAAs 2, 3, and 5, where the contaminated soil is excavated and treated/disposed off site, the overall reduction is based on the amount of contaminated soil removed. RAAs 4 and 6, however, involve the on-site treatment of the soil as backfill meaning that the total reduction is dependent both on the amount of contaminated soil removed and the effectiveness of the treatment method.

TABLE 8
SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND CRITERIA TO BE CONSIDERED
INTERIM RECORD OF DECISION, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>ARAR/TBC Type</th>
<th>Standard, Requirement, Criteria, or Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical-Specific</td>
<td>NCDEHNR guidelines for soil remediation</td>
</tr>
<tr>
<td>chemical compounds are</td>
<td>Provides a mean soil cleanup level</td>
</tr>
<tr>
<td>unless</td>
<td>(NCDEHNR, Division of Environmental Management, Groundwater Section, March 1993)</td>
</tr>
<tr>
<td>hydrocarbons are present</td>
<td>Endangered Species Act (50 CFR Part 200 and Part 402)</td>
</tr>
<tr>
<td>Location-Specific</td>
<td>Requires action of species within</td>
</tr>
<tr>
<td>species have been identified</td>
<td>involves consultation</td>
</tr>
<tr>
<td>will be applicable</td>
<td>which endangered</td>
</tr>
<tr>
<td>found at</td>
<td>Department of I</td>
</tr>
<tr>
<td>Location-Specific</td>
<td>Fish and Wildlife Coordination Act</td>
</tr>
</tbody>
</table>
located adjacent to OU (16 USC 661-666) wildlife from an or areas affect

Location-Specific Executive Order 11990 on Establishes spe
of Wetland Inventory Protection of Wetlands federal agencie
contiguous to (40 CFR 6) impacts associa
remedial of loss of wetl

Location-Specific Executive Order 11988 on Establishes spe
floodplain of Brinson Creek federal agencie
remedial actions are Floodplain Management impacts associa
an indirect floodp

TABLE 8 (Continued)

SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND CRITERI
BE CONSIDERED

INTERIM RECORD OF DECISION, CTO-0160
SITE 35, CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE, CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>ARAR/TBC Type</th>
<th>Standard, Requirement, Criteria, or Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action-Specific Clean Air Act - National Ambient Federal air sta may be applicable for Air Quality Standards criteria pollut (40 CFR 50)</td>
<td></td>
</tr>
<tr>
<td>Action-Specific Clean Water Act Prohibits disch due to the (33 USC 404) material into a permit.</td>
<td></td>
</tr>
<tr>
<td>Action-Specific NCDEHNR guidelines for soil Providea guidel and off-site treatment and remediation various remedia (NCDEHNR Division of petroleum hydro actions) Environmental Management,</td>
<td></td>
</tr>
</tbody>
</table>
removed and the total reduction of contaminant levels. The difference should be significant since all of the remediation goals will be achieved by design.

Short-Term Effectiveness

The short-term effectiveness of the action-oriented RAAs (2 through 6) are expected to be achieved in about two months. VOC emissions can be expected under RAA 4 because the soil aeration process is intended to release the VOCs from the soil to the atmosphere.

Implementability

RAAs 2, 3, and 5 will be roughly equivalent to implement. Each of these RAA involves mobilization of construction equipment to the site for the performance of staging, and backfilling operations, and the off-site treatment/disposal of soil.

Since RAAs 3 and 5 involve off-site commercial biotreatment and soil recycling, it can be reasoned that the RAA that offers more vendors would be more flexible and implementable. Baker identified more soil recycling facilities than biotreatment services in the Camp Lejeune area. Consequently, RAA 5 (Source Removal and off-site Landfill Disposal) was evaluated as easier to implement than RAA 3 (Source Removal and Biotreatment).

RAAs 4 and 6 involve on-site treatment and disposal which will be more difficult because more on-site activities will be involved. A staging area will need to be provided for each RAA to provide a location where the excavated soil can be placed to be segregated as either clean or contaminated and await treatment/disposal. This assumption that the staging area for the on-site RAAs 4 and 6 may need to be larger.

RAAs 2 through 6 will require the construction of a decontamination area for personnel. All of the anticipated site activities involve standard construction equipment, and materials and should be relatively easy to implement.

Cost

The estimated costs of alternatives, excluding the No Action alternative, are approximately $455,000 for RAA 4 (Source Removal and On-Site, Ex-Situ Soil Desorption) and approximately $613,000 for RAA 6 (Source Removal and On-Site Low Temperature Desorption). Although RAA 4 is estimated to be the lowest cost option and is the alternative most likely to be selected by the USEPA and NC DEHNR. These objections will likely pertain to the intention of this alternative to release VOCs from the soil to the atmosphere in an uncontrolled manner. In addition, RAA 4 is the only alternative which involves more on-site activities supplied by specialty contractors. It is the option with the best chance of not performing as expected and, therefore, has the highest contingency of increased costs. The contingency for RAA 4 at 25 percent is the highest one.
which represents an attempt to recognize the uncertainties of this option. alternatives in terms of cost is as follows:

<table>
<thead>
<tr>
<th>RAA</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAA 1</td>
<td>No Action</td>
<td>$0</td>
</tr>
<tr>
<td>RAA 4</td>
<td>Source Removal and On-Site, Ex-Situ Soil Aeration</td>
<td>$455,304</td>
</tr>
<tr>
<td>RAA 2</td>
<td>Source Removal and Off-Site Landfill Disposal</td>
<td>$527,390</td>
</tr>
<tr>
<td>RAA 3</td>
<td>Source Removal and Off-Site Biotreatment</td>
<td>$558,366</td>
</tr>
<tr>
<td>RAA 5</td>
<td>Source Removal and Off-Site Soil Recycling</td>
<td>$558,366</td>
</tr>
<tr>
<td>RAA 6</td>
<td>Source Removal and On-Site Low Temperature</td>
<td>$613,542</td>
</tr>
</tbody>
</table>

All of the costs shown are capital costs because none of the RAAs have any operation and maintenance activities associated with them. In all cases, treatment/disposal was the most significant variable. The next most significant cost of off-site transportation of waste. The cost of transportation for all of the RAAs except RAA 4 are based on telephone quotations from commercial vendors because a contractor that specializes in providing this service was identified.

USEPA/State Acceptance

Neither the USEPA or NC DEHNR is likely to favor RAA 1 - No Action because result in compliance with ARARs.

The USEPA is mandated to favor treatment over disposal alternatives and, therefore, Source Removal and Off-Site Landfill Disposal will not likely be as acceptable as alternatives that feature treatment. The placement of non-hazardous, petrogenic contaminated soil in an approved, permitted landfill is a common practice and will likely be acceptable to the NC DEHNR.

RAAs 3 through 6 all involve source removal and either on-site or off-site disposal. However, the NC DEHNR states its preference is toward remedial actions per USEPA guidelines. Only RAA 4 - Source Removal and On-Site, Ex-Situ Soil Aeration will likely be confronted with objections by either the USEPA or NC DEHNR. Of the objections will be that this alternative, by design, allows VOCs to be released to the atmosphere rather than be collected or destroyed as is the case in the other alternatives.

Community Acceptance

To be addressed following public comment.

9.0 SELECTED REMEDY

All of the alternatives, except for RAA 1 - No Action will result in a per
toxicity, mobility, and volume of waste at Site 35, comply with ARARs, ach remediation goals, and contribute to the overall protection of human health environment. In general, alternatives include RAA 3, 5, and 6 are consid- technically equivalent overall. Based on estimated costs, RAAs 3 and 5 are effective than RAA 6. RAA 5 (Source Removal and Off-Site Soil Recycling) alternative in lieu of RAA 3 (Source Removal and Off-Site Biotreatment). for selecting RAA 5 over RAA 3 is that more off-site commercial soil recycle the Camp Lejeune area than off-site commercial biotreatment facilities whi RAA 5 easier to implement.

Aside from RAA 1 - No Action, the other alternatives which were not select Source Removal and Off-Site Disposal and RAA 4 - Source Removal and On-Sit Aeration. RAA 2 involves a technology based on the transfer of the contam site where its effects are uncontrolled to a secure, appropriately permitt environmental impacts are routinely monitored. Unlike RAA 3 through RAA 6 not include any provision for waste treatment and, therefore, was not sele preferred alternatives. RAA 4 - Source Removal and On-Site, Ex-Situ Soil other hand, does involve soil treatment via aeration; a process designed t contaminants directly to the atmosphere in an uncontrolled manner. The ot treatment oriented RAAs 3, 5, and 6 involve processes whereby the contamin biologically metabolized (RAA 3), utilized in the production of basic mate physically captured or destroyed (RAA 6). The fact that the contaminanta another media (air) rather than being captured or destroyed coupled with a of uncertainty as to the potential overall effectiveness of soil aeration RAA 4 not being selected as the preferred alternative.

Remedy Description

The major components of RAAs 5 include:

- Excavating contaminated soil located above the seasonal high ground which have TPH concentrations exceeding 40 mg/kg via EPA Method 503 160 mg/kg via EPA Method 3550/8015.

- Staging excavated soil on site in piles designated "clean" or "cont verification sampling and analysis.

- Transporting the contaminated soil off site to a permitted soil rec recycling refers to a manufacturing process that utilizes petroleum contami nated soil in the production of bricks.

- Backfilling the excavations with clean fill.

Estimated Costs

The estimated cost of RAA 5 including a breakdown of major cost components Table 9.

No annual O&M costs are associated with RAA 5 since this alternative would less than one year. Consequently, the net present worth of RAA 5 is equal
cost. It is important to note that the cost estimate was calculated for the purpose of comparison only and should not be considered a construction-quality estimate. An FS cost estimate is usually accurate within +50 or -30 percent (EPA, 1988).

10.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 104(a)(4). These requirements include: (1) be protective of human health and the environment, (2) comply with cost-effectiveness, (3) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; and (5) have a preference for treatment that reduces toxicity, mobility, or volume as a part of the decision process. If a treatment does not satisfy these requirements for Site 35, RAA 5 must explain why this preference is not satisfied. The evaluation of RAA 5 satisfies these requirements for Site 35 is presented below.

Protection of Human Health and the Environment

RAA 5 provides protection to human health and the environment through the site/on-site treatment of the contaminated soils exceeding the remediation goals. The risk associated with exposure to these soils is eliminated under this alternative.

Compliance With Applicable or Relevant and Appropriate Requirements

RAA 5 will comply with all ARARs.

Cost-Effectiveness

The selected remedy, RAA 5, has been evaluated to be, along with RAA 3, the cost-effective of the alternatives considered.

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>RAA 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Preparation</td>
<td>$68,600</td>
</tr>
<tr>
<td>Soil Excavation/Staging</td>
<td>100,000</td>
</tr>
<tr>
<td>Off-Site Hauling/Disposal</td>
<td>178,500</td>
</tr>
<tr>
<td>Site Restoration</td>
<td>43,360</td>
</tr>
<tr>
<td>Demobilization</td>
<td>7,800</td>
</tr>
<tr>
<td>Distributive Costs</td>
<td>63,200</td>
</tr>
<tr>
<td>Engineering and Contingencies</td>
<td>96,907</td>
</tr>
</tbody>
</table>
Utilization of Permanent Solutions and Alternative Treatment Technologies

RAA 5 represents a permanent treatment solution. That is, it utilizes, and alternative treatment technology to the maximum extent practicable.

Preference for Treatment as a Principal Element

RAA 5 satisfies the preference for treatment as a principal element since soil exceeding the remediation goals will be excavated and treated off site.

11.0 RESPONSIVENESS SUMMARY

Overview

At the time of the public comment period (July 26 through August 26, 1994) of the Navy/Marine Corps had already selected a preferred alternative for contaminated soil at operable Unit No. 10 (Site 35). The preferred alternative Interim ROD is Source Removal and Off-Site Soil Recycling (RAA 5). This involves the excavation of contaminated soil located above the seasonal high and transport to an off-site commercial facility that utilizes the basic materials such as bricks and asphalt.

No written comments were received during the public comment period and, based on comments received from the audience at the public meeting of July 26, 1994, appears to support the preferred alternative. In addition, the EPA Region DEHNR are in support of the preferred alternative. Members of the community at the public meeting on July 26, 1994, did not appear to have any opposition alternative.

Background On Community Involvement

A record review of the MCB Camp Lejeune files indicates that the community centers mainly on a social nature, including the community outreach program and base/community clubs. The file search did not locate written Installation Program concerns of the community. A review of historic newspaper articles indicates the community is interested in the local drinking and groundwater quality, the New River, but that there are no expressed interests or concerns specific to environmental sites (including Site 35). Two local environmental groups, Environmental Advocates and the Southeastern Watermen's Association, have questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Interim ROD.
Lejeune, IRP, Community Relations Plan. Neither group was available for t

Community relations activities to date are summarized below:

Conducted additional community relations interviews, February through A total of 41 interviews were conducted with a wide range of persons personnel, residents, local officials, and off-base residents.

Prepared a Community Relations Plan, September 1990.

Conducted additional community relations interviews, August 1993. N persons were interviewed, representing local business, civic groups, residents, military and civilian interests.

Prepared a revised Preliminary Draft Community Relations Plan, Augus

Established two information repositories.

Established the Administrative Record for all of the sites at the ba

Released PRAP for public review in repositories, June 1994.


Held Technical Review Committee meeting, July 26, 1994, to review PR comments.

Held public meeting on July 26, 1994, to solicit comments and provid Approximately 10 people attended. The public meeting transcript is repositories.

Summary of Comments Received During the Public Comment Period and Agency Responses

As previously mentioned, no comments (written) were received during the pu period. However, several questions/comments were generated at the July 26 meeting. The public meeting was held to discuss the Department of the Nav preferred alternative. A few of the questions pertained to matters that a related to the preferred alternative (e.g., a member of the audience inqui groundwater at the site). These types of questions and answers will not b this Responsiveness Summary; however, specific answers to these questions in the transcript to the public meeting which is contained in Appendix A. also been included in the Administrative Record. A summary of comments pe proposed alternatives and site investigations is given below.

Source of Contamination

(1) One member of the audience at the public meeting inquired as to th soil contamination at Site 35.

Navy/Marine Corps Response: The five aboveground storage tanks (A
associated underground piping which comprise the Fuel Farm at Site 35 and whether the soil contamination identified to date had been a potential source of groundwater contamination.

Soil Contamination as a Source of Groundwater Contamination

(1) One member of the audience inquired as to the nature of the subsurface geology at Site 35 and whether the soil contamination identified to date had been encountered at other Camp Lejeune sites and has been used to demarcate the portion of the Castle Hayne aquifer. The Castle Hayne aquifer is the primary source of the soil contamination. Other sources include adjacent to Building G480 and various reported surface spills of which documentation is available.

Navy/Marine Corps Response: The shallow subsurface geology at Site 35 consists of sand that extends from the ground surface to a depth of 35 to 40 feet below ground surface (bgs). The water table aquifer is typically encountered at six feet. Underlying the sand is a five to 10 feet thick zone of less permeable fines which may serve as an aquitard. This zone appears to be similar to the zone encountered at other Camp Lejeune sites and has been used to demarcate the portion of the Castle Hayne aquifer. The Castle Hayne aquifer is the primary source of the soil contamination identified to date. The nature and extent of soil contamination identified to date is such that it may serve as a significant contributor to future additional contamination of site groundwater. Determination of the nature and extent of groundwater contamination is the comprehensive RI/FS currently ongoing at Site 35. This study will determine whether groundwater contamination has extended to the Castle Hayne aquifer.

Interim Versus Comprehensive RI/FS

(1) One member of the audience requested an explanation as to the purpose of the Interim RI/FS versus comprehensive RI/FS.

Navy/Marine Corps' Response: The Interim RI/FS was focused strictly on contamination at Site 35 along the area bounded by Brinson Creek to the West, Second Street to the north and, Fourth Street to the south through Site 35 that the North Carolina Department of Transportation had constructed a new four-lane divided highway. The remediation of soil in this area was deemed necessary to reduce the environmental impact of the construction of the new highway. Concurrently, a comprehensive RI/FS was initiated to focus on other media such as soil, sediment, and surface water as well as potentially contaminated soil and vegetation investigated under the Interim RI/FS.

Remediation

(1) One member of the audience inquired as to Interim Remedial Action and to the identity of the remediation contractor.
Navy/Marine Corps Response: Baker Environmental, Inc., is responsible through the completion of the remedial design which includes the prepar specifications. Remediation services at Camp Lejeune are procured under contract. The remediation contractor is OHM Remediation Services Corpo Findlay, Ohio, which is responsible for all subcontracts required to ex remediation.

Appendix A
Transcript: Public Meeting, July 26, 1994

PUBLIC HEARING
ON THE
PROPOSED CLEANUP PLAN

CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE CAMP LEJEUNE
SITE 35 - OPERABLE UNIT NO. 10
JACKSONVILLE, NORTH CAROLINA

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JULY 26, 1994
--------------

HELD AT
TARAWA TERRACE ELEMENTARY SCHOOL
CORBIN STREET
JACKSONVILLE, NORTH CAROLINA

REPORTED BY: JAMES A. PALMER, CCR
CAPE FEAR COURT REPORTING
P.O. BOX 1256
WILMINGTON, NORTH CAROLINA 28402

(919) 763-0576
APPEARANCES

DANIEL E. BONK, P.E., PROJECT MANAGER
RAYMOND WATTRAS

BAKER ENVIRONMENTAL, INC.
AIRPORT OFFICE PARK, BUILDING 3
420 ROUSER ROAD
CARAOPOLS, PENNSYLVANIA 15108
(412) 269-6000

TABLE OF CONTENTS

SPEAKERS PAGE
NEAL PAUL: 4
RAYMOND WATTRAS: 5

JULY 26, 1994

1 PROCEEDINGS 7:24 P.M.
2 MR. BONK: GOOD EVENING. I WOULD LIKE
3 TO--CAN YOU HEAR ME? I WOULD LIKE TO WELCOME EVERYONE TO THE
4 PUBLIC MEETING FOR OUR PROPOSED REMEDIAL ACTION PLAN FOR
5 OPERABLE UNIT 10, OR SITE 35, CAMP GEIGER FUEL FARM.
6 I WOULD LIKE TO MAKE SOME INTRODUCTIONS. MY NAME IS
7 NEAL PAUL AND I'M EMPLOYED HERE BY THE BASE. I'M DIRECTOR OF
8 THE INSTALLATION-RESTORATION DIVISION. MR. WALT HAVEN, WHO IS
9 THE GEOLOGIST WHO WORKS FOR ME IS ALSO HERE. MR. RAY WATTRAS,
10 WHO IS THE PROGRAM MANAGER FOR BAKER ENVIRONMENTAL, OUR
11 CONSULTANT, IS ALSO HERE; MS. KATE LANDMAN, WHO IS THE REMEDIAL
PROJECT MANAGER FROM THE ATLANTA DIVISION OF NAFEC IS HERE; MR. DAN BONK FROM BAKER, MR. TOM BIKSEY, ALSO FROM BAKER; AND OUR OTHER REMEDIAL PROJECT MANAGER, LINDA BERRY; AND LAST BUT NOT LEAST, OUR REGULATORS MR. PATRICK WATTERS FROM THE STATE OF NORTH CAROLINA; MS. GEENA TOWNSEND FROM EPA REGION 4.

THE PURPOSE OF THIS MEETING IS REALLY JUST TO DISSEMINATE SOME INFORMATION ON WHAT OUR PLANS ARE IN CLEANING UP THIS SITE. JUST TO LET EVERYONE KNOW, THE HIGHWAY 17 BYPASS THAT HAS BEEN MUCH TALKED ABOUT IN EASTERN NORTH CAROLINA IN THE LAST YEAR IS GOING TO COME DIRECTLY OVER TOP OF THIS SITE. THIS IS GOING TO BE AN INTERIM REMEDIAL ACTION AND NOT THE FINAL REMEDIAL ACTION OF THIS SITE TO FACILITATE THAT HIGHWAY AND PRECLUDE ANY DELAYS THAT MAY--THAT WOULD HAVE PROBABLY ACCOMPANIED IT HAD WE NOT TAKEN THIS REMEDIAL ACTION.

MR. RAY WATTRAS FROM BAKER WILL BE PRESENTING THE SITE SPECIFICS ON THE REMEDIAL ACTION PLAN. RAY?

MR. WATTRAS: THANK YOU, NEAL.

MR. PAUL: I FORGOT TO SAY ONE OTHER THING. THE PUBLIC COMMENT PERIOD WILL BEGIN TODAY AND END AUGUST 26 OF 1994. THE PROPOSED REMEDIAL ACTION PLAN IS IN WALT AND MYSELF'S OFFICE, WHICH IS BUILDING 67 ABOARD THE BASE. TO ACCESS IT, IT WOULD PROBABLY BE GOOD TO GIVE US A CALL AT 451-5068, OR THE ONSLOW COUNTY LIBRARY SHOULD HAVE THE COMPLETE ADMINISTRATIVE RECORD. SO, MR. WATTRAS WILL NOW PRESENT THE PROPOSED PLAN.

MR. WATTRAS: THANK YOU VERY MUCH AND THANK
YOU FOR COMING TONIGHT. WE ARE GLAD TO HAVE YOU HERE. DURING MY DISCUSSION, AS NEAL MENTIONED, WE ARE GOING TO TALK ABOUT SITE 35 AT CAMP LEJEUNE. IT'S CALLED THE CAMP GEIGER FUEL DUMP. DURING MY DISCUSSION FEEL FREE TO INTERRUPT ME IF YOU HAVE ANY QUESTIONS. IF I SAY SOMETHING YOU DON'T QUITE UNDERSTAND, DON'T HESITATE. WE WOULD ASK, IF YOU DO HAVE A QUESTION, FOR PURPOSES OF RECORDING IT, STATE YOUR NAME AND THEN PROVIDE YOUR QUESTION.

IF YOU DON'T FEEL LIKE ASKING A QUESTION DURING THE MEETING HERE, AFTERWARDS COME UP TO US. ASK US ANY QUESTIONS THAT YOU WOULD LIKE; WRITE QUESTIONS ON A SLIP OF PAPER AND WE WILL SEE THAT YOU GET AN ANSWER.

SITE 35, AS I MENTIONED, IS CALLED THE CAMP GEIGER FUEL FARM. THIS SITE HAS BEEN STUDIED FOR A NUMBER OF YEARS. PREVIOUS INVESTIGATIONS HAVE IDENTIFIED SOIL CONTAMINATED WITH PETROLEUM PRODUCTS. IT HAS BEEN DETERMINED THAT THE SOIL CONTAMINATION DOES NOT PRESENT A SIGNIFICANT HEALTH RISK OR ENVIRONMENTAL RISK, PRIMARILY BECAUSE MOST OF THE CONTAMINATION IS BELOW THE SUBSURFACE, WHICH WE WILL GET INTO LATER ON. THIS CLEANUP ACTION, THOUGH, IS GOING TO FOCUS ON THIS PETROLEUM CONTAMINATION. ALTHOUGH THE CONTAMINANT LEVELS DON'T POSE ANY REAL OR SIGNIFICANT RISK TO THE PEOPLE THAT WORK OUT THERE OR TO THE ENVIRONMENT IN THE AREA, THERE ARE LEVELS OF PETROLEUM HYDROCARBONS WHICH EXCEED STATE STANDARDS. AND AS NEAL MENTIONED, THE HIGHWAY THAT IS TO BE BUILT IN THE AREA WILL BE
COMING RIGHT THROUGH THAT AREA. BEFORE THEY CAN BUILD THAT, WE NEED TO GO IN THERE AND REMEDIATE THAT SOIL, OR CLEAN THAT SOIL UP.

AND SITE 35 IS LOCATED UP AT CAMP GEIGER. CAMP GEIGER, IF YOU DON'T KNOW WHERE IT IS, IT'S LOCATED RIGHT ALONG ROUTE 17, SOUTH OF JACKSONVILLE. THE SITE, ITSELF, REFERS TO FIVE 15,000 GALLON ABOVE-GROUND STORAGE TANKS WHICH HAVE BEEN IN OPERATION SINCE BACK IN 1945 WHEN THE FUEL FACILITY WAS FIRST BUILT. AND THESE ABOVE-GROUND STORAGE TANKS HOLD PETROLEUM PRODUCTS SUCH AS HEATING FUEL, DIESEL FUEL AND GASOLINE.

AS I MENTIONED BEFORE, THE SITE IS LOCATED JUST SOUTH OF JACKSONVILLE, RIGHT UP HERE. THERE ARE THE FIVE ABOVE-GROUND STORAGE TANKS. BENEATH THIS AREA, THERE IS PIPING THROUGHOUT. PIPING GOING TO VARIOUS DISPENSING BUILDINGS. THERE ARE SOME UNDERGROUND STORAGE TANKS IN THE AREA THAT PIPING LEADS TO.

THERE HAVE BEEN VARIOUS REPORTS OF SPILLS DATING BACK TO 1950. SPILLS OCCUR IN A VARIETY OF WAYS. SOMETIMES BY FILLING UP THE TANKS AND OVERFLOWS. YOU CAN HAVE SPILLAGE THAT WAY. OTHER TIMES YOU HAVE PIPES THAT MAY LEAK AND YOU CAN HAVE REPORTED LOSS OF PETROLEUM PRODUCT IN THAT MANNER.

IN SOME CASES DUE TO THE AMOUNT OF FUEL LEAKING OR SPILLING FROM THE FACILITY, THEY ACTUALLY HAD TO EXCAVATE TRENCHES TO COLLECT THE FUEL, AND THEY WOULD ALSO REMOVE ANY OF THE CONTAMINATED SOIL FROM THE TRENCH AREA.

I MENTIONED BEFORE THERE HAVE BEEN QUITE A NUMBER OF INVESTIGATIONS CONDUCTED, DATING BACK TO 1983. MOST OF THERE
INVESTIGATIONS HAVE BEEN INVOLVED WITH THIS FUEL FACILITY.

THE HIGHWAY IS PROPOSED TO BE BUILT IN THE SUMMER OF 1995. AND BEFORE THAT HIGHWAY CAN BE PUT IN, A NUMBER OF BUILDINGS HAVE TO BE TAKEN DOWN; AND, ALSO, THE FUEL FARM, ITSELF. AND THAT IS BEING SCHEDULED FOR DECEMBER OF THIS YEAR.

THE STUDIES CONDUCTED TO DATE HAVE IDENTIFIED A FEW AREAS OF SOIL CONTAMINATION WITH PETROLEUM PRODUCT. IN ADDITION, BY PUTTING IN MONITORING WELLS, THEY HAVE IDENTIFIED PLUMES OF PETROLEUM SOLVENTS, OR PETROLEUM PRODUCTS IN GROUNDWATER AS WELL AS SOLVENTS IN GROUNDWATER. THE SOLVENTS WERE NOT EXPECTED. TYPICALLY FROM A FUEL FACILITY, YOU EXPECT TO FIND CONTAMINANTS ASSOCIATED WITH GASOLINE AND DIESEL. BUT IN THE INVESTIGATIONS, THEY ALSO HAD CONTAMINANTS IN GROUNDWATER SUCH AS TRICHLOROETHANE WHICH IS A SOLVENT.

ALSO MENTIONED, TO DATE, THE PREVIOUS INVESTIGATIONS THAT WERE CONDUCTED REALLY DIDN'T ANALYZE FOR SOLVENTS IN SOIL. BECAUSE OF THE FACT THAT THEY ARE DEALING WITH A FUEL FACILITY, THE LOGICAL APPROACH IS TO LOOK FOR THINGS THAT YOU WOULD ASSOCIATE WITH FUEL SUCH AS PETROLEUM HYDROCARBONS, BENZINE, XYLENES AND OTHER CONTAMINANTS LIKE THAT.

TO POINT OUT A COUPLE OF THINGS ON THIS FIGURE HERE.

THESE ARE THE GROUNDWATER PLUMES THAT I'VE JUST MENTIONED. RIGHT HERE IN THIS GRAY AREA ARE THE FIVE ABOVE-GROUND STORAGE TANKS. THE AREA OUTLINED IN GREEN IS A GROUNDWATER PROBLEM, SHALLOW GROUNDWATER PROBLEM, WHICH IS CONTAMINATED WITH PETROLEUM HYDROCARBONS. WE HAVE ONE FROM THIS FUEL FACILITY AND
ONE FROM ANOTHER AREA UP IN THIS AREA. NOW, THERE IS A SMALL FUEL OIL TANK RIGHT HERE THAT WE'RE LOOKING AT.

THE OTHER BOUNDARY THAT YOU WILL SEE ON HERE IS THE SOLVENTS THAT SHOWED UP IN GROUNDWATER. THERE WAS A SMALL PLUME IDENTIFIED DOWN IN THIS AREA, A LARGER ONE COMING FROM THIS AREA, AND A THIRD ONE SOUTH OF THE SITE.

LET ME BACK UP ONE SLIDE. BRINSON CREEK IS LOCATED JUST TO THE EAST OF THIS SITE. AND AS YOU KNOW, BRINSON CREEK GOES ALL THE WAY UP TO ROUTE 17 AND THE HEADWATERS ARE ACTUALLY JUST BEYOND ROUTE 17. AND THIS IS A PICTURE OF BRINSON CREEK.

ONE OTHER THING I WOULD LIKE TO MENTION. WE'RE TALKING TONIGHT ABOUT SOIL CONTAMINATION AND WHAT WE'RE GOING TO DO TO CLEAN IT UP. WE ARE ALSO INVOLVED WITH ANOTHER STUDY. WE ARE LOOKING AT THE GROUNDWATER JUST NOW. IT'S JUST THAT WE'RE FAST-TRACKING THE SOIL TO, NUMBER ONE, DO SOMETHING ABOUT IT; AND NUMBER 2, TO DO SOMETHING ABOUT IT IN TIME FOR THE HIGHWAY TO COME THROUGH. SO, WE ARE LOOKING AT THE GROUNDWATER. WE JUST COMPLETED OUR FIELD INVESTIGATION BACK IN JUNE.

IS THAT RIGHT, DAN?

MR. BONK: YES.

MR. WATTRAS: AND WE ALSO LOOKED AT THE SURFACE DOWN IN BRINSON CREEK. WE LOOKED AT SURFACE WATER AND SEDIMENTS, AS WELL AS THE AQUATIC WILD LIFE.

THE STUDY THAT I WAS JUST TALKING ABOUT, WE BEGAN IN 1993, AND WE JUST GOT OUT OF THE FIELD IN JUNE OF 1994. PART OF THIS STUDY FOCUSED JUST ON CONTAMINATED SOIL. NOW, THERE ARE A
LOT OF STUDIES DONE TO DATE. WE LOOKED AT THAT INFORMATION.

IT'S GOOD INFORMATION, BUT WE FELT IN ORDER TO DO AN ENGINEERING STUDY, THERE WERE STILL A FEW PIECES OF INFORMATION THAT WE WOULD LIKE TO HAVE; SO, WE CONDUCTED A LIMITED INVESTIGATION. WE ONLY NEEDED ABOUT SEVEN SHALLOW SOIL BORINGS, AND WE COLLECTED ABOUT 13 SURFACE SOIL SAMPLES. WE WANTED TO TAKE A LOOK AT WHAT IS ON THE SURFACE BECAUSE ONE OF THE THINGS WE HAVE TO LOOK AT ARE IMPACTS TO HUMAN HEALTH. AND WE DID A SMALL TRENCH EXCAVATION.

THE RESULTS PRETTY MUCH CONFIRMED THE PREVIOUS INVESTIGATIONS. THEY DID SUPPLEMENT THE INVESTIGATIONS FROM THE STANDPOINT OF WHAT WE WERE REALLY TRYING TO DO, IS GET A BETTER HANDLE ON THE EXTENT OF CONTAMINATION. THAT'S IMPORTANT, OBVIOUSLY, IN THE ENGINEERING SIDE OF THINGS. WHEN YOU GO TO CLEAN IT UP, YOU WANT TO HAVE A PRETTY GOOD IDEA OF HOW MUCH SOIL WAS CONTAMINATED AND SO FORTH.

SO, WE DID IDENTIFY THE FOUR AREAS AND WE HAVE A PRETTY GOOD FEEL FOR THE EXTENT OF THAT SOIL CONTAMINATION. I WOULD LIKE TO POINT OUT, TOO, THAT MOST OF THE SOIL CONTAMINATION IS BELOW THE SURFACE AT ABOUT THREE TO SIX FEET.

BASED ON OUR RESULTS--AND WE LOOK AT IT FROM THE STANDPOINT OF THE PEOPLE THAT WORK THERE. WE ALSO LOOK AT IT FROM THE STANDPOINT THE CONSTRUCTION WORKERS WILL BE DIGGING THIS SOIL UP. BASED ON THE LEVELS OF CONTAMINATION, WE LOOKED AT THOSE EXPOSURE SCENARIOS AND DETERMINED THAT THERE WOULD BE NO REAL SIGNIFICANT HUMAN HEALTH RISK.
THE THING THAT IS CLEANING UP THIS ACTION, AS I MENTIONED BEFORE, IS PRIMARILY RELATED TO THE STATE GUIDELINES FOR TPH. ONCE THE CONTRACTOR COMES IN TO PUT THE HIGHWAY IN, IF THAT CONTRACTOR WOULD RUN INTO SOIL CONTAMINATED WITH PETROLEUM PRODUCTS, THEY WOULD HAVE TO DISPOSE OF IT PROPERLY AND THEY WOULD HAVE TO CLEAN UP TO A LEVEL THAT WOULD MEET THE STATE GUIDELINES. THAT'S WHY WE'RE DOING THIS, TO GET RID OF THAT SO THAT THEY DON'T RUN INTO ANY OBSTACLES PUTTING THAT HIGHWAY IN.

THIS IS JUST A PICTURE OF THE TRENCH THAT WE DUG THROUGH THERE. THE PURPOSE OF THAT TRENCH WAS REALLY TO GET A FEEL FOR--IF THEY START DIGGING, MEANING EXCAVATION OF THE HIGHWAY, WE DIDN'T WANT ANY SURPRISES SUCH AS PRODUCT FLOWING INTO AN EXCAVATION. SO, WE DECIDED TO PUT A TRENCH ABOUT, I GUESS--DAN, HOW LONG WAS THAT TRENCH, ABOUT 100 YARDS OR SO, OR LONGER?

MR. BONK: NO, IT WAS LONGER. MAYBE SIX OR SEVEN-HUNDRED FEET.

MR. WATTRAS: AND IT WENT DOWN ABOUT WHAT, A FOOT AND A HALF, TWO FEET?

MR. BONK: ABOUT TWO FEET. AND IT WAS PURPOSELY PUT INTO A LOW AREA WITH THE THINKING THAT ANY CONTAMINATION WOULD HAVE FLOWED FROM THE HIGHER ELEVATIONS TO THE LOWER ELEVATIONS. SO, IT WAS IN THE MOST LIKELY POSITION. IT WAS VERY CLOSE TO THE GROUNDWATER. WE JUST WANTED TO GET A LONG LOOK AT THE AREA.

MR. WATTRAS: Again, based on our
EXPERIENCE AT OTHER SIMILAR SITES--WE RAN INTO A SITUATION ONE TIME WHERE A CONTRACTOR STARTED TO DIG A TRENCH, OR STARTED TO EXCAVATE, AND CAME BACK THE NEXT MORNING AND IT WAS FILLED UP WITH PRODUCT. SO, WE SAID AHEAD OF TIME, LET'S SEE WHAT HAPPENS WITH DIGGING A TRENCH. AND THAT'S THE SOLE PURPOSE OF PUTTING THIS TRENCH IN, IS TO ELIMINATING ANY SURPRISES DOWN THE ROAD.

MS. WOOD: WHERE IS THE WATER TABLE THERE?

MR. WATTRAS: PARDON ME?

MS. WOOD: WHERE IS THE WATER TABLE THERE?

MR. WATTRAS: THE WATER TABLE IS ABOUT SIX TO SEVEN FEET, DAN?

MR. BONK: OVER MOST OF THE SITE THE WATER TABLE IS ABOUT SIX TO SEVEN FEET BELOW THE GROUND SURFACE. BUT THERE ARE TWO--BASICALLY TWO LAYERS TO OUR SITE WITH THE FLAT PORTION WHERE THE TANKS ARE LOCATED, THE GROUNDWATER IS ABOUT SIX OR SEVEN FEET DOWN, AND THEN IT DROPS OFF TOWARDS THE CREEK. SO, BASICALLY, THE GROUND WATER MEETS THE CREEK AT THAT POINT. SO, IN BETWEEN, YOU MAY BE THREE FEET, OR TWO FEET, OR WHATEVER.

MR. WATTRAS: OKAY. THE CLEANUP GOALS THAT WE ESTABLISHED WERE BASED ON A SITE SENSITIVITY EVALUATION. IT IS A CHECK LIST, IT IS A FORM THAT YOU FILL OUT, IT IS A NORTH CAROLINA ACTION LEVEL. AND IT TAKES INTO CONSIDERATION SUCH THINGS AT THE DEPTH OF THE GROUNDWATER, LOCAL POPULATION. AND
YOU FILL OUT INFORMATION ON THIS FORM AND IT CALCULATES AN ACTION LEVEL THAT THEY WOULD LIKE YOU TO CLEAN UP TO.

IN OUR CASE, WE'RE LOOKING AT TPH, WE LOOKED AT TWO ACTION LEVELS: ONE THAT WOULD BE ASSOCIATED WITH THE LIGHTER COMPOUND SUCH AS GASOLINE. AND THAT'S GOING TO BE 40 PARTS PER MILLION. THE OTHER ACTION LEVEL INVOLVES A TPH ANALYSIS THAT LOOKS AT DIESEL, AND THAT'S A LITTLE BIT MORE OF A HEAVIER FUEL. AND THAT ACTION LEVEL IS ROUGHLY 150 PARTS PER MILLION.

I BELIEVE THIS FIGURE THAT'S HERE THAT'S UP ON THIS SLIDE IS THE SAME ONE THAT'S PRINTED UP ON THE POSTERS. SO, IF YOU CAN'T READ IT, MAYBE LATER ON YOU WOULD LIKE TO TAKE A LOOK AT THAT POSTER AND WE CAN DISCUSS IT.

THERE ARE FOUR AREAS THAT WILL BE EXCAVATED. THE ONE OBVIOUS AREA IS RIGHT BELOW THE ABOVE-GROUND STORAGE TANKS. ALTHOUGH NO SAMPLES WERE TAKEN RIGHT BELOW THESE TANKS, RIGHT NOW THERE IS A CONCRETE LAYER THAT YOU REALLY WOULD HAVE TO BUST UP TO GET TO, WE ASSUME WITH PIPING, THAT ONCE THEY REMOVE THOSE TANKS, THERE IS PROBABLY GOING TO BE STAINED SOILS AND PETROLEUM CONTAMINATED SOILS. THAT'S BASED ON EXPERIENCE. ON A LOT OF TANK SITES, THAT'S WHAT YOU FIND WHEN YOU PULL THEM. SO, WE ASSUME RIGHT NOW THERE WILL BE SOME SOIL THAT WILL NEED TO BE TAKEN OUT WHEN THEY DISMANTLE THIS FACILITY.

TWO OTHER AREAS ARE LOCATED NORTH OF HERE. ONE IS UP JUST NORTH OF THIS SITE, AND ANOTHER ONE TO THE NORTHWEST OF THIS SITE. AND THEN THERE IS THE THIRD AREA. I MENTIONED BRIEFLY BEFORE THAT THERE WAS AN UNDERGROUND STORAGE TANK THAT
CONTAINED FUEL OIL. BASED ON OUR SOIL RESULTS, THERE IS SOME
SOIL CONTAMINATION HERE.

YOU MIGHT BE ABLE TO SEE IT ON HERE. THIS IS THE
LOCATION OF THE FOUR-LANE HIGHWAY GOING THROUGH. SO, IT IS
COMING RIGHT THROUGH THE CENTER OF THE SITE.

AGAIN, THE SOIL, WE ARE GOING TO HAVE TO EXCAVATE
ABOUT TWO TO THREE FEET OF CLEAN SOIL, STOCKPILE IT IN A CERTAIN
AREA, THEN GET THE CONTAMINATED SOIL. WE WILL EXCAVATE DOWN
PROBABLY JUST TO THE TOP OF THE WATER TABLE, AND THEN IT WOULD
BE BACKFILLED WITH CLEAN SOIL AGAIN.

WE LOOKED AT SIX ALTERNATIVES IN DEALING WITH THIS
PROBLEM. ONE ALTERNATIVE THAT WE ALWAYS CONSIDER IS THE
NO-ACTION ALTERNATIVE. THAT MEANS DO NOTHING. THAT'S ALWAYS AN
ALTERNATIVE. SOMETIMES YOU END UP NOT DOING ANYTHING AT A SITE
BECAUSE AFTER STUDYING IT, YOU FIND OUT THAT THERE IS REALLY NO
IMPACT OF THE PROBLEM. BUT NO ACTION IS ALSO USED AS A BASELINE
TO MEASURE THE OTHER ALTERNATIVES.

THE SECOND ALTERNATIVE WOULD INVOLVE THE REMOVAL OF
THE CONTAMINATED SOIL AND WE WOULD TAKE IT TO AN OFF-SITE
LANDFILL THAT WOULD BE PERMITTED TO ACCEPT PETROLEUM WASTE.

THE THIRD ALTERNATIVE INVOLVES EXCAVATION OF THE SOIL
IN TAKING IT OFF SITE TO A BIOTREATMENT FACILITY. HERE THAT
FACILITY WOULD TAKE IT. IT PROBABLY WOULD INVOLVE LAND FARMING
WHERE OVER TIME THOSE PETROLEUM LEVELS WOULD DEGRADE.

THE FOURTH ALTERNATIVE INVOLVES EXCAVATION OF THE
SOILS IN WHAT'S CALLED SOIL AERATION. SOIL AERATION IS SIMPLY
When you excavate or you lift the soil up and you aerate it. You drop it, you pick it up again, you move it around and it volatilizes out of the soil. It could either volatilize directly to the atmosphere, or it could be collected in hoods that capture these contaminants.

The fifth alternative involves source removal and off-site soil recycling. There are a number of facilities in this general area that would recycle this type of material. They could make it into asphalt or into bricks.

And the sixth alternative involves excavation and on-site thermal desorption, which is essentially like baking the soil. It bakes it to a temperature where it would not turn into ash, but it volatilizes out the contaminants. And then that soil would be used as backfill.

These alternates ranged anywhere from zero, if we do nothing, all the way to about six-hundred-thousand dollars. You notice, other than the no action alternative, the least expensive is alternative number four, which I mentioned is the soil aeration alternative. That one also has the highest risk involved. Because of the time frame involved here, we did not perform any treatability studies to see by aerating the soil can we get down to the action levels that the state would like us to get down to. If we don't get down to the action levels, that means one thing. You keep aerating it, which means time, and time means money; so, there is a lot of risk in that alternative.
THE SECOND LEAST EXPENSIVE ALTERNATIVE IS ALTERNATIVE NUMBER TWO WHERE WE WOULD SIMPLY EXCAVATE IT AND TAKE IT OFF TO A LANDFILL. THAT ALTERNATIVE IS NOT MUCH CHEAPER OR EXPENSIVE AS SOME OF THE OTHERS. AND WITHOUT TREATING IT, IT'S NOT--IT'S ACCEPTABLE BUT IT'S NOT THE PREFERRED ALTERNATIVE, ESPECIALLY WHEN THERE ARE OTHER ALTERNATIVES WITHIN A CLOSE RANGE OF MONEY HERE THAT WOULD ACTUALLY TREAT THE SOIL.

THE OTHER TWO ALTERNATIVES, TAKING IT TO AN OFF-SITE BIOREMEDIATION FIRM, AND ALTERNATIVE NUMBER FIVE, RECYCLING, WERE PRETTY MUCH THE SAME COST. AND FINALLY, THE LAST AND THE MOST EXPENSIVE ALTERNATIVE ENDED UP BEING THE THERMAL DESORPTION ALTERNATIVE.

THE ALTERNATIVE BEING PROPOSED BY THE NAVY MARINE CORPS IS ALTERNATIVE NUMBER FIVE. THIS WOULD INVOLVE EXCAVATION OF THE SOIL AND TAKING IT TO AN OFF-SITE SOIL RECYCLING FACILITY. BECAUSE THERE ARE A NUMBER OF FACILITIES IN THIS AREA, WE FELT WE WOULD BE ABLE TO GET COMPETITIVE BIDS WHICH COULD POSSIBLY EVEN DECREASE THE COST OF THIS ALTERNATIVE. BUT SOIL RECYCLING IS AN ACCEPTABLE ALTERNATIVE. PETROLEUM CONTAMINATED SOILS ARE USED A LOT IN ASPHALT PRODUCTION AND BRICK BAKING.

I BELIEVE THAT'S OUR PRESENTATION. I WOULD LIKE TO ENTERTAIN ANY QUESTIONS RIGHT NOW.

WHERE DO YOU BELIEVE THE CONTAMINATION CAME FROM?

WE ALL BELIEVE IT CAME FROM
AN UNDERGROUND STORAGE TANK. OUR RECORDS INDICATE THAT ALL THE UNDERGROUND STORAGE TANKS IN THE AREA ARE RELATED TO PETROLEUM FUELS AND SO FORTH. THERE ARE A NUMBER OF MAINTENANCE FACILITIES IN THE AREA. AND WITH ANY MAINTENANCE FACILITY, YOU HAVE DEGREASING OPERATIONS. AND IT IS LIKELY THAT OVER THE YEARS SMALL SPILLS HAVE OCCURRED. THAT'S WHAT WE'RE LOOKING AT RIGHT NOW. AND AS PART OF THE COMPREHENSIVE STUDY, WE ARE LOOKING AT GROUND WATER IN BRINSON CREEK. WE'VE TAKEN A NUMBER OF SOIL SAMPLES FROM DIFFERENT AREAS AND ANALYZED THEM FROM SOLVENT CONSTITUENTS TO FIND OUT WHERE THE SOURCE MIGHT BE.

NOW, I KNOW FROM EXPERIENCE DOWN HERE AT CAMP LEJEUNE, A LOT OF THESE SPILLS OCCURRED SUCH A LONG TIME AGO THROUGHOUT THE YEARS, I WOULD NOT BE SURPRISED—BECAUSE WE'VE SEEN THIS AT OTHER SITES—that it might not be in the soil matrix any more. THROUGH THIRTY-FOURTY YEARS OF OPERATIONS AND INFILTRATION OF RAIN AND SO FORTH, IN THOSE TYPES OF SOLVENTS ARE VERY—they MIGRATE VERY RAPIDLY IN THE ENVIRONMENT. THEY COULD HAVE BEEN WASHED RIGHT DOWN TO THE WATER TABLE. SO, THEY MAY NO LONGER BE IN THE SOIL, BUT THEY ARE JUST SITTING IN THE GROUND WATER.

MS. WOOD: WELL, WHAT IS THE LAND STRUCTURE DOWN HERE? ARE YOU NOT WORRIED ABOUT YOUR AQUIFER?

MR. WATTRAS: WE HAVE A PRETTY GOOD PICTURE OF IT. AT ABOUT 35 TO 40 FEET THERE IS A SEMI-CONFINING CLAY LAYER, DAN, WOULD YOU SAY?

MR. BONK: IN GENERAL WE SEE THE TYPICAL SAND MATERIAL THAT YOU WOULD PICK UP EVEN OUTSIDE HERE FOR ABOUT
35 TO 40 FEET. THEN WE HAVE--BETWEEN 40 AND 45 FEET, WE HAVE

HIT A MORE CLAY ZONE. WHETHER IT'S CONTINUOUS ENOUGH TO BE

CONSIDERED SOMETHING THAT WOULD HOLD THE CONTAMINATION ABOVE IT

IS PART OF WHAT OUR STUDY WAS SUPPOSED TO DETERMINE BECAUSE WE

DID SET WELLS ABOVE AND BELOW THAT ZONE, AND WE SHOULD BE ABLE

TO ANSWER THAT QUESTION. BUT THERE IS A LENS AT ABOUT 40 FEET

WHICH WE HOPE IS A CONFINING LAYER AND WE WILL DETERMINE THAT.

MS. WOOD:                       WELL, ONE OTHER QUESTION.

WOULD YOU DIFFERENTIATE BETWEEN YOUR INTERIM ACTION AND THEN

YOUR LONG TERM? AS I UNDERSTAND, YOU WANTED TO GET THE DIRT

OUT--

MR. WATTRAS:                   YES.

MS. WOOD:                      --SO THAT THE HIGHWAY CAN GO

THROUGH. BUT THEN, WHERE IS THE LONGER TERM--

MR. WATTRAS:                   SIMPLY PUT, THE INTERIM

ACTION FOCUSES ON THE SOIL; THE LONG TERM WILL FOCUS ON THE

GROUND WATER, POSSIBLY MORE SOIL, IF WE CAN ASSOCIATE IT WITH

THIS GROUNDWATER PROBLEM, AND ALSO IF WE FIND ANY PROBLEMS WITH

BRINSON CREEK, ITSELF. SO, THAT'S A MORE COMPREHENSIVE PICTURE.

BUT IT'S PRIMARILY GOING--IT LOOKS LIKE IT WOULD BE MAINLY

FOCUSED ON GROUNDWATER.

MS. WOOD:                      WELL, NOW ON THE BIDS, WHO

TAKES THE BIDS?

MR. WATTRAS:                   WELL, I TALKED ABOUT BIDDING

BEFORE. THERE IS A CONTRACTOR. BAKER ENVIRONMENTAL IS INVOLVED

FROM THE INVESTIGATION STAGE. WE DO THE RISK ASSESSMENTS AND
THEN WE DO THE DESIGN OF THE ALTERNATIVE. THE DEPARTMENT OF THE
NAVY HAS ANOTHER CONTRACTING MECHANISM, AND THERE IS ANOTHER
COMPANY—IT'S CALLED OHM—IT DOESN'T STAND FOR ANYTHING. BUT
THEY ARE FROM FINDLAY, OHIO. THEY HAVE OFFICES—IN FACT, THE
OFFICE THAT NEAL IS DEALING WITH IS OUT OF NORCROSS, GEORGIA.
BUT THAT COMPANY HAS THE CONTRACT TO DO THE REMEDIATION HERE AT
CAMP LEJEUNE.

THAT COMPANY WOULD DO THIS WORK. OHM DOES NOT OWN
RECYCLING FACILITIES. THEY WOULD TAKE THAT SOIL. AND IT IS UP
TO THEM. THEY WOULD GO OUT FOR COMPETITIVE BIDS TO THE LOCAL
RECYCLING CENTERS HERE AND TRY TO GET THE LOWEST COST.

MS. WOOD: SO, NORFOLK IS NOT GOING TO
BE INVOLVED IN THE BIDDING?

MR. WATTRAS: NO.

MR. PAUL: DID YOU SAY NORFOLK? THAT
WOULD ADMINISTER THE CONTRACT, BUT THAT—WHEN YOU SAY INVOLVED—

MS. WOOD: I MEAN, THEY ARE NOT
ACCEPTING THE BIDS? IT'S OHM.

MR. PAUL: IT'S OHM, THAT'S RIGHT.

MR. WATTRAS: OKAY.

ANY OTHER QUESTIONS? FEEL FREE TO STICK AROUND AND IF
YOU HAVE ANYTHING YOU WANT TO TALK ABOUT ON THE POSTER BOARDS,
FEEL FREE TO DO SO.

MS. WOOD: WAS THIS THE ONE? I THINK I
GET CONFUSED ON THIS. WAS THIS THE ONE WHERE THEY HAD THE BIG
SPILL AND THEY HAD THE FIRE AND THEN THE RECORDS WERE DESTROYED.

MR. WATTRAS: YES.

MS. WOOD: BUT THOSE RECORDS WERE

MR. WATTRAS: WE CANNOT FIND--DOCUMENTATION THROUGHOUT THE BASE OF PAST EVENTS IS POOR, TO PUT IT BLUNTLY.

WE DID HEAR THAT THERE WAS A FUEL SPILL. AND THIS WAS THE EVENT WHERE YOU TALKED ABOUT THAT THEY ACTUALLY LIT IT ON FIRE AND THAT'S HOW THEY GOT RID OF IT. AND IT IS PROBABLY ASSOCIATED WITH ONE OF OUR AREAS THAT WE HAD CIRCLED UP THERE THAT HAS SOIL CONTAMINATION. WE THINK, ANYWAY. YOU KNOW, WE ARE NOT EVEN QUITE SURE WHERE THE EXACT SPILL WAS, BUT WE THINK IT MIGHT BE IN THIS ONE AREA, AND IT HAPPENS TO BE ONE OF THE AREAS THAT WILL BE REMEDIATED. SO, THE DOCUMENTATION IS VERY POOR.

OKAY. NEAL, WOULD YOU LIKE TO SAY ANYTHING ELSE?

MR. PAUL: I DON'T HAVE ANYTHING ELSE.

WE PROBABLY WILL BE HERE FOR ANOTHER FIFTEEN OR TWENTY MINUTES.

SO, IF FOR SOME REASON YOU DIDN'T ASK A QUESTION IN THIS FORM, FEEL FREE TO, AS WE BREAK UP AND IT'S GOING TO BE INFORMAL. WE WILL PROBABLY JUST BE AROUND HERE FOR FIFTEEN OR TWENTY MINUTES.

SO, FEEL FREE, IF YOU HAVE ANY QUESTIONS, TO ASK US. WE WOULD LOVE TO ANSWER THEM FOR YOU. AND TOMORROW NIGHT, THERE WILL ALSO BE ANOTHER PUBLIC MEETING TOMORROW NIGHT FOR UNITS ONE AND FIVE TO DISCUSS OUR REMEDIAL ACTION PLANS FOR THOSE AS WELL.

AND AGAIN, THANK YOU FOR COMING TONIGHT.

(WHEREUPON, THE PUBLIC HEARING IN THE CAMP GEIGER FUEL
FARM PROPOSED CLEAN UP WAS CLOSED AT 8:05 P.M.)

I CERTIFY THAT THE FOREGOING IS A CORRECT TRANSCRIPT
FROM THE RECORD OF PROCEEDINGS IN THE ABOVE-ENTITLED MATTER.

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JAMES A PALMER, CCR                  DATE
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC

EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL (SITE 5)
USMC/CHEM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/15/1994
Operable Unit: 05
ROD ID: EPA/ROD/R04-94/194
Media: water, soil, sediment

Contaminant: Pesticides, VOC, diazinon, chlordane, lindane, DDT, malathion, milex, 2, 4-D, silvex, and dalapon
Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The 236 square mile U.S. Marine Corps Camp Lejeune site is located in Onslow County, North Carolina. Camp Lejeune is bound to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The site was used from 1945 until the present and is currently active. The water body receiving overland surface drainage is Brinson Creek.

Operable Unit 10, refers primarily to five 15,000 gallon aboveground storage tanks, a pump house, and a fuel loading pad. The aboveground storage tanks (AST) at Site 35 are currently used to dispense gasoline, diesel, and kerosene to government vehicles and to supply underground storage tanks in the area. A leak in the underground line from the ASTs to the dispensing island was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period. The leaking line was subsequently sealed and replaced. Reports of a release from an underground distribution line near one of the ASTs date back to 1957. The leak occurred as a result of damage to a dispensing pump, and it was estimated that thousands of gallons of fuel were released. Interceptor trenches were excavated and the captured fuel was ignited and burned. In addition, in April 1990, an undetermined amount of fuel was discovered along the unnamed drainage channels located to the north of the site. This fuel was believed to be an unauthorized discharge from an unidentified tanker truck. The Fuel Farm was scheduled to be decommissioned in 1994.

Operable Unit 5, primarily Site 2, is approximately five acres and is bordered to the north by a wooded area that generally drains north toward Overs Creek; to the west by Holcomb Boulevard; and to the east by a water treatment plant. Within the site are two areas of concern. Building 712, which is the mixing and lawn areas, and the former storage area.

OU1 covers an area of approximately 690 acres. OU1 is located approximately one mile east of the New River and two miles south of State Route 1. The operable unit is bordered by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Main Service Road to the southwest, and woodlands and Cogdels Creek to the southeast.
Site 21 has had a history of pesticide usage and reported transformer oil disposal. From 1958 to 1977, one portion of the site was used as a pesticide mixing and cleaning area for pesticide application equipment. Chemicals reportedly stored at this site included diazinon, chlordane, lindane, DDT, malathion, mirex, 2,4-D, silvex, and dalapon. The Former Transformer Oil Disposal Pit was located in the NE portion of the site. The pit was reportedly used as a disposal area for transformer oil during a one year period between 1950 and 1951. The pit reportedly measured 25 to 30 feet long by 6 feet wide by 8 feet deep. The quantity of oil disposed in this pit is unknown.

Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980.

With respect to Site 78, the Hadnot Point Industrial Area (HPIA) was the first developed area at MCB, Camp Lejeune. It was comprised of approximately 75 buildings and facilities including: maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, and storage yards. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks, drums, and uncontained waste storage areas. It appears that several general building areas within Site 78 may be potential source areas of contamination.

From 1945 to 1958, Building 712 was used for storing, handling, and dispensing of pesticides. Building 712 was later used as a children's day care center. Currently the building houses administrative offices. Chemicals known to have been used include chlordane, DDT, diazinon, and 2,4-D. Chemicals known to have been stored on site include dieldrin, lindane, malathion, silvex, and 2,4,5-T. Contamination at the site is believed to have occurred as a result of small spills, washout and excess product disposal. During operation it is reasonable to assume several gallons of product used per year. The estimated quantity involved is on the order of 100 to 500 gallons of liquid containing various concentrations of product. Solid residues in cracks and crevasses may total 1 to 5 pounds. The former storage area was used to store bulk materials and vehicles.

In 1983, an initial assessment study of Camp Lejeune was conducted which identified a number of areas, including OU-5. From 1984 to 1990 a Confirmation Study was conducted at site 2. In 1992, a limited ground-water sampling program to scope future remedial
investigation activities was conducted. In 1993, an RI field program was conducted to characterize potential environmental impacts and threats to human health and the environment resulting from previous operations. Investigation activities began April 1993 and continued through June 1993. Contaminants including pesticides, VOCs, and SVOCs were detected in soil, groundwater, surface water, and sediments. Pesticides appear to be the predominant contaminants of concern in soils and sediments. VOCs appear to be the primary contaminant in groundwater. A time critical removal action removed the pesticide-contaminated soils and sediment identified during the remedial investigation. An estimated 500 cubic yards of soil and sediment was planned to be excavated and transported off site for treatment and disposal.

This ROD discusses OU-5 which addresses the remediation of contaminated shallow groundwater in the vicinity of the former storage area. A time critical Removal Action will remove the contaminated soil and sediment in the vicinity of the Building 712. The contaminated soil and sediment are also potential sources of groundwater contamination.

**Remedy:** Institutional Controls restricting the installation of any new potable water supply wells and Long-term Ground-water monitoring. A time critical removal action is planned to be completed prior to the selected remedy to remove contaminated soils and sediments.

**Text:** Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 05
ONSLOW COUNTY, NC
09/15/1994
FINAL
RECORD OF DECISION
OPERABLE UNIT No. 5 (SITE 2)

MARINE CORPS BASE,
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0174
SEPTEMBER 8, 1994

Prepared For:

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

Under the:
LANTDIV CLEAN Program
Contract N62470-89-D 4814

Prepared By:
BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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<td>Comprehensive Environmental Response, Compensation and Liability Act</td>
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</tr>
<tr>
<td>COPC</td>
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<tr>
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<tr>
<td>FS</td>
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</tr>
<tr>
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<td>HQ</td>
<td>hazard quotient</td>
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<tr>
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</tr>
<tr>
<td>ICR</td>
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</tr>
<tr>
<td>IRP</td>
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<tr>
<td>MCB</td>
<td>Marine Corps Base</td>
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<tr>
<td>MCL</td>
<td>Maximum Contaminant Level</td>
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<tr>
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<td>NCWQS</td>
<td>North Carolina Water Quality Standard</td>
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<td>National Priorities List</td>
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<td>NPDES</td>
<td>National Pollution Discharge Elimination System</td>
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<tr>
<td>NPW</td>
<td>net present worth</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>operation and maintenance</td>
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<td>PRAP</td>
<td>Proposed Remedial Action Plan</td>
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<tr>
<td>RAA</td>
<td>remedial action alternative</td>
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<td>Record of Decision</td>
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<td>Superfund Amendments and Reauthorization Act</td>
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<td>STP</td>
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<td>VOC</td>
<td>volatile organic compound</td>
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Site Name and Location
Operable Unit No. 5 (Site 2)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose
This decision document presents the selected remedy for operable Unit No. 5 (Site 2) at 3 Marine Corps Base (MCB), Camp Lejeune, North Carolina which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the operable unit.

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Assessment of the Site
Actual or threatened releases of hazardous substances from this operable unit, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

Description of Selected Remedy
The selected remedy for Site 2, Institutional Controls/Long-Term Groundwater Monitoring, is the final action to be conducted at this site. A Time Critical Removal Action (TCRA) is planned to be completed prior to that of the selected remedy at the operable unit for the removal of pesticide-contaminated soils and sediment identified during the remedial investigation. The contaminated soils and sediment may present an adverse risk to human health and the environment, and are potential sources of groundwater contamination. Removal of the contaminated soils will reduce the risk to human health and ecological receptors below environmental risk guidelines set and reviewed by credible organizations. Therefore, no other action will be required for soil or sediment.

The selected remedial action included in this ROD addresses the principal threats remaining (i.e., post-TCRA) at Site 2 by addressing groundwater contamination.

The principal threat, following the implementation of the TCRA, involves the potential ingestion of contaminated groundwater originating from Site 2. The primary objectives of the selected remedy are: (1) to prevent future human exposure to the contaminated groundwater and (2) to insure, through monitoring, that there is no human or environmental exposure due to migration of the contaminant plume off site.

The major components of the selected remedy for this operable unit include:

- Restricting the installation of any new potable water supply wells within the vicinity of Site 2.
- Implementing a long-term groundwater monitoring program to monitor groundwater quality in site monitoring wells end nearby potable water supply wells.

Statutory Determinations
This remedial action is protective of human health and the environment and is cost-effective. Due to the limited nature of the contamination, the small hydraulic gradient of the aquifer horizontal flow, the high potential for treatment via natural biodegradation and attenuation processes, the practicality of employing treatment, and the lack of evidence of a contaminant source, use of treatment to reduce toxicity, mobility, or volume was not deemed feasible to protect human health and the environment, which are not at risk. Therefore, permanent solutions...
and alternative treatment technologies were not utilized to the maximum extent practicable. Additionally, this remedial action does not satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Similarly, the federal and state groundwater standards that are applicable or relevant and appropriate to the remediation action are not met by the remedial action. Although treatment is not being employed, this remedial action is protective of human health and the environment since there are currently no significant human health or ecological risks posed by the nature of the groundwater contamination. Future risks are unlikely based on the potential for exposure to contaminants in the shallow groundwater. Because this remedy will result in hazard substances remaining on site (in terms of contaminated groundwater) above state or federal groundwater standards, a five-year review of this alternative will be necessary in accordance with CERCLA.

__________________________________________________      _________
Signature (Commanding General, MCD Camp Lejenue)        Date
1.0 SITE LOCATION AND DESCRIPTION

Marine Corps Base (MCB), Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base (see Figure 1).

The study area, Operable Unit No. 5, is one of 13 operable units within MCB Camp Lejeune. An "operable unit" as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is a discrete action that comprises an incremental step toward comprehensively addressing site problems. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action. With respect to MCB Camp Lejeune, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented.

Operable Unit No. 5, which covers an area of approximately 5 acres, is made up solely of Site 2. The site is located at the intersection of Holcomb Boulevard and Brewster Boulevard (see Figures 1 and 2). As shown on Figure 2, the site is bordered to the north by a wooded area that generally drains north toward Overs Creek; to the west by Holcomb Boulevard; and to the east by a water treatment plant. Within the site, there are two main areas of concern the area around Building 712 [including the Lawn Area (LA) and the Mixing Pad Area (MPA)]; and the Former Storage Area (FSA), which is located at the southern portion of the site across the railroad tracks (see Figure 2).

The land at Site 2 is primarily flat, but dips sharply at the drainage ditches which run parallel to the Camp Lejeune Railroad. There is a drainage ditch on both the east and west side of the railroad tracks. Drainage along the eastern edge of the Building 712 area is toward these drainage ditches, which run in a north-northwest direction toward Overs Creek. Drainage along the western edge of the Former Storage Area (FSA) is also towards these drainage ditches. Another drainage ditch extends westward from the Building 712 area, underneath Holcomb Boulevard.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section of the Record of Decision (ROD) provides background information on the site's history and enforcement actions to date. Specifically, the land use history and the previous investigations which have been conducted are briefly discussed.

Site History

From 1945 to 1958, Building 712 was used for the storing, handling, and dispensing of pesticides. Building 712 was later used as a children's day care center. The building is currently used for administrative offices.

Chemicals known to have been used include chlordane, DDT, diazinon, and 2,4-D. Chemicals known to have been stored on site include dieldrin, lindane, malathion, selvex, and 2,4,5-T. Areas of suspected contamination due to previous site operations are the MPA, and the railroad drainage ditch which is adjacent to the MPA. Aboveground horizontal storage tanks were identified near the southern missing pad area in a 1952 aerial photograph. Contamination at the site is believed to have occurred as a result of small spills, washout and excess product disposal. During the years of operation, it is reasonable to assume several gallons of product used per year; therefore, the estimated quantity involved is on the order of 100 to 500 gallons of liquids containing various concentrations of product. Solid residues in cracks and crevasses may total 1 to 5 pounds.

The FSA was used to store bulk materials and vehicles. The following items, within the FSA, were identified in aerial photos:
• A railroad siding, extending from the main line into the FSA.

• A crane, possibly located on the railroad siding, that was apparently used to unload materials from railroad cars.

• An area of possibly stained surface soil, present along the eastern border of this area.

Previous Investigation

Several of the areas within Site 2 have been investigated for potential contamination due to Marine Corps operations and activities. A brief summary of these investigations is presented below.

In 1983 an Initial Assessment Study (IAS) was conducted at MCB Camp Lejeune which identified a number of areas within the Base, including Site 2, as potential sources of contamination. As a result of this study, the Department of the Navy (DoN) began to further investigate these sites.

During 1984 through 1990, a Confirmation Study was conducted at Site 2 which focused on potential source areas identified in the IAS and the Administrative Record file. The study consisted of collecting a limited number of environmental samples (soil, sediment, surface water, and groundwater) for purposes of constituent analysis. In general, the results detected the presence of pesticides in soils surrounding the MPA, pesticides and low levels of volatile organic compounds (VOCs) in groundwater (monitoring well 2GW3), and pesticides in surface water and sediments.

On October 4, 1989, MCB Camp Lejeune was placed on the National Priorities List (NPL). The DoN, the United States Environmental Protection Agency (USEPA), and the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR) entered into a Federal Facilities Agreement on February 13, 1991.

In July 1992, a geophysical investigation was performed at Site 2 to determine the source of groundwater contamination near monitoring well 2GW3. No anomalies that could serve as sources (i.e., tanks or drums) of groundwater contamination were identified during this investigation. However, an anomalous subsurface feature was detected near monitoring well 2GW3. The data from this anomaly was not conclusive to ascertain whether or not it was a tank, large diameter utility line or other buried structure.

In January 1994, additional geophysical investigation activities were conducted in the vicinity of this anomalous subsurface feature. This focused reinvestigation determined that there were no subsurface features in this area. The fixture that was apparent detected in July 1992 may have been an echo or interference from monitoring well 2GW3.

Also in 1992, Baker Environmental, Inc. (Baker) implemented a limited groundwater sampling program to obtain preliminary data to scope future remedial investigation (RI) activities. Low levels of VOCs (ethylbenzene, xylene) were again detected in monitoring well 2GW3.

In 1993, Baker conducted a RI field program at Site 2 to characterize potential environmental impacts and threats to human health and the environment resulting from previous storage, operational, and disposal activities. Investigation activities commenced in April 1993 and continued through June 1993. The field program consisted of a preliminary site survey; a geophysical investigation; a soil gas survey; a soil investigation including drilling and sampling; a groundwater investigation including monitoring well installation (shallow and deep wells) and sampling (two rounds); and a surface water and sediment investigation.

Contaminants including pesticides, VOCs, and semivolatile organic compounds (SVOCs) were detected in soil, groundwater, surface water, and sediments during the RI. Table 1 presents a listing of contaminants detected at Site 2.
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<th>Pesticides</th>
<th>Volatile Organic Compounds</th>
<th>Semivolatile Organic Compounds</th>
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<td>Acetone</td>
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<td>Selenium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pesticides appear to be the predominant contaminants of concern in soils and sediments (mostly near the MPA). VOCs appear to be the contaminants of concern in groundwater in both the surficial (less than 25 feet in depth) and the Castle Hayne (greater than 100 feet in depth) aquifers. Several areas were identified within the site which exhibited significant levels of organic contamination (pesticides). These areas are located primarily in the vicinity of the MPA. Inorganic constituents also are present throughout the site in the various media.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Final RI and Feasibility Study (F,S) Reports and the Final Proposed Remedial Action Plan (PRAP) for Operable Unit 5 (Site 2) at MCB Camp Lejeune, North Carolina were released to the public on July 21, 1994. These documents were made available to the public at the information repository maintained at the Onslow County Public Library. The notice of availability of the PRAP and RI/FS documents was published in the Jacksonville Daily News during the period July 21 through 27, 1994. A public comment period was held from July 27, 1994 to August 27, 1994. In addition, a public meeting was held on July 27, 1994. At this meeting, representatives from the DoN/Marine Corps discussed the remedial action alternatives (RAAs) currently under consideration and addressed community concerns.

Response to the comments received during the comment period is included in the Responsiveness Summary, which is part of this ROD (Section 11.0).

This decision document presents the selected RAA for Site 2 at MCB Camp Lejeune, North Carolina, chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the NCP. The selected decision for Site 2 is based on the Administrative Record.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The selected remedy for Site 2 is the final action to be conducted at the operable unit. A Time-Critical Removal Action (TCRA) will be implemented at the operable unit for the removal of contaminated soil and sediment identified within the operable unit which may pose a threat to human health and/or the environment. The contaminated soil and sediment are also potential sources of ground water contamination.

The TCRA will consist of excavation and disposal of pesticide-contaminated soil and sediment in the vicinity of the MPA. Soil and sediment cleanup levels have been calculated for the following pesticide contaminants:

<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>Soil Cleanup Level (µg/kg)</th>
<th>Sediment Cleanup Level (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,4'-DDT</td>
<td>3,000</td>
<td>15,000</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>3,000</td>
<td>15,000</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>4,000</td>
<td>21,000</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>179</td>
<td>--</td>
</tr>
<tr>
<td>Chlordane (total)</td>
<td>621</td>
<td>4,000</td>
</tr>
</tbody>
</table>

These cleanup levels are based on achieving an incremental cancer risk (ICR) of 1E-6. Confirmation samples will be collected from the excavation to insure that these cleanup levels are achieved. It is estimated that 500 cubic yards of soil and sediment will be excavated and transported off site for treatment and disposal.

Surface water and sediment, which are located outside of the TCRA area, will not be addressed under this action for the following reasons:
The overall risk to human health and the environment posed by Overs Creek is below environmental risk guidelines set and reviewed by credible organizations.

The removal of on-site contaminated soils and sediments will mitigate the potential for site contaminants to migrate off site to Overs Creek.

Direct treatment of surface water or sediment may result in a greater risk to the environment.

The selected remedial action authorized by this ROD addresses contaminated shallow groundwater in the vicinity of the FSA. Currently, there is no risk to human health since shallow groundwater is not utilized as a source of drinking water. However, under worst-case conditions, groundwater may pose a potential threat to human health and the environment because of the risk from future possible ingestion. Therefore, the objectives of the selected remedy are: (1) to prevent future human exposure to the contaminated groundwater and (2) to insure, through monitoring, that there is no human or environmental exposure due to migration of the contaminant plume off site.

5.0 SITE CHARACTERISTICS

This section of the ROD presents an overview of the nature and extent of contamination at Site 2 with respect to known or suspected sources of contamination, types of contamination, and affected media. Based on the results of the RI, potential sources of contamination were identified. The nature and extent of the contamination identified at Site 2 are itemized below.

- Soil in the vicinity of the MPA has been impacted by pesticide contamination. This is apparently the result of releases associated with pesticide mixing and washing of pesticide and herbicide spraying equipment. The soil in this area has also been impacted by SVOC contamination. This is apparently the result of petroleum-based solvents or fuels (possibly diesel fuel) being used as a carrying agent for herbicide mixtures and to operate and clean spraying equipment.

- Sediment in the railroad track drainage ditches in the vicinity of the MPA has been impacted by pesticide contamination. This is apparently the result of releases associated with pesticide mixing and washing of pesticide and herbicide spraying equipment. SVOCs have also been detected in sediment samples collected in this area. This is apparently the result of releases associated with herbicide mixing and the cleaning (possibly with diesel fuel) of pesticide and herbicide spraying equipment.

- Soil throughout Site 2 (i.e., outside of the MPA) has been impacted by pesticide contamination that resulted from the former practice of general base-wide spraying of pesticides. The pesticide concentrations in soil in the LA and FSA are several orders of magnitude lower than the pesticide contaminant concentrations detected in the vicinity of the MPA.

- Shallow groundwater in the FSA has been impacted by VOC contamination. Ethylbenzene and xylene (total) were detected in groundwater samples collected from shallow monitoring wells in the FSA. The area of highest VOC concentration is at monitoring well 2GW3. VOCs have been detected in this monitoring well during previous investigations. The extent of VOC contamination appears to be limited to the shallow groundwater in the vicinity of the FSA.

The source of the shallow groundwater contamination in the FSA has not been determined. Similar contaminants were detected in low levels in one soil boring in the vicinity of monitoring well 2GW3, indicating that the source may have been at or near the surface in this area (e.g., surface spill, etc.).

- Inorganics were detected in groundwater samples collected from shallow monitoring wells at the site. Several of these analyses exceeded federal and/or North Carolina groundwater quality standards. The distribution of detected inorganics in shallow groundwater followed no discernible pattern that would indicate a likely source. Additionally, inorganic levels in soil were not elevated to the point where soil would be believed to be considered as the source of groundwater contamination. Many
of the highest concentrations of inorganics were detected in background monitoring wells (2GW9, 2GW8). The concentrations of detected inorganics is much greater in the unfiltered (total) samples than in the filtered (dissolved) samples. This indicates that the inorganics detected in groundwater samples at Site 2 may be due predominantly to the presence of soil particles entrained in the groundwater samples and may not be attributable to site operations. Some inorganics (arsenic, lead, barium, beryllium, and vanadium) were nonetheless retained as chemicals of potential concern in the baseline risk assessment.

- Pesticides (4,4'-DDD and 4,4'-DDT) were detected in low concentrations (less than 10 μg/L) in groundwater samples collected from shallow monitoring wells at the site. The distribution of detected pesticides in shallow groundwater followed no discernible pattern that would indicate a likely source (such as the Mixing Pad Area). Pesticides were detected in a background well (2GW8). This indicates that the pesticides detected in groundwater samples at Site 2 may be due predominantly to the presence of pesticide-contaminated soil particles entrained in the groundwater samples.

- The VOC, trichloroethene (TCE) was detected at a low concentration (5 μg/L) in deep monitoring well 2GW3D. There is no evidence (documentation, soil samples, shallow groundwater samples) to indicate that this contamination is related to operation activities at Site 2. TCE and other chlorinated hydrocarbons have been detected in deep groundwater in other areas at MCB Camp Lejeune. TCE was not detected in this monitoring well during the second round of groundwater sampling.

- Trace levels of pesticides were detected in surface water samples collected in the railroad drainage ditches. This may be the result of Site 2 operations or general base-wide spraying. Copper was detected above applicable Freshwater Water Quality Screening Values (FWQSVs), North Carolina Water Quality Standards (NCWQSs), and Federal Ambient Water Quality Criteria (AWQC) applicable to Overs Creek.

6.0 SUMMARY OF SITE RISKS

As part of the RI, a human health risk assessment and an ecological risk assessment were conducted to evaluate the current and/or future potential risks to human health and the environment resulting from the presence of contaminants identified at Site 2. A summary of the key findings from both of these studies is presented below.

Human Health Risk Assessment

The human health risk assessment was conducted for several environmental media including surface soil, subsurface soil, groundwater, surface water, and sediments. Contaminants of potential concern (COPC) for each of these media were selected based on prevalence, mobility, persistence, and toxicity.

At the time when RI laboratory analytical results became available and were initial compiled, MCB Camp Lejeune/DoN determined that a TCRA was appropriate for the pesticide-contaminated soil and sediment in the vicinity of the MPA. Because a TCRA will be implemented, the baseline risk assessment (included in the RI Report) considered risks to human health and the environment at this site under two scenarios:

- Risks to human health and the environment without (or before) the TCRA.
- Risks to human health and the environment with (or after) the TCRA.

Table 2 lists the COPC which were identifies and assessed for each media. Note that COPC with respect to before and after the TCRA are presented on the table. For soil, groundwater, and sediment COPC included VOCs, SVOCs, pesticides, and inorganics. The surface water COPC included pesticides and inorganics.

The exposure routes evaluated in the human health risk assessment included ingestion, dermal contact, and particulate inhalation of surface soils; future potential ingestion and dermal contact of groundwater; and ingestion and dermal contact of surface water and sediments.
Several exposed populations were evaluated in the risk assessment with respect to both current and future potential scenarios for the operable unit. For surface soil, current civilian base personnel and future on-site residents (adults and children) were retained as potential exposed populations. For groundwater future on-site residents (adults and children) were retained as potential exposed populations. Adults and adolescents were retained for current surface water and sediment exposures, while adults and children (1-6 years) were retained for future evaluation. In addition, subsurface soil was evaluated for the future construction worker.

As part of the risk assessment, ICRs and hazard indices (HIs) were calculated for each of the potentially exposed populations. An ICR refers to the cancer risk that is over and above the background cancer risk in unexposed individuals. ICRs are determined by multiplying the intake level with the cancer potency factor. The calculated risks are probabilities which are typically expressed in scientific notation (e.g., 1E-4). For example, an ICR of 1E-4 means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at the site if no actions are conducted. The USEPA acceptable target risk range is 1E-4 to 1E-6. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The HI refers to noncarcinogenic effects and is a ratio of the level of exposure to an acceptable level for all COPC. An HI greater than or equal to unity (i.e., 1.0) indicates that there may be a concern for noncarcinogenic health effects. Table 3 presents a summary of ICRs and HIs calculated for Site 2 with respect to before and after the TCRA.

After completion of the TCRA, total risk for civilian base personnel and construction worker receptors will have ICRs less than 1E-6 and HIs less than 1.0. Site risks remain (i.e., ICR greater than 1.0E-04 and EB greater than 1.0) for the child resident and adult resident (future) receptors due to groundwater contamination.

The total site risk at Overs Creeks indicates that contamination from Site 2 is not appreciably migrating to the creek, and that adverse human health risks are not expected to occur due to contamination at Overs Creek.

Total risks remaining after the TCRA are attributable to contamination in the shallow groundwater on site. Therefore, the FS focused on developing remedial action alternatives for mitigating these risks. As groundwater was determined to be the media of concern at this site, groundwater COPC were reclassified as contaminants of concern (COC) in the FS.

Ecological Risk Assessment

An ecological risk assessment was conducted at Site 2 in conjunction with the RI. The objective of this risk assessment was to determine if past reported disposal activities are adversely impacting the ecological integrity of the terrestrial and aquatic habitats on, or adjacent to the site.

The results of the ecological risk assessment indicated the following:

- Pesticides in sediments along the drainage ditch and Overs Creek result in a potential decrease in the viability of aquatic receptors under both the no TCRA and the TCRA scenarios.

- Pesticides in the soil in the MPA result in a potential decrease in the viability of terrestrial receptors under the no TCRA scenario. Under the TCRA scenario, there is no decrease in the viability of terrestrial receptors.

There is no decrease in viability of aquatic or terrestrial receptors in the FSA under either the no TCRA scenario or the TCRA scenario.
<table>
<thead>
<tr>
<th>Chemical of Potential Concern</th>
<th>Lawn and Mixing Pad Areas</th>
<th>Former Storage Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface Soil Subsurface Soil</td>
<td>Surface Soil Subsurface Soil</td>
</tr>
<tr>
<td>Volatile Organics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Toluene</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Xylene (total)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Semivolatile Organics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acenaphthene</td>
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<td></td>
</tr>
<tr>
<td>Anthracene</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Fluoranthe</td>
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<td></td>
</tr>
<tr>
<td>Fluorene</td>
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</tr>
<tr>
<td>2-Methylnaphthalene</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Naphthalene</td>
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<td></td>
</tr>
<tr>
<td>N-Nitrosodiphenylamine</td>
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<td>Phenanthrene</td>
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<tr>
<td>Pyrene</td>
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</tr>
<tr>
<td>Pesticides</td>
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<tr>
<td>alpha-Chlordane</td>
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<td>X</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
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<td>X</td>
</tr>
<tr>
<td>4,4'-DDD</td>
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<td>X</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Heptachlor</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Inorganics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

SUMMARY TABLE OF CHEMICALS OF POTENTIAL CONCERN FOR OPERABLE UNIT No. 5, SITE 2
RECORD OF DECISION
MCB CAMP LEJEUNE, NORTH CAROLINA
<table>
<thead>
<tr>
<th>Chemical of Potential Concern</th>
<th>Sediment</th>
<th>Sediment</th>
<th>Sediment</th>
<th>Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface Water</td>
<td>Railroad</td>
<td>Time-Critical Removal Action</td>
<td>Sugar Creek</td>
</tr>
<tr>
<td>Volatile Organics</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichloroethene</td>
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<td></td>
</tr>
<tr>
<td>Xylene (total)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semivolatile Organics</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2-Methylnapthalene</td>
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<td></td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
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<tr>
<td>Naphthalene</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Phenol</td>
<td>X</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>X</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>gamma-Chlordane</td>
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<td>X</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>4,4'-DDD</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>X</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Inorganics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Barium</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lead</td>
<td>X</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: X = denotes chemical was retained as a chemical of potential concern
### TABLE 3

**TOTAL SITE INCREMENTAL LIFETIME CANCER RISK AND HAZARD INDICES**

**RECORD OF DECISION**

**OPERABLE UNIT NO. 6 (SITE 2)**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Receptors</th>
<th>Lawn and Mixing Pad Areas</th>
<th>Former Storage Area</th>
<th>Overs Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixing Pad Areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civilian Base Personnel</td>
<td>1E-4</td>
<td>1.3</td>
<td>5E-7</td>
</tr>
<tr>
<td>Construction Worker</td>
<td>6E-7</td>
<td>0.1</td>
<td>1E-10</td>
</tr>
<tr>
<td>Child Resident (future potential)</td>
<td>2E-3</td>
<td>111</td>
<td>3E-4</td>
</tr>
<tr>
<td>Adult Resident (future potential)</td>
<td>2E-3</td>
<td>23</td>
<td>7E-4</td>
</tr>
<tr>
<td>Trespassing Child (future potential)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Trespassing Adult (future potential)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

**Notes:**
- **ICR** = Incremental Lifetime Cancer Risk
- **HI** = Hazard Index
- Shading indicates that risk level is not within or fell above acceptable levels.
Soil and sediment in the vicinity of the MPA exhibit elevated concentrations of pesticide contaminant. However, these are being addressed in the TCRA. After the contaminated soils/sediments are removed, the potential human health risks associated with these two media will be reduced to an acceptable level, as indicated by an ICR value between $1E^{-4}$ to $1E^{-6}$ and an HI below 1.0. The remedial action alternatives (RAAs) were therefore developed to address contaminated groundwater at Site 2. Groundwater contamination is restricted to shallow groundwater in the FSA, near monitoring well 2GW3, where elevated levels of ethylbenzene (190 $\mu$g/L) and total xylenes (1800 $\mu$g/L) were detected. Figure 3 shows the general location of shallow groundwater contamination.

Based on the above, six groundwater RAAs were developed and evaluated in the FS. A glossary of evaluation criteria is presented on Table 4. A brief overview of each of the RAAs is included below. All costs and implementation times are estimated.

The following groundwater RAAs were developed and evaluated for Site 2:

- RAA No. 1 No Action
- RAA No. 2 Institutional Controls/Long-Term Groundwater Monitoring
- RAA No. 3 Collection/Treatment/Discharge to a Sewage Treatment Plant
- RAA No. 4 Collection/Discharge to a Sewage Treatment Plant
- RAA No. 5 Collection/Discharge to Site 82 (operable Unit No. 2)
- RAA No. 6 In Situ Treatment

<IMG SRC 0494194B>
<table>
<thead>
<tr>
<th><strong>GLOSSARY OF EVALUATION CRITERIA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall Protection of Human Health and Environment</strong> - addresses whether or an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering controls or institutional controls.</td>
</tr>
<tr>
<td><strong>Compliance with ARARs</strong> - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs) or other Federal State environmental statutes.</td>
</tr>
<tr>
<td><strong>Long-term Effectiveness and Permanence</strong> - refers to the magnitude of remaining risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.</td>
</tr>
<tr>
<td><strong>Reduction of Toxicity, Mobility, or Volume through Treatment</strong> - is anticipated performance of the treatment options that may be employed in alternative.</td>
</tr>
<tr>
<td><strong>Short-term Effectiveness</strong> - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction implementation period.</td>
</tr>
<tr>
<td><strong>Implementability</strong> - is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the closure solution.</td>
</tr>
<tr>
<td><strong>Cost</strong> - includes capital and operation and maintenance costs. For comparison purposes, presents present worth values.</td>
</tr>
<tr>
<td><strong>USEPA/State Acceptance</strong> - indicates whether, based on review of the RI as reports and the PRAP, the USEPA and State concur with, oppose, or have comments on the preferred alternative.</td>
</tr>
<tr>
<td><strong>Community Acceptance</strong> - evaluates the issues and concerns the public may regarding each of the RAAs. This criterion is addressed in the ROD on comment on the RI/FS reports and the PRAP have been received.</td>
</tr>
</tbody>
</table>
Common Elements - Common elements between the RAAs are listed below.

- RAAs 2 through 6 will include institutional controls such as a long-term groundwater monitoring, and restrictions on the future use of the site and on the installation of potable water supply wells near the site. The monitoring activities will be conducted to gauge the effectiveness of the selected remedy. Restrictions will be placed on the operable unit to prohibit the installation of any new potable water supply wells in this area.

- RAAs 3 through 5 will include the extraction of contaminated groundwater followed by on-site or off-site treatment and discharge.

A description of each alternative as well as the estimated capital costs, annual operation and maintenance (O & M) costs, the net present worth (NPW) and timeframe to implement the alternative follows. The NPW is calculated over a period of 30 years, at a 5 percent interest rate:

- RAA No. 1: No Action
  
  Capital Cost: $0  
  Annual O&M Costs: $0  
  NPW: $0  
  Months to Implement: None

The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented.

- RAA No. 2: Institutional Controls/Long-Term Groundwater Monitoring
  
  Capital Cost: $0  
  Annual O&M Costs: $57,000 for Years 1 and 2, $28,550 for Years 3 through 5, and $15,475 for Years 6 through 30  
  NPW: $350,000  
  Months to Implement: 3

RAA No. 2 will include the institutional controls that are common with RAA Nos. 2 through 6, as mentioned previously. The long-term monitoring program will consist of quarterly sampling and analysis of the groundwater from 12 existing monitoring wells and 3 nearby operational water supply wells for a period of two years. Samples will be collected semiannually during years three to five. Restrictions will be implemented which will restrict the installation of any new potable water supply wells within the vicinity of Site 2. After five years, the site will be reviewed, and the long-term monitoring program may be adjusted to annual sampling.

- RAA No. 3: Collection/Treatment/Discharge to a Sewage Treatment Plant
  
  Capital Cost: $303,000  
  Annual O&M Costs: $162,760 for Years 1 and 2, $134,210 for Years 3 through 5, and $119,935 for Years 6 through 30  
  NPW: $1.89 million  
  Months to Implement: 15

Under RAA No. 3, the contaminated groundwater plume originating in the FSA near monitoring well 2GW3 will be extracted and treated on site. A network of three shallow extraction wells will be placed along the boundary of the plume. Each extraction well will be installed to a depth of 35 feet and pumped at a rate of approximately 5 gallons per minute (gpm). The extracted groundwater will be treated on site via a combination of applicable treatment options (or treatment train), and then discharged through a force main to a sanitary sewer which discharges to the Hadnot Point Sewage Treatment Plant (STP). The treatment train may consist, but not be limited to, filtration, neutralization, precipitation, air stripping, and activated carbon adsorption.

The overall objective of this RAA is to reduce the COC in the groundwater to drinking water standards for Class I aquifers and to mitigate the potential for further migration of the
Under RAA No. 4, the contaminated groundwater plume originating in the FSA near monitoring well 2GW3 will be extracted via an extraction well system as discussed for RAA No.3, and discharged untreated through a force main to a sanitary sewer, which discharges to the Hadnot Point STP.

The overall objective of this RAA is to reduce the COC in the groundwater to drinking water standards for Class I aquifers and to mitigate the potential for further migration of the existing groundwater plume. The cone of influence created by extraction wells are expected to reach the downgradient boundary of the plume. Groundwater extraction and treatment will be employed until the remediation objectives are met. In addition, this RAA includes the same institutional controls as Groundwater RAA Nos. 2 and 3.

Under RAA No.5, the contaminated groundwater plume originating in the FSA near monitoring well 2GW3 will be extracted via an extraction well system as discussed for RAA No.3, and discharged untreated through a force main to a groundwater treatment system to be constructed at Site 82. At Site 82, the extracted groundwater will be treated via a treatment train similar to the one mentioned in RAA No.3 (with the exception of size). Treated groundwater will be discharged to Wallace Creek.

The overall objective of this RAA is to reduce the COC in the groundwater to drinking water standards for Class I aquifers and to mitigate the potential for further migration of the existing groundwater plume. In addition, this RAA includes the same institutional controls as Groundwater RAA Nos. 2, 3, and 4.

Under RAA No. 6, the contaminated groundwater plume originating in the FSA near monitoring well 2GW3 will be remediated via an air sparging and soil vapor extraction system. In this method, air will be injected into the groundwater through air sparging wells. The air acts to strip and remove the VOC contaminants from the groundwater. Soil venting wells will be placed to control air flow and to collect vapors within the vadose zone. The collected vapors would be treated to remove the contaminants prior to the air being vented to the atmosphere. No groundwater is removed in this alternative, therefore, groundwater does not have to be discharged to a STP or a watercourse.

The objective of this RAA is to reduce the COC in the groundwater to levels that meet drinking water standards for Class I aquifers, and to reduce the potential for further migration of the
existing groundwater plume at Site 2. In addition, this RAA includes the same institutional controls as Groundwater RAA Nos. 2, 3, 4, and 5.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the groundwater RAAs using the nine evaluation criteria in order to select a site remedy. Table 5 presents a summary of this detailed analysis for the RAAs. A brief summary of each alternative's strengths and weaknesses with respect to the evaluation criteria follows. A glossary of the evaluation criteria has previously been noted on Table 4.

Overall Protection of Human Health and the Environment

RAA No. 1 (No Action) does not provide protection to human health or the environment. Under the Institutional Controls/Long-Term Groundwater Monitoring RAA (No. 2), institutional controls will provide protection to human health, although the potential for further migration of the contaminated groundwater still exists. All of the remaining Groundwater RAAs provide protection of human health and the environment. RAA Nos. 3, 4, 5, and 6 provide protection through preventing further migration of the contaminated groundwater plume and providing treatment. It should be noted that RAAs Nos. 3, 4, 5, and 6 may result in complete restoration of the plume over time; however, remediation will continue for many years.

Compliance with ARARs

Site-specific ARARs are summarized on Table 6 and 7 (contaminant-specific), Table 8 (location-specific), and Table 9 (action-specific). RAA Nos. 1 and 2 will potentially exceed federal and state ARARs associated with the contaminants remaining in groundwater. RAA Nos. 3, 4, and 5 will potentially meet all of their respective ARARs for the treated effluent. In time, RAA Nos. 3, 4, 5, and 6 will meet the groundwater remediation objectives.

Long-Term Effectiveness and Permanence

RAA No. 1 will not reduce potential risks due to exposure to contaminated groundwater. Risks will be reduced under RAA Nos. 2 through 6 through the implementation of the institutional controls and/or treatment. Enforcing potable water supply well restrictions is effective in eliminating direct exposure to groundwater. RAAs 3 through 6 will provide additional long-term effectiveness and permanence because they use a form of treatment to reduce the potential hazards posed by the COC present in the groundwater aquifer.

All of the RAAs will require a 5-year review.

Reduction of Toxicity, Mobility, or Volume Through Treatment

No form of treatment is included under RAA Nos. 1 and 2. RAA Nos. 1 and 2 do not satisfy the statutory preference for treatment, whereas the other RAAs do satisfy the preference. All of the "treatment" RAAs (RAA Nos. 3 through 6) will provide reduction of toxicity, mobility and/or volume of contaminants in the groundwater aquifers.

Short-Term Effectiveness

Risks to community and workers are not increased with the implementation of RAA Nos. 1 and 2. Current impacts, which are negligible from existing conditions will continue under these two RAAs. Under RAA Nos. 3, 4, 5, and 6, risks to the community and workers will be slightly increased due to a temporary increase in dust production and volatilization during the installation of the piping for the groundwater treatment system or piping system (during treatment operations for the workers). In addition, aquifer drawdown will occur under RAA Nos. 3, 4 and 5. This drawdown, however, should not result in any significant environmental effects.
### TABLE 5
SUMMARY OF DETAILED ANALYSIS: GROUNDWATER RAAs
OPERABLE UNIT NO. 5 (SITE 2)
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
<th>RAA No. 5</th>
<th>RAA No. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection</td>
<td>Allows continued contamination of the groundwater.</td>
<td>Allow continued contamination of the groundwater.</td>
<td>Migration of contaminated groundwater is reduced by pump and treat.</td>
<td>Groundwater plume treated.</td>
<td>Migration of contaminated groundwater is reduced by pump and treat.</td>
<td>Groundwater plume treated.</td>
</tr>
<tr>
<td><strong>COMPLIANCE WITH ARARs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical-Specific ARARs</td>
<td>Will exceed Federal and/or NC groundwater quality ARARs.</td>
<td>Will exceed Federal and/or NC groundwater quality ARARs.</td>
<td>Should meet Federal and NC groundwater quality ARARs in time.</td>
<td>Should meet Federal and NC groundwater quality ARARs in time.</td>
<td>Should meet Federal and NC groundwater quality ARARs in time.</td>
<td>Should meet Federal and NC groundwater quality ARARs in time.</td>
</tr>
<tr>
<td>Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
</tr>
<tr>
<td>Action-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Will meet action-specific ARARs. Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs. Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs. Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs.</td>
</tr>
<tr>
<td>LONG-TERM EFFECTIVENESS AND PERMANENCE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnitude of Residual Risk</td>
<td>As migration of groundwater continues, potential risks may since the use of the contaminated groundwater continues.</td>
<td>Risk reduced to human health</td>
<td>Risk reduced to human health extracting</td>
<td>Risk reduced to human health extracting</td>
<td>Risk reduced to human health extracting</td>
<td>Risk reduced to human health extracting</td>
</tr>
<tr>
<td>Adequacy and Reliability of Treatment</td>
<td>Not applicable - no controls.</td>
<td>Institutional controls are reliable if strictly enforced.</td>
<td>Groundwater pump and treat is reliable.</td>
<td>Groundwater pump and treat is reliable.</td>
<td>In-situ treatment demonstrated for COCs.</td>
<td>In-situ treatment demonstrated for COCs.</td>
</tr>
<tr>
<td>Need for 5-year Review</td>
<td>Review would be required to ensure adequate protection of human health and the natural attenuation of organic contaminants over time.</td>
<td>Review would be required to ensure adequate protection of human health and the environmental is maintained.</td>
<td>Review not needed once remediation goals are met.</td>
<td>Review not needed once remediation goals are met.</td>
<td>Review not needed once remediation goals are met.</td>
<td>Review not needed once remediation goals are met.</td>
</tr>
<tr>
<td>REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Process Used</td>
<td>None.</td>
<td>None.</td>
<td>Treatment train for metals removal, air stripping, and physical and biological treatment at STP.</td>
<td>Treatment train at Site 82 for metals removal, air stripping, and physical and biological treatment at STP.</td>
<td>In-situ air sparging and soil venting for VOC removal.</td>
<td>Majority of contaminants in groundwater.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
<td>RAA No. 5</td>
<td>RAA No. 6</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>Action</td>
<td>Institutional Controls/Long- Term Groundwater Monitoring</td>
<td>Discharge to a STP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection/Discharge to a STP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection/Discharge to Site 82</td>
<td>In-Situ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduction of Toxicity, Mobility or Volume</td>
<td>None.</td>
<td>None.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
</tr>
<tr>
<td>Residuals Remaining After Treatment</td>
<td>Not applicable - no treatment</td>
<td>Not applicable - no treatment</td>
<td>Minimal residuals after goals are met.</td>
<td>Minimal residuals after goals are met.</td>
<td>Minimal residuals after goals are met.</td>
<td>Minimal residuals after goals are met.</td>
</tr>
<tr>
<td>EFFECTIVENESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Protection</td>
<td>Risks to community not increased</td>
<td>Risks to community not increased</td>
<td>Risks to community not increased</td>
<td>Risks to community not increased</td>
<td>Risks to community not increased</td>
<td>Risks to community not increased</td>
</tr>
<tr>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
<td>Potential risks to public health</td>
</tr>
<tr>
<td>IMPLEMENTABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to Construct and Operate</td>
<td>No construction or operation activities.</td>
<td>No construction or operation activities.</td>
<td>Installation and treatment technologies proven.</td>
<td>Installation and treatment technologies proven.</td>
<td>Installation and treatment technologies proven.</td>
<td>Installation and treatment technologies proven.</td>
</tr>
<tr>
<td>Availability of Service and Capacities; Equipment</td>
<td>None required.</td>
<td>None required.</td>
<td>Groundwater extraction and treatment equipment is readily available.</td>
<td>Groundwater extraction and treatment equipment is readily available.</td>
<td>Groundwater extraction equipment is readily available.</td>
<td>System components readily available.</td>
</tr>
<tr>
<td>COSTS</td>
<td>Net Present Worth</td>
<td>$0</td>
<td>$250,000</td>
<td>$1.88 million</td>
<td>$1.3 million</td>
<td>1.44 million</td>
</tr>
</tbody>
</table>

RAA = Remedial Action Alternative  
STP = Sewage Treatment Plant  
ARARs = Applicable or Relevant and Appropriate Requirements
<table>
<thead>
<tr>
<th>ARAR Citation</th>
<th>Requirement</th>
<th>Consideration in the FS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL/CONTAMINANT-SPECIFIC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe Drinking Water Act</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Maximum Contaminant Levels (MCLs) 40 CFR 141.11-141.16</td>
<td>Standards for protection of drinking water sources serving at least 25 persons. MCLs consider health factors, as well as economic and technical feasibility of removing a contaminant; MCLGs do not consider the technical feasibility of contaminant removal. For a given contaminant, the more stringent of MCLs or MCLGs is applicable unless the MCLG is zero, in which case the MCL applies.</td>
<td>Relevant and appropriate in developing remediation levels for contaminated groundwater used as a potable water supply.</td>
</tr>
<tr>
<td>b. Maximum Contaminant Level Goals (MCLGs) 40 CFR 141.50-141.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Doses (RfDs), EPA Office of research and Development</td>
<td>Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to characterize risks due to exposure to contaminants.</td>
<td>To be considered (TBC) requirements in the public health assessment.</td>
</tr>
<tr>
<td>Carcinogenic Potency Factors, EPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Criteria and Assessment Office; EPA Carcinogen Assessment Group</td>
<td>Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to compute the individual incremental cancer risk resulting from exposure to carcinogens.</td>
<td>TBC requirements in the public health assessment.</td>
</tr>
<tr>
<td>Health Advisories, EPA Office of Drinking Water</td>
<td>Non-enforceable guidelines for chemicals that may intermittently be encountered in public water supply systems. Available for short- or long-term exposure for a child and/or adult.</td>
<td>TBC requirement in the public health assessment.</td>
</tr>
<tr>
<td>National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61)</td>
<td>Standards promulgated under the Clean Air Act for significant sources of hazardous pollutants, such as vinyl chloride, benzene, trichloroethylene, dichlorobenzene, asbestos, and other hazardous substances. Considered for any source that has the potential to emit 10 tons of any hazardous air pollutant or 25 tons of a combination of hazardous air pollutants per year.</td>
<td>Remedial actions (e.g., air stripping) may result in release of hazardous air pollutants. The treatment design may elect to control equipment air emissions using the same or similar methods.</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirement</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>National Ambient Air Quality Standards (40 CFR 50)</td>
<td>Standards for the following size criteria pollutants: particulate matter; sulfur dioxide; carbon monoxide; ozone; nitrogen dioxide; and lead. The attainment and maintenance of these standards are required to protect the public health and welfare.</td>
<td>Relevant and appropriate requirements for remedial actions requiring discharge to the atmosphere.</td>
</tr>
<tr>
<td>EPA Ambient Water Quality Criteria (Section 304(a)1 of CWA)</td>
<td>Non-enforceable criterion for water quality for the protection of human health from exposure to contaminants in drinking water and from ingestion of aquatic biota and for the protection of fresh-water and salt-water aquatic life.</td>
<td>Potentially relevant and appropriate for groundwater treatment.</td>
</tr>
<tr>
<td>State/Contaminant-Specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State of North Carolina Department of Environment, Health, and Natural Resources Division of Environmental Management 15A NCAC 2B.0200 - Classifications and Water Quality Standards Applicable to Surface Water of North Carolina</td>
<td>Surface water quality standards based on water use and criteria class of surface water.</td>
<td>Relevant and appropriate for remedial actions requiring discharge to surface water.</td>
</tr>
<tr>
<td>North Carolina Anti-Degradation Policy for Surface Water (Water Quality Standards Title 15A, Chapter 2, Subchapter 2B)</td>
<td>Provides for an anti-degradation policy for surface water quality. Pursuant to this policy, the requirements of 40 CFR 131.12 are adopted by reference in accordance with General Statute 150B-14(b).</td>
<td>This policy is a TBC requirement for remedial actions requiring discharge to surface water.</td>
</tr>
<tr>
<td>North Carolina Groundwater Standards Applicable Statewide</td>
<td>Establishes maximum contaminant concentrations to protect groundwater. These standards are mandatory.</td>
<td>Potentially relevant and appropriate for remedial actions requiring discharge to groundwater.</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirements</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>North Carolina DEHNR Regulations</td>
<td>Standards for protection of health of consumers using public drinking water supplies. Establishes MCLs for given contaminants.</td>
<td>Potentially relevant and appropriate in developing remediation goals for contaminated groundwater used as a potable water supply.</td>
</tr>
<tr>
<td>North Carolina DEHNR Toxic Air Pollutant Rule Statutory Authority G.S. 143-215.107(a)(1),(3),(4),(5);143-B-282</td>
<td>A facility shall not emit any toxic air pollutants (as listed in Rule .1104) that may cause or contribute beyond the premises (contiguous property boundary) to any significant ambient air concentration that may adversely affect human health.</td>
<td>Potentially relevant and appropriate for remedial actions requiring discharge to the atmosphere.</td>
</tr>
<tr>
<td>North Carolina DEHNR Regulations for Hazardous (15A NCAC 13A) and Solid Waste (15A NCAC 13B)</td>
<td>Standards and requirements for management and disposable of hazardous and solid waste.</td>
<td>Potentially relevant and appropriate for remedial actions requiring management and disposal of hazardous and/or solid waste.</td>
</tr>
<tr>
<td>Contaminant of Concern</td>
<td>MCL (1) (µg/L)</td>
<td>NCWQS (2) (µg/L)</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arsenic</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Barium</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Beryllium</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>700</td>
<td>29</td>
</tr>
<tr>
<td>Lead</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2-Methylnaphthalene</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Phenol</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>5</td>
<td>2.8</td>
</tr>
<tr>
<td>Vanadium</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Xylene (total)</td>
<td>10,000</td>
<td>530</td>
</tr>
</tbody>
</table>

Notes:  
(1) MCL = Safe Drinking Water Act Maximum Contaminant Level (MCL for lead is an Action Level)  
(2) NCWQS = North Carolina Water Quality Standards for Class GA groundwater  
(3) Health Advisories – to be considered criteria  
(4) Level at 1E-4 cancer risk  

--- No ARAR available or established
<table>
<thead>
<tr>
<th>ARAR Citation</th>
<th>Requirement</th>
<th>Consideration in the FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEDERAL AND STATE/Locations-Specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Historic Preservation Act of 1966 16 USC 470, 40 CFR 6.301(b), and 36 CFR 800</td>
<td>Requires action to take into account effects on properties included in or eligible for the National Register of Historic Places and to minimize harm to National Historic Landmarks.</td>
<td>No known historic properties are within or near OU No. 5, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>Archeological and Historic Preservation Act 16 USC 469 and 40 CFR 6.301(c)</td>
<td>Established procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain.</td>
<td>No known historical or archeological data is known to be present at the site, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>Historic Sites, Building and Antiquities Act 16 USC 461467 and 40 CFR 6.301(a)</td>
<td>Requires action to avoid undesirable impacts on landmarks on the National Registry of Natural Landmarks.</td>
<td>No known historic sites, buildings or antiquities are within or near OU No. 5, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>Fish and Wildlife Coordination Act 16 USC 661-666</td>
<td>Requires action to protect fish and wildlife from actions modifying streams or areas affecting streams.</td>
<td>Overs Creek and the drainage ditch adjacent to the railroad tracks are located near and within the operable unit boundaries, respectively. If remedial action are implemented that modify this creek or drainage channel, this will be an applicable ARAR.</td>
</tr>
<tr>
<td>Federal Endangered Species Act 16 USC 1531, 50 CFR 200, and 50 CFR 402</td>
<td>Requires action to avoid jeopardizing the continued existence of listed endangered species or modification of their habitat.</td>
<td>Many protected species have been cited near and on MCB Camp Lejeune such as the American alligator, the Bachmans sparrow, the Black Skimmer, the green turtle, the Loggerhead turtle, the piping plover, the Red-cockaded woodpecker, and the rough-leaf lossesstrife (LeBlond, 1991), (Fussell, 1991), (Walters, 1991). Therefore, this will be considered as an ARAR.</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirement</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>North Carolina Endangered Species Act GS 113-331 to 113-337</td>
<td>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.</td>
<td>Since the American alligator has been sighted in nearby surface water features, this will be considered as an ARAR.</td>
</tr>
<tr>
<td>RiverS and Harbors Act of 1899 (Section 10 Permit) 33 USC 403</td>
<td>Requires permit for structures or work in or affecting navigable waters.</td>
<td>No remedial action will affect the navigable waters of the New River. Therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>Executive Order 11990 on Protection of Wetlands Executive Order Number 11990 and 40 CFR 6</td>
<td>Establishes special requirements for Federal agencies to avoid the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.</td>
<td>Based on review of Wetland Inventory Mapa, the lower reaches of oceans Creek has areas of wetlands. Therefore, this will be an applicable ARAR.</td>
</tr>
<tr>
<td>Executive Order 11988 on Floodplain Management Executive Order Number 11988, and 40 CFR 6</td>
<td>Establishes special requirements for Federal agencies to evaluate the adverse impacts associated with direct and indirect development of a floodplain.</td>
<td>Based on the Federal Emergency Management Agency's Flood Insurance Rate Map for Onslow County, the site is primarily within a minimal flooding zone (outside the 500-year floodplain). The creek is within the 100-year floodplain (FEMA, 1987). Therefore, this may be an ARAR for the operable unit.</td>
</tr>
<tr>
<td>Wilderness Act 16 USC 1131 and 50 CFR 35.1</td>
<td>Requires that federally owned wilderness area are not impacted. Establishes nondegradation, maximum restoration, and protection of wilderness areas as primary management principles.</td>
<td>No known federally owned wilderness areas near the operable unit exist, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>National Wildlife Refuge System 16 USC 668, and 50 CFR 27</td>
<td>Restricts activities within a National Wildlife Refuge.</td>
<td>No known National Wildlife Refuge areas near the operable unit exist, therefore, this...</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirement</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Scenic Rivers Act</td>
<td>Requires action to avoid adverse effects on designated wild or scenic rivers.</td>
<td>No known wild or scenic rivers near the operable unit exist, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>16 USC 1271, and 40 CFR 6.302(e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Zone Management Act</td>
<td>Requires activities affecting land or water uses in a coastal zone to certify noninterference with coastal zone management.</td>
<td>No activities will affect land or water uses in a coastal zone, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>Clean Water Act (Section 404)</td>
<td>Prohibits discharge of dredged or fill material into wetland without a permit.</td>
<td>No actions to discharge dredged or fill material into wetlands will be considered for the operable unit, therefore, this act will not be considered as an ARAR.</td>
</tr>
<tr>
<td>33 USC 404</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCRA Location Requirements</td>
<td>Limitations on where on-site storage, treatment, or disposal of RCRA hazardous waste may occur.</td>
<td>These requirements may be applicable if the remedial actions for the operable unit includes the on-site storage, treatment, or disposal of RCRA hazardous waste. Therefore, these requirements may be an applicable ARAR for the operable unit.</td>
</tr>
<tr>
<td>40 CFR 264.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# TABLE 9

**APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED ACTION-SPECIFIC CRITERIA**

**RECORD OF DECISION**

**OPERABLE UNIT NO. 5 (SITE 2)**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>ARAR Citation</th>
<th>Requirement</th>
<th>Consideration in the FS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL AND STATE/ACTION-SPECIFIC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSHA Requirements (29 CFR Parts 1910, 1926, and 1904)</td>
<td>Regulations provide occupational safety and health requirements applicable to workers engaged in on-site field activities.</td>
<td>Required for site workers during construction and operation of remedial activities. Applicable to all actions at the site.</td>
</tr>
<tr>
<td>DOT Rules for Hazardous Materials Transportation (49 CFR Parts 107 and 171.1-500)</td>
<td>Regulates the transport of hazardous waste materials including packaging, shipping, and placarding.</td>
<td>Remedial actions may include off-site treatment and disposal of contaminated groundwater. Applicable for any action requiring off-site transportation of hazardous materials.</td>
</tr>
<tr>
<td><strong>Resource Conservative and Recovery Act (RCRA)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtitle C Identification and Listing of Hazardous Waste (40 CFR Part 261)</td>
<td>Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing.</td>
<td>Primary site contaminants are not considered to be listed wastes. However, contaminated medial may be considered hazardous by characteristic.</td>
</tr>
<tr>
<td>Treatment, Storage, and Disposal of Hazardous Waste (40 CFR Parts 262-265, and 266)</td>
<td>Regulates the treatment, storage, and disposal of hazardous waste.</td>
<td>During remediation, treatment, storage, and disposal activities may occur. Materials may be classified as hazardous wastes.</td>
</tr>
<tr>
<td><strong>RCRA Subtitle D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regulates the treatment, storage, and disposal of solid wastes and materials designated by the States as special waste.</td>
<td>Applicable to remedial actions involving treatment, storage, or disposal of materials classified as solid and/or special waste.</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirement</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>RCRA Land Disposal Restrictions (LDRs) Requirements (40 CFR Part 268)</td>
<td>Restricts certain listed or characteristics hazardous waste from placement or disposal on land (includes injection wells) without treatment. Provides treatment standards and Best Demonstrated Available Technology (BAT).</td>
<td>LDRs may prohibit or govern the implementation of certain remedial alternatives. Extraction and treatment and/or movement of RCRA hazardous waste may trigger LDR requirements for the waste. Re-injection of treated groundwater into or above an underground source of drinking water may be exempt from LDRs given the treatment of the groundwater meets exemption requirements.</td>
</tr>
<tr>
<td>Control of Air Emissions from Superfund Air Strippers at Superfund Ground Water Sites (OSWER Directive 9355.0-28)</td>
<td>Guidance that establishes criteria as to whether air emission controls are necessary for air strippers. A maximum 3 lbs/hr or 15 lbs/day or 10 tons/yr of VOC emissions is allowable; air pollution controls are recommended for any emissions in excess of these quantities.</td>
<td>To be considered (TBC) as remedial action may include air stripping.</td>
</tr>
<tr>
<td>General Pretreatment Regulation for Existing and New Sources of Pollutants (40 CFR Part 403)</td>
<td>Regulations promulgated under the Clean Water Act. Includes provisions for effluent discharge to Publicly Owned Treatment Works (POTW). Discharge of Pollutants that pass through or interfere with the POTW, contaminate sludge, or endanger health/safety of POTW workers is prohibited. These regulation should be used in conjunctions with local POTW pretreatment program requirements.</td>
<td>Applicable for remedial actions involving discharge to a sanitary sewer.</td>
</tr>
<tr>
<td>ARAR Citation</td>
<td>Requirement</td>
<td>Consideration in the FS</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>North Carolina Water Pollution Control Regulations (Title 15, Chapter 2, Section .0100)</td>
<td>Regulated point-source discharges through the North Carolina permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system, and completion of regular discharge monitoring records.</td>
<td>May be applicable for actions requiring discharge to the ditches on site. The base currently has a North Carolina permit for surface water discharge to the ditch to the north of the site. This permit may need to be modified.</td>
</tr>
<tr>
<td>Protection of Archaeological Resources (32 CFR Parts 229 and 229.4; 43 CFR Parts 107 and 171.1-5)</td>
<td>Develops procedures for the protection of archaeological resources.</td>
<td>Applicable to any excavation on site. If archaeological resources are encountered during soil excavation, they must be reviewed by Federal and State archaeologists.</td>
</tr>
<tr>
<td>North Carolina Sedimentation Pollution Control Act of 1973 (Chapter 113A)</td>
<td>Regulates stormwater management and erosion/sedimentation control practices that must be followed during land disturbing activities.</td>
<td>Applicable for remedial action involving land disturbing activities (i.e., excavation of soil and sediment).</td>
</tr>
</tbody>
</table>
Implementability

No construction, operation, or administrative activities are associated with RAA No. 1. There are no construction or operation activities associated with RAA No. 2 other than groundwater sampling, which is easily performed. RAA No. 3 will require operation of a groundwater pump and treatment system. RAA Nos. 4 and 5 will require operation of a groundwater extraction system only. RAA No. 6 will require operation of an in situ treatment system.

Cost

Costs for RAAs 1 through 6 are summarized below.

<table>
<thead>
<tr>
<th>Remedial Action Alternatives</th>
<th>No.1</th>
<th>No.2</th>
<th>No.3</th>
<th>No.4</th>
<th>No.5</th>
<th>No.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Costs</td>
<td>$0</td>
<td>$0</td>
<td>$303,000</td>
<td>$210,000</td>
<td>$323,000</td>
<td>$124,000</td>
</tr>
<tr>
<td>O &amp; M Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years 1 &amp; 2</td>
<td>$0</td>
<td>$57,000</td>
<td>$162,760</td>
<td>$106,220</td>
<td>$108,220</td>
<td>$113,440</td>
</tr>
<tr>
<td>Years 3-5</td>
<td>$0</td>
<td>$28,550</td>
<td>$134,210</td>
<td>$77,670</td>
<td>$79,670</td>
<td>$84,890</td>
</tr>
<tr>
<td>Years 6-30</td>
<td>$0</td>
<td>$15,475</td>
<td>$119,935</td>
<td>$63,395</td>
<td>$65,395</td>
<td>$70,615</td>
</tr>
<tr>
<td>Present Worth</td>
<td>$0</td>
<td>$350,000</td>
<td>$1,890,000</td>
<td>$1,300,000</td>
<td>$1,440,000</td>
<td>$1,320,000</td>
</tr>
</tbody>
</table>

9.0 SELECTED REMEDY

This section of the ROD focuses on the selected remedy for Site 2. The major treatment components, engineering controls, and institutional controls of the remedy will be discussed along with the estimated costs to implement the remedial action. In addition, the remediation objectives to be attained at the conclusion of the remedial action will be discussed.

Remedy Description

The selected remedy for Site 2 is RAA No. 2, Institutional Controls/Long-Term Groundwater Monitoring. The major components of the selected remedy include:

- Implementing a long-term groundwater monitoring program to monitor on-site wells and nearby potable water supply wells. Under this program, groundwater from 12 existing monitoring wells and 3 nearby operational water supply wells will be collected and analyzed for the following parameters:
  - VOCs
  - Barium (total and filtered)
  - Beryllium (total and filtered)
  - Cadmium (total and filtered)
  - Chromium (total and filtered)
  - Lead (total and filtered)
  - Manganese (total and filtered)
  - Total suspended solids
  - Total dissolved solids
- Restricting the installation of new potable water supply wells in the vicinity of Site 2.

Estimated Costs

The estimated capital cost associated with the selected remedy is $0. Annual O&M costs of approximately $57,100 are projected for administration of institutional controls and the quarterly sampling of the monitoring wells and supply wells for years 1 and 2. Approximately $28,550 are projected for the semiannual sampling in years 3 through 5 and $15,475 for the annual sampling in years 6 through 30. This annual cost is for 30 years. Assuming an annual percentage rate of 5 percent, these costs equate to a NPW of approximately $350,000. Table 10 presents a summary of this cost estimate for the major components of the selected remedy.
## Detailed Costing Evaluation

### Operable Unit No. 5, Site 2 Record of Decision

**Groundwater Remedial Action Alternative No. 2**

#### Limited Action

**O & M Cost Estimate**

16-Jun-94

<table>
<thead>
<tr>
<th>COST COMPONENT</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>UNIT COST</th>
<th>SURTOTAL</th>
<th>TOTAL</th>
<th>BASIS OR COMMENTS</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groundwater Monitoring - Years 1 - 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>Hours</td>
<td>360</td>
<td>$35</td>
<td>$12,600</td>
<td></td>
<td>15 wells x 2 samplers x 3 hrs/well x 4 events</td>
<td>Engineering Estimate</td>
</tr>
<tr>
<td>Lab. Analysis - TCL VOA/Metals</td>
<td>Sample</td>
<td>60</td>
<td>$375</td>
<td>$22,500</td>
<td></td>
<td>15 samples, quarterly</td>
<td>Basic Ordering Agreement</td>
</tr>
<tr>
<td>Misc. Expenses</td>
<td>Sample Event</td>
<td>4</td>
<td>$2,500</td>
<td>$10,000</td>
<td></td>
<td>Incl. travel, lodging, supplies, -2 people</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td>Reporting</td>
<td>Sample Event</td>
<td>4</td>
<td>$3,000</td>
<td>$12,000</td>
<td></td>
<td>1 report per sampling event</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td><strong>Groundwater Monitoring - Years 3 - 5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>Hours</td>
<td>180</td>
<td>$35</td>
<td>$6,300</td>
<td></td>
<td>15 wells x 2 samplers x 3 hrs/well x 2 events</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td>Lab. Analysis - TCL VOA/Metals</td>
<td>Sample</td>
<td>30</td>
<td>$375</td>
<td>$11,250</td>
<td></td>
<td>15 samples, semiannually</td>
<td>Basic Ordering Agreement</td>
</tr>
<tr>
<td>Misc. Expenses</td>
<td>Sample Event</td>
<td>2</td>
<td>$2,500</td>
<td>$5,000</td>
<td></td>
<td>Incl. travel, lodging, supplies, -2 people</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td>Reporting</td>
<td>Sample Event</td>
<td>2</td>
<td>$3,000</td>
<td>$6,000</td>
<td></td>
<td>1 report per sampling event</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td><strong>Groundwater Monitoring - Years 6 - 30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>Hours</td>
<td>90</td>
<td>$40</td>
<td>$3,600</td>
<td></td>
<td>15 wells x 2 samplers x 3 hrs/well x 1 event</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td>Lab. Analysis - TCL VOA/Metals</td>
<td>Sample</td>
<td>15</td>
<td>$375</td>
<td>$5,625</td>
<td></td>
<td>15 samples, annually</td>
<td>Basic Ordering Agreement</td>
</tr>
<tr>
<td>Misc. Expenses</td>
<td>Sample Event</td>
<td>1</td>
<td>$2,750</td>
<td>$2,750</td>
<td></td>
<td>Incl. travel, lodging, supplies, -2 people</td>
<td>Engineering estimate</td>
</tr>
<tr>
<td>Reporting</td>
<td>Sample Event</td>
<td>1</td>
<td>$3,500</td>
<td>$3,500</td>
<td></td>
<td>1 report per sampling event</td>
<td>Engineering estimate</td>
</tr>
</tbody>
</table>

**Total Annual O & M Costs, Years 1 - 2**

$57,000

For years 1 and 2

**Total Annual O & M Costs, Years 3 - 5**

$28,550

For years 3 through 5

**Total Annual O & M Costs, Years 6 - 30**

$15,475

For years 6 through 30

**Approximate Present Worth Value**

$350,000
Remediation Goals

Based on the results of the RI/FS and all other available site information, the selected remedy is expected to meet the remediation objective of reducing the risk to human health due to groundwater exposure. This will be accomplished by conducting long-term groundwater monitoring to insure that there is no exposure to human health due to potential off-site migration of groundwater contaminants. In addition, restrictions on the installation of new potable water supply wells in the vicinity of Site 2 will prevent potential human health exposure.

USEPA/State Acceptance

USEPA Region IV and the NC DEHNR have reviewed the Proposed Remedial Action Plan (PRAP) for Operable Unit 5. Both agencies are in agreement with the selected remedy (RAA No.2, Institutional Controls/Long-Term Groundwater Monitoring) outlined in this ROD.

Because North Carolina groundwater standards (15A NCAC 2L.0106) for ethylbezene, xylene, and total metals (barium, beryllium, cadmium, chromium, lead, and manganese) were exceeded in shallow monitoring wells, a Corrective Action Plan will be submitted (under separate cover) to the NC DEHNR in accordance with 15A NCAC 2L.0106(k) and (l).

Community Acceptance

The selected remedy (RAA No.2, Institutional Controls/Long-Term Groundwater Monitoring) was presented to the community during the public comment period and during the public meeting (refer to Section 3.0 - Highlights of Community Participation). The limited number of Community comments, and the nature of these comments (refer to Section 11.0 - Responsiveness Summary) indicate that the selected remedy has achieved community acceptance.

10.0 STATUTORY DETERMINATIONS

A selected remedy must satisfy the statutory requirement of CERCLA Section 121 which include:

- Be protective of human health and the environment.
- Comply with ARARs.
- Be cost-effective.
- Utilize permanent solution and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.
- Satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied.

The evaluation of how the selected remedy for Site 2 satisfies these requirements is presented below.

Protection of Human Health and the Environment

The selected remedy provides protection to human health and the environment through groundwater monitoring (to insure there is no off site migration of groundwater contaminants) and restriction on construction of new potable water supply wells. These restrictions, if carefully enforced, prevent groundwater ingestion and exposure, thereby satisfying the requirement to be protective of human health and the environment.

Compliance With Applicable or Relevant and Appropriate Requirements

The selected remedy will not immediately meet the federal and North Carolina groundwater standards, although long-term achievement of these standards is possible through natural biodegradation processes. Institutional controls are sufficient to protect human health and the environment and, therefore, compliance with chemical-specific ARARs may be impractical. Due to the isolated nature of the contaminated groundwater, the selected remedy will insure, through
the long-term groundwater monitoring program, that no off-site migration of groundwater contaminants occurs. The selected remedy meets location-specific and action-specific ARARs.

There are a number of site-specific factors which contribute to the effectiveness/appropriateness of the selected remedy. These factors, which support the decision to not cleanup the groundwater, include the following:

- There are no sources of groundwater contamination or free product remaining on the site.
- Organic contaminants which exceed the North Carolina groundwater standards (ethylbenzene and total xylenes) have the capacity to degrade and/or attenuate naturally under site-specific conditions. These contaminants have only been detected in concentrations exceeding the North Carolina groundwater standards in monitoring well 2GW3. Detected concentrations of ethylbenzene and total xylenes in monitoring well 2GW3 have decreased steadily over time (Figures 4 and 5). In addition, contamination is limited to the shallow aquifer, which is not utilized as a source of drinking water.
- Inorganics were detected in groundwater samples collected from shallow monitoring wells at the site. Several of these analytes, based on total metals analysis, exceeded federal and/or North Carolina groundwater quality standards. The distribution of detected inorganics in shallow groundwater followed no discernible pattern that would indicate a likely source. Many of the highest concentrations of inorganics were detected in background monitoring wells 2GW9 and 2GW8. The concentrations of detected inorganics is much greater in the unfiltered (total) samples than in the filtered (dissolved) samples. This indicate that the inorganics detected in groundwater samples at Site 2 may be due predominantly to the presence of soil particles entrained in the groundwater samples and may not be attributable to site operations. Some inorganics (arsenic, lead, barium, beryllium, and vanadium) were nonetheless retained as chemicals of concern in the baseline risk assessment.
- The existing groundwater monitoring network (13 monitoring wells) completely encircles the site. The selected remedy includes long-term monitoring of groundwater quality through collection of groundwater samples from these monitoring wells.
- The groundwater monitoring network can be utilized to predict time and direction of groundwater contaminant travel with reasonable certainty.
- The groundwater monitoring network will be utilized to ensure that groundwater contaminant migration will not result in any violation of applicable groundwater standards at any existing or foreseeable receptor.
- The groundwater monitoring network will be utilized to ensure that groundwater contaminants have not and will not migrate onto adjacent properties.
- The groundwater monitoring network will be utilized to ensure that groundwater contaminants will not discharge to surface waters in violation of applicable surface water standards.
- The long-term groundwater monitoring program included in the selected remedy will sufficiently track the degradation and attenuation of contaminants and contaminant byproducts within and downgradient of the plume and to detect contaminants and contaminant byproducts prior to their reaching any existing one year’s time of travel upgradient of the receptor and no greater than the distance the groundwater at the contaminated site is predicted to travel in five years.

Cost Effectiveness
The selected remedy is highly cost-effective because it provides adequate protection of human health and the environment at a relatively low cost. The only RAA that incurs less cost is the No Action RAA, which may not be effective at protecting human health and the environment.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. Restricting the installation of additional potable supply wells is a permanent solution to potential groundwater exposure, if carefully enforced. Due to the isolated nature of the contaminated groundwater and the lack of evidence of a contaminated source, use of alternative treatment technologies was deemed impracticable from an engineering and administrative standpoint.

Preference for Treatment as a Principal Element

The selected remedy does not satisfy the statutory preference for treatment as a principal element. Due to the isolated nature of the contaminated groundwater, the limited extent of contamination, and the minimal risks to the community and workers, use of treatment was deemed impracticable.

11.0 RESPONSIVENESS SUMMARY

The selected remedy for Operable Unit 5 is RAA No. 2 - Institutional Controls/Long-Term Groundwater Monitoring. Based on written comments received during the public comment period and the comments received from the audience at the public meeting of July 27, 1994, the public appears to support the preferred alternative. In addition, the EPA Region IV and the NC DEHNR are in support of the preferred alternative. Members of the community who attended the public meeting on July 27, 1994, did not appear to have any opposition to the preferred alternative.

11.1 Background On Community Involvement

A record review of the MCB Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and base/community clubs. The file search did not locate written Installation Restoration Program concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Site 2). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relation interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including base personnel, residents, local officials, and off-base residents.

- Prepared a Community Relations Plan, September 1990.

- Conducted additional community relation interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-base residents, military and civilian interests.

- Prepared a revised Preliminary Draft Community Relations Plan, August 1993.

- Established two information repositories.

- Established the Administrative Record for all of the sites at the based.

- Released PRAP for public review in repositories, July 1994.
11.2 Summary of Comments Received During the Public Comment Period and Agency Responses

11.2.1 Written Comments

A letter commenting on the selected remedy was submitted by the NC DEHNR during the public comment period. This letter was dated August 18, 1994, and included comments on two general points:

- NC DEHNR Superfund section is in agreement with the selected remedy.
- As the selected remedy does not actively remediate the ethylbenzene and xylene detected in monitoring well 2 GW3, a Corrective Action Plan is to be submitted in accordance with North Carolina groundwater regulations (15A NCAC 2L.0106).

Navy/Marine Corps Response: A Corrective Action Plan will be submitted (under separate cover) to the NC DEHNR in accordance with 15A NCAC 2L.0106(k) and (l).

11.2.2 Public Meeting Comments

Several questions/comments were generated at the July 27, 1994, public meeting. The public meeting was held to discuss the Department of the Navy/Marine Corps' preferred alternative. A few of the questions pertained to matters that are not specifically related to the preferred alternative (e.g., some members of the audience inquired as to the history of site operations). These types of questions and answers will not be addressed as part of this Responsiveness Summary; however, specific answers to these questions are documented in the transcript to the public meeting which is contained in Appendix A. The transcript has also been included in the Administrative Record. A summary of comments pertaining to the proposed alternatives and site investigations is given below.

Water Supply Wells

1. One member of the audience at the public meeting inquired as to the proximity of water supply wells to Site 2.

Navy/Marine Corps Response: There are three operating water supply wells in the vicinity of Site 2. These are:

- Well 616 - 1,900 feet southeast of Site 2
- Well 646 - 1,200 feet northwest of Site 2
- Well 647 - 1,300 feet east of Site 2

Each of these supply wells will be sampled with the on-site monitoring wells during the long-term groundwater monitoring.

Remediation

1. One member of the audience inquired as to the location of the incinerator for the excavated pesticide–contaminated soil and identity of the remediation contractor.

Navy/Marine Corps Response: The excavated pesticide–contaminated soil is transported to an incinerator in Kentucky for treatment and disposal. The remediation contractor is OHM Remediation Services Corporation of Findlay, Ohio, which is responsible for all subcontracts required to execute the remediation.
2. One member of the audience inquired as to the duration of the selected remedy.

Navy/Marine Corps Response: The long-term groundwater monitoring may be conducted over a 30-year period. In accordance with CERCLA requirements, the selected alternative will be reviewed every five years.
PUBLIC HEARING

ON THE

PROPOSED CLEANUP PLAN FOR OPERABLE UNITS ONE AND FIVE

SITES 21, 24, AND 78

JULY 27, 1994

HELD AT
TARAWA TERRACE ELEMENTRY SCHOOL
CORBIN STREET
JACKSONVILLE, NORTH CAROLINA

REPORTED BY: STACY TONE, CCR
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APPEARANCES

PRESENTED BY:

MR. RAYMOND WATTRAS and
MR. TOM BIXIE
BAKER ENVIRONMENTAL, INC.
AIRPORT OFFICE PARK, BUILDING 3
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MR. PAUL: GOOD EVENING. TONIGHT WE'RE GOING TO DISCUSS THE PROPOSED REMEDIAL ACTION PLANS FOR OPERABLE UNIT ONE AND FIVE, NOT TEN WE DISCUSSED THAT LAST NIGHT. THE PUBLIC COMMENT PERIOD WILL BEGIN TODAY, JULY 27TH, AND EXTEND THROUGH AUGUST 27TH OF 1994. I WILL SAVE INTRODUCTIONS TONIGHT BECAUSE YOU GUYS WERE HERE LAST NIGHT AND KNOW PROBABLY WHO EVERYONE IS AND I'LL TURN IT OVER NOW TO MR. RAY WATTRAS FROM BAKER.

MR. WATTRAS: THANK YOU. PRETTY MUCH THE SAME FORMAT AS LAST NIGHT. FEEL FREE TO INTERRUPT ME AT ANY TIME TO DISCUSS SOMETHING THAT MIGHT NOT BE CLEAR AND WE'LL GO FROM THERE; A PRETTY CASUAL FORMAT HERE.

WE'RE FIRST GOING TO BE TALKING ABOUT OPERABLE UNIT NUMBER ONE. THIS OPERABLE UNIT CONSISTS OF THREE SITES. THE MOST NOTABLE SITE MIGHT BE SITE 78, THE HADNOT POINT INDUSTRIAL AREA. IT'S THE MAIN PART OF CAMP LEJEUNE, ONE OF THE FIRST PORTIONS OF THE BASE THAT WAS CONSTRUCTED.

THE OTHER TWO SITES -- SITE 21 IS ACTUALLY LOCATED WITHIN THE BOUNDARY OF HADNOT POINT. IT'S A TRANSFORMER STORAGE LOT. AND SITE 24 IS KNOWN AS THE INDUSTRIAL AREA FLY ASH DUMP.

IT'S LOCATED RIGHT OFF OF THE HADNOT POINT AREA.

SITE 21 IS THE SMALLEST OF THE SITES. IT'S ROUGHLY TEN ACRES IN SIZE. THE HISTORY OF THAT SITE TELLS US THAT AT ONE TIME PART OF THIS SITE WAS USED AS A PESTICIDE HANDLING AND MIXING...

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AREA. AND ANOTHER PORTION OF THE SITE WAS USED TO EMPTY
TRANSFORMER FLUIDS INTO IT. AND, OF COURSE, AT THAT TIME PCB'S
WERE USED IN THOSE TRANSFORMERS.

THIS IS A SLIDE SHOWING THE -- THE SITE 21. THERE'S
SOME BETTER PICTURES HERE. IN THIS AREA -- THIS IS THE AREA WHERE
THEY DISPOSED OF THE PCB. YOU CAN TELL WHEN YOU'RE OUT THERE --
YOU CAN'T REALLY SEE THIS ON THE FIGURE, BUT WHEN YOU GO OUT THERE
THERE IS A SMALL DEPRESSION IN THE GROUND SURFACE, AND THAT'S
WHERE WE STARTED WITH OUR SAMPLING. WE TOOK OUR SAMPLES IN THE
CENTER OF THAT PIT AND WE WORKED OUR WAY OUTWARD. THIS IS JUST
ANOTHER ANGLE. AGAIN, IT'S VERY DIFFICULT TO TELL, BUT IT'S RIGHT
BEHIND THIS DARK MOUND IS WHERE THIS SMALL PIT IS.

MR. PAUL: IT'S ABOUT THREE OR FOUR FEET
DEEP OR?

MR. WATTRAS: NO, PROBABLY AT BEST A FOOT, I
WOULD SAY, THE DEPRESSION. NOT BEING -- NO, NOT THAT NOTICEABLE
MAYBE A FOOT IN THE CENTER. YOU CAN BARELY TELL. THIS IS A
PORTION OF THE SITE, AND BY THE WAY, THE SITE IS FENCED IN. AND
IT IS ACTIVELY USED FOR STORAGE WITH THE EXCEPTION OF THIS
DISPOSAL PIT AREA THAT PART IS OUTSIDE OF THE FENCE. BUT THIS IS
THE -- WHAT WE KNOW AS THE PESTICIDE HANDLING AND MIXING AREA OF
THE SITE. IT'S JUST ANOTHER VIEW OF THAT SAME AREA. A LOT OF THE
LOT IS COVERED WITH GRAVEL. AS YOU CAN SEE IT'S STILL USED TO
STORE DIFFERENT THINGS.

SITE 24 IS THE FLY ASH DUMP. IT'S APPROXIMATELY 100

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ACRES IN SIZE. IT WAS REPORTED THAT NUMEROUS THINGS WERE TAKEN OUT THERE, INCLUDING FLY ASH, SLUDGE, SOLVENTS, CIDERS, PAINT STRIPPING COMPOUNDS AND CONSTRUCTION DEBRIS.

WE LOOKED AT FIVE AREAS WITHIN THIS 100 ACRE AREA. WE CALL THESE AREAS OF CONCERN. WE NOTED THIS AREAS USING HISTORICAL AERIAL PHOTOGRAPHS. AND ALSO WE DID A GEOPHYSICAL INVESTIGATION OUT THERE, WHICH WAS USED TO TRY TO DEFINE THE BOUNDARIES TO SEE IF THERE WAS ANY BURIED METAL OR BURIED DRUMS OR WHATEVER OUT THERE SO WE USED GEOPHYSICAL TECHNIQUES TO LOOK AT THAT. AND WE NAMED THESE AREAS THE SPIRACTOR SLUDGE DISPOSAL AREA, THE FLY ASH DISPOSAL AREA, THE BORROW AND DEBRIS DISPOSAL AREA, AND TWO BURIED METAL AREAS.

NOW, THE BURIED METAL AREAS WERE NOTED DURING THE GEOPHYSICAL INVESTIGATION WHERE WE LOOKED AT SOME ANOMALIES THAT WE THOUGHT COULD BE ASSOCIATED WITH BURIED METAL; POSSIBLY DRUMS.

THIS IS SOME OF THE FIELD ACTIVITIES AT THE SITE. THIS IS MORE OF THE -- ONE OF THE OPEN AREAS. A LOT OF THE SITES ARE HEAVILY VEGETATED. AS YOU'LL SEE IN THIS PHOTO HERE, IT'S GROWN OVER. THAT'S A PICTURE OF A MONITORING WELL IN THE MIDDLE, BUT IT'S VERY THICK IN MOST OF THE AREAS OF THE SITE.

THIS IS ANOTHER AREA. THIS IS ONE OF THE BURIED METAL AREAS THAT WE WERE LOOKING AT. ANY TIME WE DO TEST PITTING ACTIVITIES WE HAVE TO TAKE PRECAUTIONS AND DON WHAT'S CALLED LEVEL PROTECTION WHERE OUR FIELD PEOPLE WILL ACTUALLY USE SCBA'S;

SELF-CONTAINED BREATHING APPARATUSES IN CASE THEY WOULD ENCOUNTER

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SOMETHING AND THEY WOULD BE EXPOSED TO SOMETHING.

IN THIS CASE, BY THE WAY, WE FOUND THAT WHAT WAS BURIED THERE WAS JUST CONSTRUCTION DEBRIS. SO, THE GEOPHYSICAL INVESTIGATION SAW SOMETHING IN THE SUBSURFACE; WE THOUGHT IT COULD BE DRUMS AND WE CHECKED IT OUT AND IN THIS CASE IT WAS PRETTY MUCH JUST CONSTRUCTION DEBRIS.

MRS. WOOD: WE WENT OVER THAT BECAUSE I THOUGHT WE PRETTY MUCH DISCOUNTED 24 AS NO PROBLEM, BUT YOU WENT BACK AND WENT OVER IT ANYWAY.

MR. WATTRAS: I DON'T BELIEVE -- THIS IS THE FIRST TIME WE'VE -- THERE WERE FIVE EXISTING MONITORING WELLS AT SITE 24 --

MRS. WOOD: YEAH. YEAH, THEY HAD --

MR. WATTRAS: -- THAT WERE PUT IN IN THE MID-80S AND THEY LOOKED AT GROUNDWATER ONLY. THEY NEVER LOOKED AT ANYTHING ELSE. THEY PUT IN FIVE MONITORING WELLS. AND IN THOSE FIVE MONITORING WELLS IF I RECALL THEY REALLY DIDN'T FIND ANY PROBLEMS. THEY HAD A LITTLE BIT OF ELEVATED METALS IN THE SHALLOW GROUNDWATER, BUT AS I REMEMBER THEY DID NOT HAVE ANY VOLATILE ORGANICS OR ANY OTHER TYPE OF ORGANIC COMPOUNDS. BUT THIS IS THE FIRST EXTENSIVE STUDY THAT HAS BEEN DONE AT SITE 24 WHERE WE ACTUALLY DID SOIL SAMPLING AND I'LL DISCUSS A LITTLE BIT LATER WE TOOK SOME SURFACE WATER SEDIMENT SAMPLES AND SO FORTH.

A LITTLE BIT ABOUT THE HADNOT POINT INDUSTRIAL AREA; THIS IS A HUGE AREA, AS YOU PROBABLY KNOW, IT'S ABOUT 590 ACRES.

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A LOT OF MAINTENANCE SHOPS AND WAREHOUSES AND ADMINISTRATIVE BUILDINGS. WE KNOW BECAUSE OF ALL THE UNDERGROUND STORAGE TANKS, MOST OF THEM USED FOR HEATING FUEL, THAT THERE HAVE BEEN SPILLS AND LEAKS IN THE PAST.

THERE IS ANOTHER SITE, WHICH I HAVE NOT DISCUSSED YET.

SITE 22 IS A FUEL FARM. THIS FUEL FARM SITS RIGHT IN THE CENTER OF THE SITE. THE TANKS HAVE BEEN REMOVED. THIS IS FLOATING PRODUCT ON THE GROUNDWATER, BUT THERE IS A -- THERE IS AN ACTIVE REMEDIATION SYSTEM THAT'S COLLECTING THIS FLOATING PRODUCT. WE ARE NOT GOING TO DISCUSS SITE 22 TONIGHT BECAUSE ACTION IS ALREADY BEING TAKEN AT THIS SITE.

MRS. WOOD: IS THAT UNDER PURVIEW OR IS THAT UNDER THE UST PROGRAM?

MR. WATTRAS: THAT IS ACTUALLY UNDER THE UST PROGRAM. EXACTLY.

MRS. WOOD: HAVE THEY CHANGED THE LEGISLATION ON THAT ALL? THEY DON'T DO THE PUBLIC HEARINGS.

I HAVEN'T EVEN SEEN ANYTHING. THEY JUST GO AHEAD AND THAT'S THAT.

IS THAT -- IS IT --

MR. WATTRAS: I DON'T KNOW HOW THAT GOES TO BE QUITE HONEST WITH YOU. I'M NOT SURE IF NEAL COULD HELP ANSWER THAT QUESTION.

MR. PAUL: THERE IS A CORRECTIVE -- WHEN YOU GO INTO A CORRECTIVE ACTION PLAN THERE IS A PUBLIC MEETING THAT YOU TO HAVE BEFORE YOU --

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MRS. WOOD: ONCE YOU'RE UNDERWAY THERE SEEMS TO BE A DIFFERENT --

MR. PAUL: YOU MEAN FOR HAD NOT POINT?

MRS. WOOD: WELL, NO, FOR THIS SITE 22 UNDER UST. THEY MAY HAVE THE SAME RESPONSIBILITIES.

MR. PAUL: THERE ARE SOME PUBLIC RELATIONS REQUIREMENTS AND THIS PREDATES ME. SO, I WASN'T HERE WHEN THIS SYSTEM STARTED.

MRS. WOOD: WELL, NOTHING IS MENTIONED IN THIS LETTER TO -- THAT WENT OUT TO THE EPA. AND IT WAS AN EVALUATION THAT YOU ALL -- NOT YOU PER SE --

MR. PAUL: RIGHT.

MRS. WOOD: -- BUT WHOEVER WAS HERE THEN HAD NOT INCLUDED 22 IN THIS DATA BECAUSE IF FELL UNDER THE UST PROGRAM AND THEY GOT A VERY NASTY LETTER BACK FROM THE EPA SAYING "HEY, SOME OF YOUR CONTAMINANTS ARE COMING OUT OF THIS. THEREFORE, YOU DO NOT -- YOU MUST INCLUDE IT AS PART OF THE CLEANING FACTOR GOING ON. BUT IT DID INDICATE --

MS. BERRY: SINCE THAT PREDATED HIM, THEN WE'LL TAKE A LOOK AT IT AND SEE IF THERE'S OTHER CONTAMINANTS THAT MUST BE TREATED UNDER THERE.

MRS. WOOD: I THOUGHT IT WOULD BE THERE BETWEEN THE TWO.

MS. BERRY: EXACTLY.

MRS. WOOD: IN THE MAJORITY OF THE THINGS

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IN THE LIBRARY YOU JUST DON'T SEE THAT. NONE OF THAT'S UNDER YOUR
PROGRAMS.

MR. PAUL: WELL, WE HAVE -- I HAVE --

MRS. WOOD: NONE OF THAT'S UNDER YOUR
PROGRAM.

MR. PAUL: WELL, IT IS UNDER MY PROGRAM
BECAUSE I HAVE I.R. SITE AND I ALSO HAVE OTHER PROGRAM SITES.

BUT IT HAS TO BE INCLUDED AS PART OF THE RECORD BECAUSE THE STATE
OF NORTH CAROLINA ACTUALLY ADDRESSES THE RECORD. THEREFORE, THEY
ARE CERCLA REGULATED SITES, WHERE THE STATE HAS JURISDICTION NOT
EPA. SO, WE SEND THOSE GUYS QUARTERLY REPORTS, QUARTERLY REPORTS
OF HOW MUCH WE PULL OUT OF THE GROUND; WATER WE'VE ACTUALLY
TREATED. AND TO DATE THERE'S LIKE 25,000 GALLONS OF GASOLINE FROM
THE INVENTORY RECORDS THAT WERE SHOWN TO BE MISSING. AND TO DATE
WE HAVE RECOVERED ABOUT 20,000 OF GASOLINE AND WE'VE TREATED OVER
3 MILLION GALLONS OF WATER AND THAT'S BEEN SINCE OCTOBER OF '91.

SO, THAT SYSTEM HAS JUST ABOUT DONE EVERYTHING YOU CAN DO. AND
WE'LL PROBABLY GO BACK IN A YEAR OR TWO AND ADDRESS THE SOILS
THERE, BUT THE PLUME TREATMENT IS PRETTY CLOSE TO BEING
REMEDIATED. THE REST OF THE WATER IS DISSOLVING. WE'RE PROBABLY
NOT GOING TO BE TAKING ANY FREE PRODUCT, WE'LL JUST BE TREATING
THE CONTAMINATED GROUNDWATER. GAS HAS BEEN ACTUALLY DISSOLVED.

SO IT REALLY HAS BEEN AN EFFECTIVE SYSTEM. AND IF YOU WANT TO
KNOW ANYTHING ABOUT IT FELL FREE TO GIVE WALT OR MYSELF A CALL.

MRS. WOOD: OH, I WAS --

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MR. PAUL: AND THAT IS REALLY ONE OF OUR BIG SUCCESS STORIES.

MRS. WOOD: JUST TO GO ON, WHAT WOULD YOU EXPECT THE -- WHAT PERCENTAGE WOULD YOU EXPECT TO GET OUT?

MR. PAUL: WITH THE PLUME TREATMENT OPERATING FOR FREE PRODUCT?

MRS. WOOD: NO, IF YOU'VE GOT GASOLINE.

MR. PAUL: AND SOME OF THIS IS STRAIGHT FROM RICH BONNELLI, IS THAT IF YOU GET 75 PERCENT OF THE FREE PRODUCT THAT YOU THINK YOU SPILLED INTO THE GROUNDWATER THEN YOU'RE DOING A GREAT JOB, AND 20 OUT OF 25 IS ALMOST 80 PERCENT.

SO, WE DONE PROBABLY AS GOOD AS WE CAN DO. AND EVEN 75 PERCENT IS A GREAT RECOVERY RATE. BUT FROM THE PEOPLE I'VE TALK TO IN THE STATE AGREE IT IS A SUCCESS.

MRS. WOOD: I'M SORRY. GO AHEAD.

MR. WATTRAS: NO, THAT'S FINE. THIS IS HADNOT POINT. CAN I ASK, HAVE YOU BEEN DOWN TO HADNOT POINT OR HAVE YOU EVER BEEN BASE?

MRS. WOOD: OH, FOR YEARS. OH, I HAVE --

MR. WATTRAS: OKAY. SO, YOU HAVE SOME IDEA OF WHAT THIS PLACE LOOKS LIKE?

MRS. WOOD: YEAH, I KNOW THIS WHOLE AREA.

MR. WATTRAS: OKAY. THESE ARE JUST RANDOM PHOTOS IT WASN'T ANYTHING PARTICULAR; JUST GOING AROUND THE HADNOT POINT AREA AND TAKING SOME PICTURES. I WILL SAY MOST OF THIS --

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HADN'T POINT IS -- YOU KNOW, IT'S VERY INDUSTRIAL IN NATURE FROM
THE STANDPOINT THAT MOST OF THE AREA IS GRAVEL COVERED OR COVERED
WITH CONCRETE OR ASPHALT. THERE'S NOT THAT MANY OPEN AREAS WITHIN
THE MAIN INDUSTRIAL AREA.

MRS. WOOD: WHAT WERE YOUR INDUSTRIAL
BUILDINGS? BUILDING 900 OR --

MR. WATTRAS: YES, WE'RE GOING TO TALK ABOUT
THIS RIGHT NOW. BUILDING 900 AREA IS A FORMER MAINTENANCE AREA.
AND THAT'S WHERE WE KNOW WE HAVE A CONTAMINATE PLUME OF SOLVENTS
IN THE GROUNDWATER AND THAT'S WHERE WE CURRENTLY ARE CONSTRUCTING
A REMEDIATION SYSTEM TO CONTAIN THE MIGRATION OF THIS PLUME AND
WE'RE READY TO -- THEY'RE BUILDING IT RIGHT NOW IN FACT. THIS --
WE DISCUSSED THIS EFFORT ABOUT TWO YEARS AGO. I THINK BACK IN
1992 THE DECISION WAS MADE TO PUT IN SOME CONTAINMENT WELLS TO
CONTAIN ANY MIGRATING OF THIS PLUME BY THE 900 BUILDING AREA AND
ALSO BY THE 1600 BUILDING AREA.

MRS. WOOD: 1600, YES.

MR. WATTRAS: NOW, THERE'S ANOTHER BUILDING
1502, WHICH WE'LL TALK ABOUT. THAT'S A DIFFERENT PROBLEM. THIS
IS JUST THE 900 BUILDING AREA. UNDERNEATH THIS AREA IS WHERE WE
PROBABLY HAVE THE HIGHEST LEVELS OF SOLVENTS IN GROUNDWATER.

MRS. WOOD: SO, YOU'RE TALKING ABOUT THE
TCE'S?

MR. WATTRAS: THE TCE'S, YES. WE ALSO HAVE
A LITTLE BIT OF BENZENE WHICH ASSOCIATED WITH FUELS, BUT THE

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TCE IS THE MAIN -- THE SOLVENTS TCE AND OTHER THINGS LIKE THAT ARE
THE MAIN CONTAMINANTS IN THIS PLUME.

MRS. WOOD: WELL, NOW, HOW DO YOU -- WHEN YOU SAY "CONTAINING IT" IS IT JUST PULLED OUT OR WHAT? WHAT ARE YOU DOING?

MR. WATTRAS: WHEN I SAY CONTAINED WE HAVE A PLUME -- IT'S PROBABLY ON ONE OF THESE FIGURES OVER HERE. I DON'T KNOW -- LET ME JUST MOVE AHEAD REAL QUICK HERE. I DON'T THINK IT'S ON THE SLIDE.

WE WILL PUT WELLS AT THE EDGE WHERE WE BELIEVE THE EDGE OF THE PLUME TO BE, THE OUTER LIMITS OF THE PLUME, AND WE KNOW THAT MY SAMPLING MONITORING WELLS. AND IN THE SOURCE AREA, FOR EXAMPLE, WE MIGHT HAVE 10,000 PARTS PER BILLION OF THE SOLVENTS. AS WE PUT IN WELLS AWAY FROM THAT ALONG THE OUTER EDGES WE MIGHT 50 OR A HUNDRED PARTS PER BILLION. SO WE SEE A NICE PATTERN GOING FROM HIGH CONCENTRATION DOWN TO LOW CONCENTRATION AND IT FOLLOWS THE FLOW. GROUNDWATER AT HADNOT POINT PRETTY MUCH FLOWS IN A, I BELIEVE, A SOUTHWEST DIRECTION -- SOUTHWEST OR SOUTHEAST DIRECTION, AND WE CAN FOLLOW THAT. AND WE PUT IN WELLS. THE WELLS ARE BEING CONSTRUCTED RIGHT NOW TO PUMP GROUNDWATER AT A RATE OF ABOUT FIVE GALLONS PER MINUTE, AND THE WELLS ARE AT THE EDGES OF THIS PLUME TO PREVENT IT FROM GOING ANY FURTHER AND THAT'S WHAT WE CALL CONTAINMENT.

MRS. WOOD: NOW, WHAT HAPPENS IF YOU GET, YOU KNOW, HEAVY EXTENDED RAINS?

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MR. WATTRAS: NOT ONE OR TWO TIME EVENTS OF
RAIN, IT WILL NOT EFFECT -- OTHER THAN THE WATER LEVEL RISING A
LITTLE BIT.

MRS. WOOD: YEAH.

MR. WATTRAS: BUT IT REALLY WOULD NOT DO MUCH
TO THE CONCENTRATIONS. I MEAN, THESE PROBLEMS AT HADNOT POINT
HAVE BEEN AROUND FOR YEARS.

IN FACT, THIS PLUME THAT I'M TALKING ABOUT RIGHT NOW WAS
FIRST STUDIED IN THE MID 1980'S AND THE CONCENTRATIONS HAVEN'T
DIFFERED THAT MUCH. YOU KNOW, WE -- FOR EXAMPLE BACK IN THE
1980'S THEY SAW VERY SIMILAR LEVEL. IT'S NOT LIKE IN 1985 THEY
SAMPLED IT AND MEASURED 10,000 AND THEN IN 1994 WE SAMPLED IT AND
SAW 1,000. THAT WOULD BE A PRETTY DRASTIC CHANGE IN CONCENTRATION
OVER SUCH A SHORT PERIOD. WE'VE SEEN VERY SIMILAR LEVELS.

MRS. WOOD: NOW, ARE THEY SAYING THAT -- I
MEAN, WHAT ARE THEY DOING NOW TO CONTROL THIS?

MR. WATTRAS: CONTROL?

MRS. WOOD: I MEAN, DO THEY HAVE
UNDERGROUND TANKS WHERE THESE SOLVENTS ARE OR IS IT JUST --

MR. WATTRAS: NO, THE SOLVENTS, THEY'RE -- WE
BELIEVE THERE MAY HAVE BEEN ON TANK THAT WAS USED FOR SPENT
SOLVENTS. THAT TANK AS FAR AS WE KNOW HAS SINCE BEEN REMOVED.
THERE ARE OTHER UNDERGROUND STORAGE TANKS RELATED TO
FUEL. I MEAN, THAT -- WE DON'T BELIEVE THOSE TANKS ARE ASSOCIATED
WITH THIS PROBLEM.

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BUT WE DID LOOK AT SOIL AND FOUND VERY LITTLE OF THE
SOLVENTS IN THE SOIL IN THE HIGHEST AREA THAT WE KNOW OF
GROUNDWATER CONTAMINATION WE PULLED SOIL SAMPLES AND FOUND VERY
LOW LEVELS WHICH GOES BACK TO SOMETHING WHERE I SAID -- WHAT I WAS
TALKING ABOUT LAST NIGHT. I THOUGHT I MAYBE SAID IT HERE AT THIS
MEETING WHERE OVER TIME, YOU KNOW, KNOWING THAT THESE SPILLS
HAPPENED MANY YEARS AGO THROUGH TIME WITH PRECIPITATION AND
EVERYTHING IT SORT OF -- THE SOLVENT WILL MOVE OUT OF THIS
FRONTAL ZONE. AND THAT MIGHT BE THE CASE HERE WHERE WE HAVE VERY
LOW LEVELS IN SOIL AND VERY FEW SAMPLES HAVE SOLVENTS IN THEM.
SO, THE TANK HAS -- AS FAR AS WE KNOW HAS BEEN PULLED
THAT HAD SPENT SOLVENTS. AND EVEN THAT INFORMATION TO BE QUITE
HONEST WITH YOU IS SKETCHY. IF WASN'T CONCRETE THAT THE TANK THAT
THEM PULLED WAS USED FOR SPENT SOLVENTS; ON REPORT SAID THAT IT
DID AND ANOTHER REPORT DID NOT SAY THAT. BUT WE HAVE TO THAT FOR
WHAT --
MRS. WOOD: YEAH, WE'VE GOT THE MATERIAL
THERE.
MR. WATTRAS: WE AGREE, YOU KNOW, WE SUSPECT
THAT THERE WAS A TANK THAT WAS USED TO COLLECT SPENT SOLVENTS
I'LL TALK A LITTLE BIT ABOUT THE PAST INVESTIGATIONS.
I JUST MENTIONED -- YOU KNOW, WE -- THERE HAVE BEEN A LOT OF
INVESTIGATIONS ESPECIALLY AT HADNOT POINT SINCE THE MID-80S.
THIS INTERIM REMEDIAL ACTION OF THE SHALLOW WAUIFER, THIS IS what
I WAS JUST TALKING ABOUT THE CONTAINMENT WALLS AND WE MADE THE

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MRS. WOOD: MARINE CORPS.

MR. WATTRAS: THEY MADE THE DECISION TO GO WITH THE CONTAINMENT ALTERNATIVE WHICH WAS ACCEPTED BY THE EPA AND THE STATE OF NORTH CAROLINA.


MRS. WOOD: WHAT ABOUT THE DEEP AQUIFER, YOU DIDN'T FIND ANY --

MR. WATTRAS: ABOUT THE?

MRS. WOOD: THE DEEP AQUIFER.

MR. WATTRAS: WE'LL TALK ABOUT THAT IN A MINUTE HERE.

BASICALLY, TO THROW OUT THE TERM REMEDIAL INVESTIGATION, THIS IS DONE UNDER CERCLA. THE OBJECTIVE OF REMEDIAL INVESTIGATION IS TO FIND OUT WHAT IS THE PROBLEM AT THE SITE. HOW July 27, 1994
BAD IS THE PROBLEM, WHAT KIND OF CONTAMINANTS ARE THERE, AT WHAT
CONCENTRATIONS. AND ONCE WE COLLECT ALL THAT DATA THE MAIN PART
OF REMEDIAL INVESTIGATION IS TO DETERMINE WHAT IS THE IMPACT TO
HUMAN HEALTH AND THE ENVIRONMENT.

SO, IN A NUTSHELL THE REMEDIAL INVESTIGATION LOOKS AT
WHAT'S AT THE SITE, TRIES TO FIGURE OUT WHERE IS IT GOING, HOW
DEEP HAS IT MIGRATED, HOW FAR OFF-SITE HAS IT MIGRATED VERTICALLY
-- OR HORIZONTALLY AND WHAT DOES THIS MEAN TO THE PEOPLE WORKING
THERE OR THE ENVIRONMENT

NOW, HERE'S WHAT WE FOUND AND THIS IS WHERE I'LL GET
INTO THESE DIFFERENT AQUIFERS. WE CONFIRMED -- WE KNEW RIGHT THEN
WE HAD TWO MAIN PLUMES TO LOOK AT. WE PUT IN A FEW MORE WELLS TO
MAKE SURE WE KNEW THE EXTENT -- THE HORIZONTAL EXTENT OF THESE
PLUMES. WE DEFINED THE HORIZONTAL EXTENT OF THE PLUMES. WE FEEL
VERY COMFORTABLE THAT WE HAVE A GOOD IDEA OF HOW FAR THE
CONTAMINATION HAS MIGRATED HORIZONTALLY. AND AS I MENTIONED
BEFORE THE TWO PLUMES ARE AT THE 900 BUILDING AREA AND THE 1600
BUILDING AREA.

WE ALSO RECOGNIZED THE BTEX PLUME AT SITE 22 WHICH NEAL
TALKED ABOUT EARLIER. WE HAD TOTAL METALS-- WE HAD SOME METALS
THROUGHOUT HADNOT POINT AND AT NO SPECIFIC PATTEN. PRETTY MUCH
RANDOM HITS OF LEAD, CHROMIUM, MANGANESE, IRON, BUT NO PARTICULAR
PATTERN WHAT YOU CAN ASSOCIATE IT WITH A PLUME. WE FOUND THIS AT
OTHER SITES TOO. WE'RE NOT SO SURE THESE METALS ARE NECESSARILY
DUE TO DISPOSAL ACTIVITIES. THEY COULD BE DUE TO A LOT OF OTHER

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THINGS SUCH AS THE GEOLOGIC CONDITIONS OF THE SHALLOW AQUIFER AND POSSIBLY --

MRS. WOOD: WOULD YOU EXPAND ON THAT A LITTLE BIT BECAUSE I DON'T UNDERSTAND THAT.

MR. WATTRAS: OKAY.

MRS. WOOD: YOU KNOW, THE CHROMIUM I DON'T UNDERSTAND.

MR. WATTRAS: THAT'S FINE.

MRS. WOOD: WHERE WOULD THEY COME FROM IN YOUR --

MR. WATTRAS: FROM THE SOIL ITSELF. THE SOIL SAMPLES WILL HAVE CHROMIUM AND LEAD.

MRS. WOOD: YEAH, I MEAN --

MR. WATTRAS: AND THAT'S NATURALLY OCCURING.

I MEAN --

MRS. WOOD: MANGANESE, I --

MR. WATTRAS: MANGANESE -- EVEN LEAD -- YOU HAVE SOME LEAD IN SOILS, AND SOME LEAD FROM PARTICULATES AND SO FORTH.

WHEN WE PUT IN A SHALLOW WELL THE SHALLOW AQUIFER IS IMPOUNDED ABOUT FIVE TO TEN FEET BELOW GROUND SURFACE HERE AT HADNOT POINT DEPENDING UPON WHERE YOU'RE AT.

THE CHARACTERISTICS OF THE AQUIFER, IT'S VERY LOOSELY COMPACTED, VERY SANDY; IT'S NOT TIGHTLY COMPACTED. WE PUT IN A WELL, WE HAVE A SCREEN IN THE WELL THAT TRIES TO GET OUT THESE

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SILTS AND SANDS FROM THE SAMPLE, BUT YOU STILL HAVE SOME THAT GO THROUGH THE SLOTS OF THE SCREEN.

WHEN WE SAMPLE WE TRY TO TAKE PRECAUTIONS WHEN WE PULL A SAMPLE NOT TO HAVE ANY SUSPENDED SOLIDS IN THAT WATER SAMPLE. IT'S VERY HARD TO DO THAT IN THIS GEOLOGIC FRAMEWORK BECAUSE OF THE LOOSELY COMPACTED SILTS AND SANDS.

NOW, OUR DEEP WELLS, AND HERE'S THE ONLY PATTERNING THAT WE'RE SEEING, WE'RE SEEING THESE TOTAL METALS AND TOTAL METALS MEANS JUST THAT; IT'S A SAMPLE OF THE WATER IT'S TAKEN STRAIGHT TO THE LABORATORY, IT'S NOT FILTERED.

SO, WITH THE -- THE ANALYSIS MIGHT BE BIASED HIGH A LITTLE BIT BECAUSE OF THE FINDS OR PARTICULATES IN THE SAMPLE. I CAN TELL YOU THIS THAT WE ALSO LOOK AT DISSOLVED METALS. AND WHEN WE LOOK AT DISSOLVED METALS THAT WATER SAMPLE IS PUT THROUGH A FILTER FIRST, AND ALL THE FINDS ARE TAKEN OUT OR ANY MATTER, YOU KNOW, IT COULD BE SOME BACTERIAL OR WHATEVER THAT COLLECTS IN THE WELL, THAT'S SCREENED AWAY AND THEN THAT SAMPLE IS SENT TO THE LABORATORY.

NOW, WHEN WE LOOK AT DISSOLVED WATER SAMPLES WE REALLY DON'T FIND A METALS PROBLEM. ANOTHER PLACE WHERE WE REALLY DON'T FIND A METALS PROBLEM IS IN DEEP GROUNDWATER AND WE BELIEVE THE REASON IS -- WE USE THE SAME SAMPLING TECHNIQUES, BUT IN THE DEEP GROUNDWATER THE WAY THE GEOLOGY IS YOU HAVE VERY TIGHTLY COMPACTED SILTS AND SAND. THEY'RE VERY TIGHT AS OPPOSED TO THE SHALLOW WHERE THEY'RE LOOSE. AND IN THE DEEP AQUIFER WE DON'T REALLY HAVE

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MUCH OF A METALS PROBLEMS. WE HAVE THE MANGANESE. WE HAVE FOUND
THIS MANGANESE IN SOME OF THE DEEP WELLS AND I BELIEVE OUT OF ALL
OF OUR DEEP WELLS, I THINK, WE HAD ONE HIT OF LEAD THAT WAS JUST
ABOVE THE DRINKING WATER STANDARDS AND IT -- THE DRINKING WATER
STANDARDS FOR LEAD -- IT'S 15.

MRS. WOOD: 15, YEAH.

MR. WATTRAS: WE FOUND ONE HIT OF LEAD AT 16
IN ONE DEEP WELL. SO, FOR THE MOST PART THE PATTERN THAT WE'RE
SEEING IS THE SHALLOW HAS CONSISTENTLY SHOWN US HIGH TOTAL METALS,
NOT JUST AT HADNOT POINT, EVEN IN SOME OF OUR BACKGROUND WELLS
THAT WE HAVE THROUGHOUT THE BASE, AND EVEN AT SOME OFF-BASE WELLS.
WE'VE LOOKED AT SOME STUDIES THAT WERE DONE -- I'M NOT SURE IF IT
WAS MENTIONED HERE LAST NIGHT ABOUT CAMP LEJEUNE ACQUIRING 40,000
ACRBS OF LAND.

MRS. WOOD: OH, YEAH. YEAH. RIGHT.

MR. WATTRAS: SO THERE'S BEEN A COUPLE OF
STUDIES DONE THERE WHERE THE SAME PATTERN HAS OCCURRED WHERE THE
SHALLOW AQUIFER EVERY TIME WE LOOK AT TOTAL METALS IT SHOWS US
SOME ELEVATED LEVELS WHICH WOULD BE ABOVE DRINKING WATER
STANDARDS.

MRS. WOOD: WELL, THEY HAVE NOT DONE A SOIL
STUDY ON THIS AREA THAT WOULD HAVE DEFINED WHAT TO EXPECT IN YOUR
TOTAL METALS. I MEAN, BEFORE YOU STARTED THIS PROGRAM THERE ISN'T
SOME --

MR. WATTRAS: WELL, WE LOOKED AT THE SOIL

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RESULTS. WE COMPARED THE SOIL RESULTS, IF I'M UNDERSTANDING YOUR

QUESTION -

MRS. WOOD: No, I'M JUST SAYING -

MR. PAUL: DIDN'T THE STATE STUDY THIS

AREA?

MRS. WOOD: -- JUST A GENERAL STUDY.

MR. WATTRAS: No, NOT BEFORE THIS. WE JUST

LOOKED AT THIS, WE DID A PRELIMINARY STUDY PROBABLY ABOUT TWO

MONTHS AGO AND BAKER LOOKED AT 21 SITES AT CAMP LEJEUNE AND THESE

WERE -- THE 21 SITES MAKE UP DIFFERENT INVESTIGATIONS THAT WE'RE

LOOKING AT, DIFFERENT PHASES AND SO FORTH. AND AT ALL 21 SITES WE

HAD HIGH TOTAL METALS AND WE HAD A NUMBER OF WHAT WE CALL

BACKGROUND WELLS. THESE ARE WELLS THAT ARE INSTALLED OFF-SITE,

UPGRADIENT, WITH RESPECT TO FLOW THAT WE WOULDN'T EXPECT THAT WELL

TO BB CONTAMINATED FROM THIS SITE. FOR EXAMPLE, IF THIS SITE IS

SITTING HERE AND THERE'S A HILL COMING UP THIS WAY, WE MIGHT PUT

A WELL UP HERE, WHICH WE HOPE IS GOING TO TELL US WHAT IS OUR

BACKGROUND CONCENTRATIONS.

WELL, I THINK WE LOOKED AT 14 BACKGROUND WELLS, AND I

BELIEVE -- I'M GOING TO SAY EITHER SIX OR NINE OF THE BACKGROUND

WELLS ALSO HAD THIS SAME TOTAL METALS PATTERN IN THE SHALLOW

AQUIFER.

SO, THE OTHER THING WE DID TOO TO LOOK AT THIS TOTAL

METALS PROBLEM IS WE LOOKED AT THE SOIL RESULTS TO SEE IF THERE

WAS A CORRELATION BETWEEN WHAT WE SEE IN THE SOIL AND HIGH LEVELS

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IN THE SHALLOW GROUNDWATER. AND WE LOOKED AT SOIL RESULTS FROM
I'LL SAY A CLEAN WELL, A WELL THAT SHOWED NO REAL ELEVATED LEVELS
OF METALS AND THE SOIL RESULTS WE LOOKED AT THAT, AND WE COMPARBD
THOSE SOIL RESULTS WITH SOIL RESULTS TAKEN FROM ANOTHER AREA THAT
EXHIBITED HIGH TOTAL METALS AND THERE WAS NO DIFFERENCE. SO, WE
SAID THERE'S NO SOURCE.

I MEAN, WHEN YOU HAVE A GROUNDWATER PROBLEM YOU HAVE TO
ASSOCIATE IT WITH A SOURCE. WE COULD NOT CORRELATE THESE TOTAL
METALS IN SHALLOW GROUNDWATER WITH A SOURCE IN SOIL. SO, WE
PRETTY MUCH PRELIMINARILY -- WE'VE ONLY CONDUCTED ON STUDY AND
THIS IS SOMETHING THAT WE'RE GOING TO LOOK AT ON AND ON BECAUSE
WE'RE FACING THIS PROBLEM WITH EVERY SITE OF TOTAL METALS. AND WE
HAVE TO -- OBVIOUSLY THE STATE OF NORTH CAROLINA AND EPA STANDARDS
ARE BASED ON TOTAL METALS AND THAT'S A PROBLEM BECAUSE WE'RE NOT
SURE WHETHER THESE TOTAL METALS ARE NECESSARILY RELATED TO
DISPOSAL ACTIVITIES OR WHETHER THEY'RE RELATED TO A COMBINATION OF
THE GEOLOGIC FRAMEWORK AND SAMPLING TECHNIQUES.

MRS. WOOD: NOW, AS A CORPORATION ARE YOU
RESPONSIBLE FOR MAKING -- I MEAN, YOU ALL ARE DOING THIS WORK AND
GETTING PAID FOR IT, BUT I THINK THE STATE WOULD HAVE TO COME IN
AND DO COMPLEMENTARY STUDIES. I DON'T SEE WHY YOU WOULD HAVE TO
BE RESPONSIBLE IF IT IS A GEOLOGICAL CONDITION OR A NATURAL
CONDITION TO FIND THAT.

MR. WATTRAS: WE ARE -- WE'RE --
MR. WATTERS: NOT -- NOT --

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MR. WATTRAS: SORRY GO AHEAD, PATRICK.

MR. WATTRAS: NOT NECESSARILY. THE STATE

WOULD'NT HAVE TO COME IN AND DEAL WITH THAT. IT'S JUST THAT IN

THIS PARTICULAR CASE THE STATE WILL TELL WHOEVER IS WORKING ON THE

PROBLEM TO SHOW US WHETHER OR NOT THIS IS REAL OR WHETHER OR NOT

THIS IS --

MRS. WOOD: SO, IN OTHER WORDS THEY'RE THE

ONES THAT COME IN --

MR. WATTERS: IT'S UP TO WHOEVER OWNS THE

PROPERTY.

MRS. WOOD: THEY HAVE TO REVEAL THOSE

STANDARDS. I MEAN, THEY COULD COME IN AND SAY THIS IS A NATURAL

CONDITION THAT THEY ARE FINDING AND YOU WOULD HAVE TO MAKE THAT

DETERMINATION. SO, IF THIS CAME UP SOMEWHERE DOWN THE LINE IF

THEY ARE FINDING, YOU KNOW, IT AS A NATURAL PHENOMENON.

MR. WATTERS: IF THERE'S SOMETHING TO PAY

WELL I GUESS IT GOES BACK TO THE GENERAL ASSEMBLY AND WE NEED TO

DEAL WITH THE STANDARD, BUT IN THE MEAN TIME WE HAVE TO DEAL WITH

THE INITIAL --

MRS. WOODS: COULDN'T YOU DO A WAIVER?

MR. WATTERS: WE COULD DO THE WAIVER SYSTEM

BUT --

COURT REPORTER: WAIT I CAN'T HEAR HER.

MR. WATTRAS: CAN YOU SPEAK UP?

MS. TOWNSEND: WE MET WITH THE GROUNDWATER

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SECTION UP IN WILMINGTON AND THIS ISSUE CAME UP AND RAY AND HIS GROUP HELPED PRESENT THE FACTS OF WHAT WE WERE FINDING AND THE CONCLUSION WAS LIKE IN THIS EVENT. AND WE'RE TRYING TO SEE WHAT'S ACTUALLY GOING ON, WHAT WE THINK IS GOING ON. YOU KNOW, WE PROVED IT ON PAPER, BUT WE NEED TO SEE WHAT'S ACTUALLY IN THE ACTUAL SAMPLE AND WE HAVEN'T DONE THAT IN THE PAST. THAT'S WHERE WE'RE HEADING.

MR. WATTRAS: ANOTHER THING THAT WE'RE DOING -- TOM BIXIE HERE WORKS FOR BAKER AND HE'S INVOLVED WITH A PROJECT FOR AN INDUSTRIAL CLIENT WHERE THEY HAD THE SAME SITUATION WHERE THEIR TOTAL METALS WERE VERY HIGH AND THEY WEREN'T REALLY CONVINCED THAT THESE METALS WERE DUE TO WHAT WAS DISPOSED OF AT THIS SITE HE WAS WORKING AT AND THERE'S NOW DIFFERENT SAMPLING TECHNIQUES THAT WE'RE GOING TO TRY IN THE FUTURE TO ELIMINATE THE SUSPENDED PARTICLES, YOU KNOW, TRY TO REDUCE THAT DOWN. SO, WE'RE GOING TO TRY THAT IN OUR NEXT INVESTIGATION, A LITTLE BIT DIFFERENT SAMPLING TECHNIQUES. SO, THERE'S SOME THINGS THAT WE'RE LOOKING AT BECAUSE, YOU KNOW, IT COULD BE PARTLY DUE TO THE SAMPLING TECHNIQUE.

MRS. WOOD: YEAH.
MR. WATTRAS: I MEAN, THERE'S NO DOUBT ABOUT IT.
MRS. WOOD: YEAH.
MR. WATTRAS: NOW, THE GEOLOGIC FRAMEWORK IS ONE THING, BUT WE'VE GOT TO TRY TO DEAL WITH THAT AND THAT'S WHAT July 27, 1994
WE'RE GOING TO TRY TO.
CORRECT ME IF I'M WRONG GINA, BUT I WAS TALKING TO N.U.S., YOU KNOW, AT THE MEETING THE OTHER DAY AND THEY'RE WORKING AT CHERRY POINT, WHICH IS ABOUT AN HOUR AWAY, AND THEY -- THEY'RE RUNNING INTO SIMILAR PROBLEMS ALSO AND IT'S BECAUSE OF THIS LOOSELY COMPACTED SANDS AND SILTS OF THE SHALLOW AQUIFER AND THEY'RE ALSO GOING TO BE TRYING THIS LOW FLOW TECHNIQUE - MRS. WOOD: TO SEE - MR. WATTRAS: -- TO SEE. MRS. WOOD: -- WHAT CHANGES.
MR. WATTRAS: NOW, THE INTERMEDIATE GROUNDWATER AND THE DEEP GROUNDWATER WERE ALSO STUDIED. WE SAW A DRASTIC CHANGE IN CONCENTRATION COMPARED TO THE SHALLOW, WHICH IS GOOD. THE INTERMEDIATE I'M TALKING ABOUT DEPTHS OF ABOUT 75 FEET; ROUGHLY 75 FEET. THE DEEP, I'M REFERRING TO DEPTHS OF ABOUT 150 TO 175.
NOW, THE SUPPLY WELLS IN THE HADNOT POINT AREA, AND THERE ARE QUITE A FEW. THERE ARE ABOUT -- AT LEAST SIX SUPPLY WELLS SURROUNDING THE HADNOT POINT AREA. THEY ARE SCREENED IN SEVERAL INTERVALS. THESE SUPPLY WELLS AND THEY'RE ALL -- THEY ARE SHUT DOWN. THEY'VE BEEN SHUT DOWN FOR A NUMBER OF YEARS, BUT THEY ARE SCREENED AT ABOUT 75 FEET AND THEN DOWN BLOW FURTHER AT ABOUT 150 UP TO 200 FEET AND THAT'S WHY THE INTERMEDIATE WELLS WERE INSTALLED, AND THESE WERE INSTALLED BY ANOTHER FIRM, BUT THEY INSTALLED THEM, I BELIEVE, TO MATCH THE SCREENING INTERVALS OF THE
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SUPPLY WELLS.

AGAIN, WHAT WE SAW WAS A DRASTIC CHANGE IN CONCENTRATION BETWEEN WHAT WE ARE SEEING IN THE SHALLOW AND THEN WHAT WE'RE SEEING IN THE INTERMEDIATE AND EVEN LOWER IN THE DEEP. AND IN THE DEEP I WOULD ALMOST SAY WE HAVE NOT MUCH OF A PROBLEM AT ALL.

THERE WAS JUST BENZENE AND, IN FACT, IT WAS AT A WELL NEAR HADNOT POINT FUEL FARM. THAT WAS AT ABOUT FIVE PARTS PER BILLION, WHICH IS JUST AT THE M.C.L., MAYBE FIVE, MAYBE SIX; IT WAS RIGHT AROUND THE M.C.L. EVERYTHING ELSE IN THE DEEP WAS PRETTY -- WHAT WE WOULD CALL CLEAN; MEANING, BELOW THE DRINKING WATER STANDARDS.

MRS. WOOD: NOW, THESE WERE THE FIGURES YOU GOT AND YOU'RE NOT RELYING ON THE ONES THAT WERE TAKEN FROM THE PREVIOUS STUDIES?

MR. WATTRAS: YEAH. OH, YEAH. WE'RE WERE-SAMPLED THESE WELLS. THESE WELLS HAVE BEEN SAMPLED SEVERAL TIMES. WE ARE SEEING SOME PATTERN OVER TIME THAT THE CONCENTRATIONS IN THE INTERMEDIATE AND DEEP HAVE BEEN DECREASING.

WE DID TAKE ON MORE SAMPLE -- OR ANOTHER ROUND OF SAMPLES LATE IN THE INVESTIGATION AND THEY SLIGHTLY INCREASED.

SO, OVERALL THERE HAS BEEN A TREND OF DECREASE IN CONCENTRATIONS WITH THE EXCEPTION OF THE LAST ROUND; THEY INCREASED SLIGHTLY.

NOT -- I MEAN, I'M NOT TALKING A MAJOR INCREASE, BUT I CAN'T SAY THAT EVERY SAMPLING ROUND THEY WENT DOWN, DOWN, DOWN, DOWN, IN CONCENTRATION, BUT THE LAST ONE WAS SLIGHTLY HIGHER THAN THE PREVIOUS ONE.

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WE'LL TALK A LITTLE BIT ABOUT THE SOIL. AS EXPECTED

WITHIN SITE 21 WE HAD SOME HIGH LEVEL OF PESTICIDES IN THAT

MIXING AREA AND ALSO IN THE PCB DISPOSAL PIT. WE FOUND PCB'S AT

4.6 PARTS PER MILLION. THAT IS A LITTLE BIT ELEVATED. I WOULD'NT

-- YOU HAVE A -- WHAT'S CALLED A TSICA WASTE WHEN YOU HIT 50 PARTS

PER MILLION AND THAT'S WHEN YOU REALLY HAVE A PROBLEM. SO, WE'RE

-- WE DO HAVE SOME ELEVATED LEVELS. THEY'RE AT FOUR ROUGHLY

FOUR AND A HALF PARTS PER MILLION AND THAT WAS THE MAXIMUM

CONCENTRATION. IN FACT, THAT WAS RIGHT FROM THE CENTER CORE OF

THE PIT.

AT SITE 24 WE HAD SOME METALS THAT WERE ABOVE WHAT WE

CALL BACKGROUND CONCENTRATIONS IN THE SOIL. AGAIN, AS WE

INVESTIGATE EACH SITE WE ALWAYS TAKE BACKGROUND SAMPLES OF EACH

SITE AND WE'VE BEEN -- WE HAVE A DATABASE THAT HAS BEEN

ACCUMULATING OVER TIME. THE METALS IN -- AT SITE 24 WERE SLIGHTLY

ABOVE THOSE BACKGROUND CONCENTRATIONS, BUT I WILL SAY WHEN WE

COMPARSED THE SOIL RESULTS AT SITE 24 WITH SITE 21 AND 78 THEY WERE

PRETTY COMPARABLE. AND SEE, AT SITE 24 THAT'S A FLY ASH DUMP, WE

THOUGHT WE WOULD SEE SOME ELEVATED LEVELS OF METALS.

SO, IN ONE SENSE, I'LL SAY THAT YES, THEY WERE ELEVATED

BECAUSE THEY WERE ABOVE BACKGROUND, BUT WHEN WE COMPARED THEM TO

SITES 21 AND 24 THEY WERE COMPARABLE. SO, WE DID'NT SEE MUCH OF

A PATTERN BETWEEN THE THREE SITES IS WHAT I WOULD SAY.

MRS. WOOD: YOU'VE GOT A PROBLEM GENERALLY.

MR. WATTRAS: WE DON'T BELIEVE IT WAS MUCH OF

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A PROBLEM THERE. WE HAD A PESTICIDE THAT WAS DETECTED IN ONE SOIL SAMPLE, THIS HEPTACHLOR EPOXIDE IT WAS AT A LOW CONCENTRATION DOWN AT SITE 24. IT WAS ALSO -- AND I'M KIND OF JUMPING AHEAD OF MYSELF, BUT THE REASON WE PUT IT UP ON THE SLIDE THAT PESTICIDE WAS ALSO FOUND IN GROUNDWATER IN THE SHALLOW AQUIFER AT SITE 24.

HERE'S A CASE WHERE, AGAIN, WE FOUND IT AT LOW LEVELS IN THE GROUNDWATER, BUT IN OUR SOIL WE RELLY DIDN'T SEE MUCH OF IT. WE CAN'T -- WE'RE REALLY NOT TOO CLEAR ON WHAT HAPPENED THERE. YOU KNOW, DID WE MISS THE SOURCE OR IS THE SOURCE DEPLETED FROM THE SOIL, OR -- I MEAN, ANOTHER POSSIBILITY WOULD BE THE SAME SITUATION WITH THE METALS, DID WE GET A GROUNDWATER SAMPLE THAT HAD SOME FINDS IN IT OF SOME PESTICIDES THAT WAS REALLY MORE OR LESS RELATED TO THE SEDIMENT AS OPPOSED TO BEING IN GROUNDWATER.

BECAUSE ON THING ABOUT PESTICIDES THEY'RE NOT -- NUMBER ONE, THEY'RE NOT THAT MOBILE IN THE ENVIRONMENT. THEY DON'T MIGRATE LIKE A SOLVENT WILL. IF YOU HAVE A GASOLINE SPILL OR A SOLVENT SPILL AND IT WOULD RAIN OVER TIME THAT WOULD PRETTY MUCH GO TO THE GROUNDWATER PRETTY QUICK. PESTICIDES STAY WITH THE SOILS. THEY DON'T MIGRATE THAT READILY. SO, WE WERE A LITTLE BIT SURPRISED TO SEE IT IN THE GROUNDWATER ESPECIALLY WHEN WE SAW THAT OUR HIGHEST LEVEL IN SOIL WAS VERY, VERY LOW. THAT'S FIVE PARTS PER BILLION. THAT'S EXTREMELY LOW TO SEE IT -- THINKING THAT IT MIGHT BE PART OF THE GROUNDWATER PROBLEM.

SO, I'M GOING TO JUMP AHEAD OF MYSELF A LITTLE BIT RIGHT HERE. WE ARE GOING TO MONITOR THAT. WE'RE GOING TO LOOK AT THOSE

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WELLS SOME MORE TO TRY TO FIGURE OUT, IS THERE REALLY A
GROUNDWATER PROBLEM ASSOCIATED WITH PESTICIDES. AGAIN, IT WAS AT
VERY LOW LEVELS OR WAS THAT A SAMPLE THAT MIGHT HAVE BEEN BIASED
HIGH DUE TO SOME PARTICULATES THAT MAY HAVE ACCUMULATED IN THE
SAMPLE ITSELF.

SITE 78 -- AT SITE 78 WE FOUND SOME HIGH LEVELS OF
PESTICIDES AROUND BUILDING 1502 AND THE HISTORY OF THAT BUILDING
AS FAR AS WE KNOW AND WHAT WE CAN TELL WAS NEVER USED FOR
PESTICIDE MIXING AND HANDLING. SO, ALTHOUGH THE HISTORY DOESN'T
TELL US ANYTHING WE DO KNOW WE HAVE SOME HIGH LEVELS OF PESTICIDES
THAT WILL BE TAKEN CARE OF.

NOW, VOC'S THESE ARE THE VOLATILES, WE DID FIND THEM AT
SEVERAL BUILDING AREAS AND WE ALSO FOUND PAH'S, WHICH ARE ANOTHER
GROUP OF CONTAMINANTS, MAINLY IN THE 900 BUILDING AREA AS I
MENTIONED. THEY WERE AT LOW LEVELS THOUGH. SO, WE SHOULD OF
MAYBE ADDED THAT TO THE SLIDE, THAT THEY WERE DETECTED, BUT AT
PRETTY LOW LEVELS. NOTHING WHERE WE WOULD SAY THERE IS A
CONTINUING SOURCE OF A GROUNDWATER PROBLEM. I MEAN, WE'RE TALKING
IN THE PARTS PER BILLION RANGE.

COLONEL WOOD: WHAT SIDE OF THE MAIN ROAD IS
1502 ON AS YOU GO IN?

MR. WATTRAS: PARDON ME?

COLONEL WOOD: WHAT SIDE OF THE ROAD IS IT ON?

THE RIGHT SIDE OR THE LEFT SIDE?

MR. WATTRAS: OF BUILDING --
COLONEL WOOD: IN THE INDUSTRIAL AREA?

MR. WATTRAS: I DON'T RECALL.

MR. HAVEN: IT'S IN THE INDUSTRIAL AREA.

COLONEL WOOD: IT'S IN THE INDUSTRIAL AREA?

MR. HAVEN: YES, SIR. YES, SIR. IT WOULD

BE MORE IN THE SOUTHWESTERLY END.

MS. BERRY: IT'S RIGHT HERE. YOU CAN SEE

IT HERE.

COLONEL WOOD: I'M SORRY, I THOUGHT IT WAS --

MIGHT BE ASSOCIATED WITH THE WASH TOWER AND THE HARDSTAND WHERE

THEY USED TO WASH DOWN VEHICLES AND THINGS LIKE THAT. AND --

MR. HAVEN: NO, SIR; IT'S --

MS. BERRY: IT'S RIGHT OFF GIBB STREET,

RIGHT HERE.

COLONEL WOOD: I'M WITH YOU. OKAY, THANK YOU.

THANK YOU. I'M SORRY.

MR. WATTRAS: FROM A STANDPOINT OF HUMAN

HEALTH RISK WE COLLECT ALL THIS INFORMATION. LOOKING AT THE

ACTIVITIES AT HADNOT POINT WE LOOK AT, YOU KNOW, THE PEOPLE

WORKING THERE AND HOW THEY WOULD BE EXPOSED TO THIS. THE RISK

ASSESSMENT RESULTS SHOWED THAT THERE IS -- THAT THE NUMBERS -- THE

INCREMENTAL CANCER RISKS OR THE CHANCE OF ACQUIRING CANCER DUE TO

EXPOSURE ARE WITHIN ACCEPTABLE RANGE AS DEFINED BY EPA. CAN I SAY

THAT?

MS. TOWNSEND: (NODS HEAD.)

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MR. WATTRAS: OKAY. WHICH IS THE RANGE OF

ONE IN 10,000 TO ONE IN ONE MILLION. WE ALSO LOOK AT OTHER THINGS

SUCH AS WHAT'S CALLED THE HAZARD INDEX, AND THAT'S AN INDEX OF

ONE. THAT HAZARD INDEX TAKES INTO ACCOUNT THINGS LIKE LIVER

DAMAGE, THINGS THAT ARE OBVIOUSLY NOT CANCER RELATED, BUT IMPACTS

THE BODY; SUCH AS THE KIDNEY OR THE LIVER OR OTHER THINGS. AND IT

WAS ACCEPTABLE FOR SOIL, BUT NOT FOR GROUNDWATER WHICH EXPECTED

AT THOSE HIGH LEVELS SOMEBODY -- YOU KNOW, WE DON'T WANT SOMEBODY

DRINKING THAT SHALLOW AQUIFER. THAT WOULD GIVE THEM AN

UNACCEPTABLE RISK.

NOW, YOU HAVE TO REMEMBER TOO ABOUT THE GROUNDWATER WHEN

WE DO A RISK ASSESSMENT CURRENTLY THERE'S REALLY NO EXPOSURE.

PEOPLE OBTAIN THEIR WATER FROM SUPPLY WELLS -- FROM CLEAN SUPPLY

WELLS. SO, UNDER CURRENT SITUATIONS THERE'S NO RISK TO HUMAN

HEALTH WITH THE GROUNDWATER.

NOW, IF HAD NOT POINT OR CAMP LEJEUNE WOULD SHUT DOWN ONE

DAY AND SOMEONE DECIDED TO TURN IT INTO A COMPLEX AND THEY

INSTALLED THEIR WELLS IN THE SHALLOW AQUIFER THEY WOULD HAVE AN

UNACCEPTABLE RISK.

SO, WHEN WE DO A RISK ASSESSMENT YOU LOOK AT THE CURRENT

SITUATION AND YOU ALWAYS HAVE TO PROJECT OUT, AND WE CALL THAT THE

FUTURE POTENTIAL RISK. IT'S A CONSERVATIVE WAY OF LOOKING AT

THINGS, BUT YOU KNOW, THINGS OVER TIME CHANGE. IT COULD BE

REALISTIC IN A LOT OF CASES. AND AT CAMP LEJEUNE WE THINK RIGHT

NOW THAT WOULD BE PRETTY UNREALISTIC.

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I'LL HAVE TOM BIXIE TALK A LITTLE BIT ABOUT ECOCLOGICAL
RISKS BECAUSE THAT'S THE OTHER PART OF THE RISK ASSESSMENT WHICH
PLAYS A GREAT IMPORTANCE IS LOOKING AT, YOU KNOW, DO THESE
CONTAMINANTS IMPACT THE TERRESTRIAL HABITAT OR THE AQUATIC
HABITAT.

MR. BIXIE: AT THE SITE WE DID LOOK AT WHAT
WOUlD BE THE IMPACTS FROM -- FROM THE SITE AND THE CONTAMINANTS ON
BOTH THE AQUATIC, ENVIRONMENT AND THE TERRESTRIAL. WE TOOK SOME
SURFACE WATER AND SEDIMENT SAMPLES AND COMPARED THESE TO STANDARDS
THAT HAVE ESTABLISHED FOR SCREENING VALUES TO SEE IF -- IF THERE
WERE ANY EXCEEDANTS OF THESE VALUES, AND NOT ONLY IF THERE WERE
ANY EXCEEDANTS; WHERE WERE THEY, WERE THEY UP STREAM OR WERE THEY
DOWN STREAM, WAS THERE ANY PATTERN TO THEM.

IN TERMS OF THE SURFACE SOILS WHAT WE HAVE BEEN DOING IS
GOING THROUGH A SCENARIO WHERE WE MODEL THE UPTAKE OF THE
CONTAMINANTS ENTERING PLANTS THAT SOME TYPE OF TERRESTRIAL
WILDLIFE WOULD BE FOR EXAMPLE, A RABBIT; WE USED A RABBIT, AND WE
USED A BIRD AND WE USED A DEER.

SO, WE GO THROUGH A SCENARIO JUST AS YOU GO THROUGH THE
HUMAN HEALTH SCENARIO AS A SMALL CHILD USES DRINKING WATER. WE GO
THROUGH AND WE HAVE THE DEER EATING SOME SOIL WHILE HE'S GRAZING
ON THE PLANTS; HE'S EATING THE PLANTS AND DRINKING THE WATER FROM
THE AREA'S. SO, WE GO THROUGH THOSE TYPES OF SCENARIOS. IN LOOKING
AT THIS PARTICULAR SITE IT LOOKS LIKE THE PESTICIDES SEEM TO
REPRESENT THE MOST POTENTIAL FOR ANY TYPE OF ADVERSE IMPACT TO THE
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ECOLOGICAL ENVIRONMENT. AND --

MRS. WOOD: OKAY, NOW, I'M THINKING GREAT VAST AREAS OF CEMENT THAT YOU HAVE AROUND BURGER KING. YOU'VE GOT THAT FIELD UP THERE AND YOU'RE GOT THE STEAM PLANT. WHERE IS THIS WATER GOING TO BE?

MR. BIXIE: IT'S -- IT'S IN THE TWO CREEKS THAT ARE LOCATED ON EITHER SIDE.

MRS. WOOD: I'M TRYING TO VIEW THIS. MR. BIXIE: IT'S COGDELS CREEK AND BEAVER DAM.

MR. WATTRAS: YES, BEAVER DAM AND COGDELS CREEK.

MR. BIXIE: BEAVER DAM IS SOUTEAST -- MR. WATTRAS: TO THE WEST OF HOLCOMB BOULEVARD. COGDELS CREEK IS TO THE EAST OF THE HADNOT POINT INDUSTRIAL AREA. MAYBE BRING THAT -- MRS. WOOD: NO, I'LL GET OVER THERE. THAT'S FINE.

(MR. WATTRAS AND MR. BIXIE SHOW MRS. WOOD A MAP OF THE LOCATION IN QUESTION.)

(PAUSE.)

MR. BIXIE: LOOKING AT THE IMPACTS OF TERRESTRIAL WILDLIFE IS NOT AS ADVANCE AS IT IS -- AS WHAT WE'RE LOOKING AT WITH IMPACTS TO FISH AND THINGS THAT LIVE IN THE WATER JUST BECAUSE WATER IMPACTS HAVE BEEN A LOT MORE WELL STUDIED OVER}

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THE YEARS.

WE'VE DEVELOPED THIS MODEL THAT LOOKS AT WHAT TYPE OF DOSAGE THIS PARTICULAR WILDLIFE COULD GET. JUST AS YOU COMPARE FOR HUMANS WHAT THE ALLOWABLE INTAKE EPA HAS ESTABLISHED FOR LEAD AND MERCURY OR WHATEVER THERE'S ALSO LEVELS THAT EPA HAS ESTABLISHED IN THE LITERATURE FOR DEER AND FOR RABBIT THAT MAY BE EXPOSED TO ZINC OR -- SO WE GO THROUGH THAT TYPE OF ANALYSIS AND BASED ON THAT WE CAME UP WITH PESTICIDES ARE -- SEEM LIKE THEY HAVE THE MOST IMPACT.

MRS. WOOD: THAT'S INTERESTING. THANK YOU.

MR. WATTRAS: ONCE ALL THESE THINGS ARE TAKEN INTO ACCOUNT AND WE KNOW WHAT THE POTENTIAL RISKS ARE TO BOTH HUMANS AND WILDLIFE WE WILL LOOK AT WHAT ARE THE PROBLEMS OUT THERE THAT ARE CAUSING A HIGH RISK SUCH AS THE GROUNDWATER, SUCH AS PESTICIDES OF THE SOIL OR WHATEVER. AND WE LOOK AT WHAT ARE THE BEST CLEANUP METHODS OR ALTERNATIVES IN DEALING WITH THESE PROBLEMS.

FOR THE GROUNDWATER, THERE ARE TWO PRIMARY PLUMES WHICH WE'RE LOOKING AT. AND FOR SOIL THERE ARE FOUR AREAS OF CONCERN. THREE OF THE AREAS OF CONCERN ARE WITHIN SITE 21 AND THE FOURTH ONE IS AT THIS BUILDING 1502.

I CAN TELL YOU -- NOW, THOSE AREAS OF CONCERN ARE MEASURED THERE IN SQUARE FEET. IT WOULD HAVE BEEN MAYBE A LITTLE BIT BETTER TO SHOW IT IN CUBIC YARDS. IT'S A LOT EASIER, I THINK, TO PICTURE THINGS IN CUBIC YARDS THAN SQUARE FEET, BUT I'LL TELL

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YOU THAT THE PESTICIDES AND PCB'S ARE PRIMARILY UP IN THE TOP TWO
FEET OF SOIL. BELOW THAT OUR SOIL SMAPLES REALLY DIDN'T FIND ANY
SIGNIFICANT CONTAMINATION.

SO, DURING REMEDIATION IT WOULD PRETTY MUCH INVOLVE
TAKING OUT ABOUT TWO FEET OF SOIL OVER THAT AREA. THEY ARE SMALL
AREAS. NONE OF THESE AREAS ARE WHAT IF WOULD CALL A HUGE AREA OF
CONTAMINATION. THEY'RE PRETTY -- YOU KNOW, YOU'RE TALKING ABOUT
800 SQUARE FEET, THAT'S NOT VERY BIG. SAME THING WHERE THE
HIGHEST ONE IS AT SITE 21 ABOUT 8,100 SQUARE FEET. THAT'S NOT
THAT LARGE OF AN AREA.

THE GROUNDWATER ALTERNATIVES THAT WE LOOKED AT WOULD BE
THE NO ACTION ALTERNATIVE, WHICH EVERYBODY KNOWS WE LOOK AT.
INSTITUTIONAL CONTROLS WHICH WOULD BE SHUTTING WELLS DOWN, NOT
ALLOWING NEW WELLS TO BE PUT IN. THE THIRD ALTERNATIVE IS
REFERRED TO AS SOURCE CONTROL. AS I MENTIONED BEFORE THE ACTION
THAT'S GOING ON RIGHT NOW IS CONTAINMENT ALTERNATIVE. WE'RE
CONTAINING MIGRATION.

ALTERNATIVE THREE FOCUSES ON GOING TO THE HOT SPOT AND
DEALING WITH THAT HOT SPOT; PUMPING FROM THAT AREA. AND IN
ALTERNATIVE THREE IT WOULD SIMPLY BE ADDING ADDITIONAL WELLS IN
THE HOTTEST, THE MOST CONTAMINATED PORTION OF THAT PLUME, TYING IT
INTO THE EXISTING TREATMENT SYSTEM THAT IS BEING CONTRUCTED.
A FOURTH ALTERNATIVE WOULD ALSO BE SORCE CONTROL, BUT IT WOULD USE
A DIFFERNT TECHNIQUE OF AIR SPARGING.

AIR SPARGING IS SIMPLY PULLING AIR -- PULLING AIR OUT OF

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THE GROUND. BY DOING THIS IT'S ALMOST LIKE A VACUUM WHERE YOU'RE
PULLING THE VOLATILES, AND VOLATILES READILY MOVE AND IT WOULD GO
THROUGH AN AIR PATHWAY AND IT WOULD BE COLLECTED. THE AIR WOULD
BE -- EMISSIONS WOULD BE COLLECTED.

IN THAT ALTERNATIVE THE ADVANTAGES -- YOU DON'T REALLY
TREAT ANY -- YOU DON'T HAVE TO PULL ANY AGROUND WATER OUT. YOU DO
EVERYTHING -- WHAT WOULD BE IN SITU. YOU'RE NOT PULLING OUT
ANYTHING. EVERYTHING STAYS THE SAME, IT'S JUST THAT YOU'RE
SUCKING AIR OUT AND THE VOLATILES WOULD FOLLOW THAT AIR PATHWAY.

THE FIFTH ALTERNATIVE ADDRESSES THE DEEPER GROUNDWATER.

THE FIRST FOUR -- OF COURSE, ONE AND TWO DON'T DO ANYTHING WITH
THE GROUNDWATER, BUT THE THIRD AND FOURTH ALTERNATIVE FOCUSES JUST
ON THE SHALLOW GROUNDWATER.

THE FIFTH ONE CONSIDERS WHAT WOULD HAPPEN IF -- OR WHAT
WOULD BE THE COST AND OUTCOME IF WE PUT IN SOME DEEP EXTRACTION
WELLS AND WENT AFTER THE CONTAMINATION IN THE INTERMEDIATE AQUIFER
AND IN THE DEEP AQUIFER.

LET ME MOVE AHEAD A LITTLE BIT HERE AND I'LL GO BACK TO
THAT. LET'S LOOK AT THE COST OF THESE ALTERNATIVES TOO. THE
COST OF --

COLONEL WOOD: COULD YOU FOCUS THAT JUST A
LITTLE BIT?

MR. WATTRAS: I'LL TELL YOU THE COST. I'M
SORRY IF YOU CON'T TELL WHAT THEY ARE. THEY ARE A LITTLE BIT HARD
TO SEE.

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THE ALTERNATIVES FOR GROUNDWATER RANGE ANYWHERE FROM
ZERO, IF WE DID NOTHING ELSE OUT THERE, UP TO 690,000 AND THAT WAS
FOR THE AIR SPARGING.

INSTITUTIONAL CONTROLS AND DID MORE MONITORING IT WOULD COST
ROUGHLY $260,000.

THE THIRD ALTERNATIVE IS TO ADDRESS THE SHALLOW
GROUNDWATER IN THE MOST CONTAMINATED AREA TIE THAT INTO THE
EXISTING TREATMENT SYSTEM AND IT'S AT $460,00. THE OTHER
TREATMENT ALTERNATIVE INVOLVING SOME REMEDIATION OF THE
INTERMEDIATE AND DEEP AQUIFER IS $615,000.

I'LL TALK ABOUT SOIL LATER. I FIGURE IT'S BEST MAYBE TO
GO THROUGH THE GROUNDWATER THEN WE'LL MOVE BACK AND TALK ABOUT
SOIL.

THE ALTERNATIVE THAT THE DEPARTMENT OF NAVY AND MARINE
CORPS IS PROPOSING WOULD BE ALTERNATIVE THREE, AND THAT'S JUST TO
ADDRESS MORE CLEANUP OF THE SHALLOW GROUNDWATER IN THE HOTTEST
AREA OF CONTAMINATION. AGAIN, THAT'S WHERE WE WOULD JUST ADD ON
TO THE EXISTING TREATMENT SYSTEM. THE REASON ALTERNATIVE SIX WAS
NOT SELECTED WAS BECAUSE WHAT WE'RE AFRAID OF IS INSTALLING SOME
EXTRACTION WELLS IN THE INTERMEDIATE PORTION OF THE AQUIFER AS
WELL AS THE DEEP PORTION COULD POTENTIALLY MAKE THINGS WORSE.

MRS. WOOD: I WAS WONDERING ABOUT THAT. IF
IT WOULDN'T CREATE A PULL.

MR. WATTRAS: WE'RE WORRIED ABOUT THAT

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BECAUSE THERE IS NO CONFINING LAYER. YOU KNOW LAST NI

TALKED ABOUT A SEMI-CONFINING LAYER OUT AT SITE 35. AT

POINT THE GEOLOGY IS TOTALLY DIFFERENT. IT'S ON THE OTHER

THE NEW RIVER. THERE IS NO CONFINING LAYER AT HADNOT POINT

ABOUT 220 FEET.

WHAT WOULD PROBABLY -- WHAT COULD POSSIBLY HAPPEN

BE IF WE WOULD ADDRESS THE INTERMEDIATE AND DEEP IS YOU

START PUMPING OVER TIME AND YOU COULD ACTUALLY DRAW CONTAMINATED

DOWNWARD.

GIVEN THAT THE CONTAMINATION LEVELS IN THE INTERMEDIATE

AND DEEP ARE PRETTY LOW TO BEGIN WITH WE FELT THAT WOULD NO

THAT WE'D ACTUALLY END UP WITH A WORSE RESULT. SO, THAT

THAT ALTERNATIVE WASN'T SELECTED. IT'S NOT, YOU KNOW,

THEY DON'T FEEL LIKE CLEANING UP THE DEEP AQUIFER. WE FE

BEST TO JUST ADDRESS THE SHALLOW, WHICH IS THE HOT SPOT AND

THE SOURCE OF THE DEEP. I MEAN, THE SHALLOW IS THE SO

OBVIOUSLY THE DEEP. WE FEEL LET'S CLEAN THAT UP SEE WHAT

TO THE LEVELS DOWN BELOW. WHILE WE'RE CLEANING UP THAT

AQUIFER OVER TIME AND AT CERTAIN INTERVALS, USUALLY IT'S QU

AND THEN SOMETIMES THEY'LL BACK IT OFF TO MAYBE TWICE A

WILL TAKE SAMPLES FROM OUR MONITORING WELLS TO SEE HOW E

THE SOLUTION IS. WE WILL ALSO TAKE SAMPLE FROM THE D

WANT TO SEE IF OVER TIME THE DEEP AQUIFER IS SLOWLY DECRE

CONCENTRATION AS WELL AS THE INTERMEDIATE. WE THINK T

HAPPEN OVER TIME IF WE ADDRESS THE SOURCE AREA.

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MRS. WOOD: WHERE WOULD THAT WATER IN THE DEEP BE MIGRATING TO?

MR. WATTRAS: IN THE DEEP?

MRS. WOOD: YEAH.

MR. WATTRAS: IT’S HEADING TOWARDS THE NEW RIVER. THE DEEP AQUIFER --

MRS. WOOD: WELL, AT THAT RATE WOULD IT INTERSECT -- ACTUALLY INTERSECT OR IS IT GOING RIGHT OUT INTO THE OCEAN?

MR. WATTRAS: SOME OF IT -- YOU KNOW, AGAIN, THIS CASTLE HAYNE AQUIFER GOES DOWN TO 220 FFET. YOU KNOW, AT A HUNDRED FEET SOME OF THAT GROUNDWATER AS IT HEADS TOWARDS THE NEW RIVER IS GOING TO START GOING UPWARDS TOWARDS THE RIVER. THE WATER AT 220 FEET IS PROBABLY GOING TO GO RIGHT UNDERNEATH THE NEW RIVER.

BY THE WAY, WE HAVE SAMPLED THE NEW RIVER JUST TO SEE IF THERE IS ANY IMPACT. THERE WAS NO VOLATILE CONTAMINATION OF THAT SURFACE WATER. CHANCES ARE AT LEVELS -- AND I MENTIONED BEFORE WE HAD A LITTLE BIT OF BENZENE IN THE DEEP AQUIFER AT ABOUT FIVE PARTS PER BILLION. MY BEST JUDGEMENT WOULD BE THAT ONCE THAT WOULD REACH THE NEW RIVER AND ENTER THE NEW RIVER YOU WOULD NOT EVEN BE ABLE TO MEASURE IT BECAUSE OF DELUSIONAL EFFECTS. THAT WOULD BE -- YOU’D HAVE TO HAVE A PRETTY GOOD SLUG OF GROUNDWATER FOR IT TO ACTUALLY SHOW UP IN THE NEW RIVER; YOU WOULD HAVE A PRETTY GOOD PROBLEM.

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COLONEL WOOD: IN YOUR TESTING OF THE NEW RIVER DID YOU FIND ANY METALS THERE?

MR. WATTRAS: WE DO FIND METALS.

COLONEL WOOD: DID YOU FIND MERCURY?

MR. WATTRAS: OH, MERCURY? I DON'T ACTUALLY RECALL. CAN YOU -- I DON'T -- IT DOESN'T RING A BELL.

MR. BIXIE: IT WASN'T ANYTHING THAT WAS ABOVE ANY STANDARDS. I MEAN, YOU ALWAYS FIND VERY, VERY LOW LEVELS OF METALS, BUT NOTHING THAT WAS ABOVE STANDARD.

MR. PAUL: DO YOU ASK THAT FOR ANY SPECIFIC REASON?

COLONEL WOOD: WHAT IT DOES TO THE FISH.

MR. PAUL: WHAT'S THAT?

COLONEL WOOD: WHAT DOES IT DO TO THE FISH.

MR. PAUL: BUT NO KNOWN PRACTICE THAT YOU KNOW ABOUT?

COLONEL WOOD: NO, NO, NO, NO.

MR. PAUL: THAT WAS THE SITE OF THE AIR STATION THAT WE EXPECTED TO FIND MERCURY, BUT WE DIDN'T FIND IT.

MR. WATTRAS: YEAH, SAMPLED -- DID YOU ASK ABOUT THE FISH?

COLONEL WOOD: YEAH.

MR. WATTRAS: OKAY. I'M SORRY, I COULDN'T HEAR YOU. YEAH, WE DID --

MR. PAUL: NO, HE JUST SAID WHAT IT DOES.

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TO THE FISH.

MR. WATTRAS: OH.

MR. PAUL: WHAT IT DOES TO THE FISH.

MR. WATTRAS: OH, I SEE.

MR. PAUL: I DIDN'T KNOW IF THERE WAS SOME HISTORY THERE THAT HE COULD SHED SOME LIGHT ON?

COLONEL WOOD: NO, NOT AT ALL.

MR. WATTRAS: SO, THAT'S THE PROPOSED ALTERNATIVE TO GROUNDWATER. TO SIMPLY -- WE ARE CONTAINING IT AT PRESENT. NOW, WE'RE GOING TO GO OUT TO THE HOT SPOT AND TIE IN WITH THE EXISTING SYSTEM.

I'M GOING TO BACK UP AND GO OVER THE SOIL ALTERNATIVES. WE CAME UP WITH FOUR ALTERNATIVES. OBVIOUSLY, THE NO ACTION ALTERNATIVE IS ALWAYS CONSIDERED. THE SECOND ALTERNATIVE WOULD BE TO LEAVE THE SOIL IN PLACE AND POSSIBLY CAP IT. YOU CAN CAP IT WITH ASPHALT. YOU CAN CAP IT WITH CLAY. YOU CAN CAP IT WITH SOIL, PUT TWO FEET OF SOIL ON IT AND PLANT GRASS. THAT WOULD BE CONSIDERED CAPPING.

THE THIRD ALTERNATIVE IS ON-SITE TREATMENT. THAT WOULD BE EXCAVATION OF THE SOIL, POSSIBLY BRINGING ON -- YOU CAN BRING ON AN INCINERATOR OR ANOTHER TYPE OF TREATMENT TECHNIQUE THAT WOULD BE APPLICABLE TO PESTICIDES AND PCB'S.

THE FOURTH ALTERNATIVE WOULD BE JUST TO EXCAVATE IT AND TO TAKE IT OFF-SITE TO A PERMITTED FACILITY FOR DISPOSAL.

I'LL GO OVER THE COSTS AGAIN; YOU PROBABLY CAN'T SEE July 27, 1994
THEM VERY WELL. THE COSTS RANGE ANYWHERE, OBVIOUSLY, FROM ZERO ALL THE WAY UP TO 1.4 MILLION.

1.4 MILLION WOULD BE THE COST OF BRINGING AN ON-SITE INCINERATOR ACTUALLY TO THE BASE. THE REASON IT'S SO HIGH -- I MENTIONED BEFORE ABOUT THE QUANTITIES OF SOIL. WE DON'T REALLY HAVE A -- YOU KNOW, THESE ARE SMALL AREAS. AND HERE'S WHERE YOU RUN INTO THE COST OF, BECAUSE YOU'RE DEALING WITH SUCH A SMALL AMOUNT OF SOIL, IT REALLY DOES NOT MAKE COST-EFFECTIVE TO BRING A TREATMENT SYSTEM ON-SITE, LBECause OF ALL THE CAPITAL COSTS ASSOCIATED WITH JUST A SMALL AMOUNT OF SOIL. TAHT'S WHY THE COST IS SO HIGH; IT'S REALLY NOT THAT COST-EFFECTIVE TO DO ON-SITE TREATMENT FOR SUCH A SMALL COST OF SOIL.

NOW, MAYBE IF YOU HAD A PROBLEM WHERE YOU HAD A VERY LARGE AREA OF SOIL CONTAMINATION, THAT MIGHT BE FEASIBLE, INSTEAD OF EXCAVATING AND TRUCKING EVERYTHING OFF-SITE FOR TREATMENT OR FOR OFF-SITE DISPOSAL, THAT MIGHT BE A CASE WHERE IT'S MORE FEASIBLE TO SAY LET'S BRING THE TREATMENT SYSTEM ON-SITE, BECAUSE WE HAVE PLENTY OF SOIL AND IT'S GOING TO BE COST-EFFECTIVE.

SO, THERE'S A LITTLE BIT OF -- THE LESS CONTAMINATION YOU HAVE, IT SEEMS LIKE THE MORE EXPENSIVE IT IS TO BRING THE TREATMENT ON-SITE. THAT MIGHT NOT -- NOW, FOR PETROLEUM -- AGAIN, WE'RE TALKING PESTICIDES AND PCB'S. LAST NIGHT WE TALKED ABOUT THE PETROLEUM PRODUCT. THAT'S A LITTLE BIT DIFFERENT. IT'S A LOT EASIER TO TREAT, TOO.

PESTICIDES AND PCB'S THERE AREN'T THAT MANY TREATMENT
TECHNOLOGIES IN DEALING WITH THEM. YOU'RE ALMOST LIMITED TO --

INCINERATION IS PROBABLY THE MOST NOTED AND THE LEAST AMOUNT OF
RISK WE KNOW THAT IT'S GOING TO GET RID OF IT. THERE ARE SOME
OTHER TECHNOLOGIES THAT ARE WHAT THEY CALL INNOVATIVE, AND THEY
HAVE MORE RISKS. YOU WON'T BE -- THERE IS --

MRS. WOOD: DEFINE "INNOVATIVE"?

MR. WATTRAS: FOR EXAMPLE --

MRS. WOOD: DEFINE IT.

MR. BIXIE: SOIL WASHING.

MR. WATTRAS: SOIL WASHING. THEY CAN ADD

SOME -- I WANT TO -- ACTUALLY LIKE A SOLVENT TO THE SOIL TO

EXTRACT THE PCB'S OR PESTICIDES. THEN, ALL THOSE PCB'S AND

PESTICIDES ARE --

MRS. WOOD: YOU STILL HAVE THEM.

MR. WATTRAS: -- IN THE SOLVENT, AND THEN

THEM WOULD JUST GET RID OF THE SOLVENT, AND THE SOIL WOULD BE USED

AS BACK FILL.

SO, THE COST RANGE, AGAIN, THIS IS -- THAT ONE ON-SITE

TREATMENT -- THIS IS A TYPOGRAPHICAL ERROR. THE COSTS RANGE FROM

$650,000 TO 1.4 MILLION.

FOR THE OFF-SITE DISPOSAL, THE COSTS WOULD RANGE FROM

$480,000 UP TO 1.3 MILLION. THE REASON IS $480,000 REPRESENTS

TAKING IT OFF-SITE AND TAKING IT TO A PERMITTED LANDFILL. THE 1.3

MILLION DOLLAR RANGE REPRESENTS TAKING IT OFF-SITE, TREATING

VIA INCINERATION.

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NOW, THE SOIL -- THERE'S OUR TREATMENT SYSTEM, BY THE WAY. WE CAN TALK ABOUT THAT LATER ON.

THE PROPOSED ALTERNATIVE FOR SOIL IS TO CHOOSE ALTERNATIVE FOUR AND SIMPLY EXCAVATE THE SOIL AND TAKE IT TO AN OFF-SITE LANDFILL. IN THIS CASE -- IT HAS A LOT TO DO WITH THE QUANTITY OF SOIL. WE'RE NOT TALKING HIGH QUANTITIES OF SOIL. IN THIS CASE, IT'S MOST FEASIBLE TO JUST TAKE IT TO AN OFF-SITE LANDFILL. THE PESTICIDE AND PCB CONTAMINATED SOIL IS NOT CONSIDERED A HAZARDOUS WASTE. IT'S CONSIDERED -- IT HAS HAZARDOUS SUBSTANCES IN IT, BUT IT DOES NOT FALL UNDER THE CATEGORY OF HAZARDOUS WASTE.

ONCE A SOIL OR A LIQUID FALLS UNDER THE CATEGORY OF A HAZARDOUS WASTE, IT HAS TO GO TO A VERY SPECIAL TYPE OF LANDFILL, AND THAT DOES RUN INTO A LOT OF MONEY. IN THIS CASE, BECAUSE IT'S NOT HAZARDOUS, IT COULD BE TAKEN TO A PERMITTED, WHAT THEY CALL A TITLE C LANDFILL, IF I'M NOT MISTAKEN. BUT IT COULD BE TAKEN TO A LANDFILL THAT DOES NOT -- IT HAS A LOT OF PRECAUTIONS, YOU KNOW, IT'S NOT JUST A DUMP.

MS. WOOD: IT'S LINED.

MR. WATTRAS: BUT IT'S DIFFERENT THAN A HAZARDOUS WASTE LANDFILL AND IT BECOMES MORE COST-EFFECTIVE JUST TO TAKE THIS PESTICIDE AND PCB SOIL TO AN OFF-SITE LANDFILL. THAT'S THE CONCLUSION OF THE HADNOT POINT PROPOSED ALTERNATIVES. WE'RE GOING TO TALK ABOUT ANOTHER OPERABLE UNIT. BUT

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BEFORE WE GET INTO THAT, ARE THERE ANY OTHER QUESTIONS THAT YOU
MIGHT HAVE THAT YOU WANT TO TALK ABOUT NOW OR -- WE COULD -- WE
CAN ADDRESS THEM.

MRS. WOOD: JUST, IN OTHER WORDS, YOU'RE
CONCENTRATING ON THE WATER AND THE SOILS THAT ARE CONTAMINATBD
WITH THE PESTICIDES.

MR. WATTRAS: RIGHT, PESTICIDES AND PCB'S.

MRS. WOOD: THERE'S NO PROBLEMS WITH
PETROLEUM PRODUCTS --

MR. WATTRAS: NO, THAT --

MRS. WOODS: -- OR SOLVENTS?

MR. WATTRAS: THAT WAS NOT INCLUDED AS PART
OF THIS STUDY. YOU'RE TALKING ABOUT SITE 22 OR?

MRS. WOOD: WELL, I MEAN -- YEAH, OR UP
THERE BY BUILDING 900, THERE'S NO GROUND PROBLEM?

MR. WATTRAS: OH, NO. NO, NO, NO. AGAIN, WE
LOOKED AT THOSE SOIL RESULTS. THAT'S WHAT I WAS SAYING BEFORE,
WHERE WE REALLY DIDN'T SEE VERY HIGH LEVELS OF SOLVENTS THAT WE
COULD ASSOCIATE WITH CONTINUING SOURCE.

IF WOULD HAVE, AND THAT WOULD HAVE, YOU KNOW -- THAT
WOULD HAVE BEEN A GREAT THING TO SAY THAT THERE'S STILL A SOURCE
THERE AND WE'RE GOING TO DO SOMETHING WITH IT. BUT IF WE WOULD
HAVE FOUND SOME VERY HIGH LEVELS OF SOLVENTS IN SOILS THAT ARE
ASSOCIATED WITH THAT PLUME, THEY WOULD HAVE BEEN TAKEN CARE OF.

I MEAN, WE WOULD -- I DON'T BELIEVE --

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MRS. WOODS: SO, IT'S JUST THE PLUME.

MR. WATTRAS: -- A SOURCE WOULD HAVE BEEN LEFT THERE. I DON'T BELIEVE EPA OR THE STATE WOULD HAVE EVER PERMITTED A SOURCE OF CONTAMINATION TO THE SOIL TO REMAIN THERE. IT CERTAINLY WOULD HAVE BEEN ADDRESSBD. BUT IT APPEARS THAT THE SOURCE HAS BEEN DEPLETED FROM THAT SOIL MATRIX AT THIS TIME AND IS PRETTY MUCH SITTING IN THE SHALLOW GROUNDWATER.

OKAY. OPERABLE UNIT NUMBER FIVE IS A VERY SMALL OPERABLE UNIT. IT CONSISTS OF ONE SITE: SITE TWO. SITE TWO IS CALLED THE FORMER NURSERY DAY CARE CENTER. IT INVOLVES TWO AREAS; ONE IS -- WE CALL THE BUILDING 712 AREA. THAT WAS THE BUILDING THAT USED TO HOUSE THE PESTICIDES AND STORED THEM. AND WE HAVE ANOTHER AREA CALLED THE FORMER STORAGE AREA. THIS IS ACROSS A SET OF RAILROAD TRACKS THAT WAS ONCE OPENED -- THAT'S AN OPEN FIELD THAT WAS ONCE USED TO STORE BULK MATERIALS.

THIS IS A PICTURE OF BUILDING 712, AND BEHIND IT THAT'S A PARKING LOT AREA. IT'S CURRENTLY USED AS AN ADMINISTRATIVE OFFICE. AND I CAN SHOW YOU ON ANOTHER SLIDE, BUT OVER IN THIS AREA, THERE ARE TWO CONCRETE PADS, CEMENT PADS OR CONCRETE PADS, WHICH WE BELIEVE THEY USED TO STORE DRUMS OF PESTICIDES. WE LOOKED AT SOME AERIAL PHOTOGRAPHS WHERE WE COULD SEE THESE DRUMS OF PESTICIDES SITTING ON THESE PADS. AND THEY PROBABLY, YOU KNOW -- THEY WERE 55 GALLON DRUMS THAT WERE TURNED ON THEIR SIDE. THEY PROBABLY HAD THE SPIGOT THERE AND WOULD POUR OUT THE PESTICIDES AS THEY NEED THEM AND FILL UP THEIR SPRAYERS AND APPLY THEM.

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COLONEL WOOD:  DID THEY OPERATE THOSE

PADS COINCIDENTALLY WITH THE -- OR AT THE SAME TIME THAT THE PLACE

WAS OPERATING AS A DAY CARE CENTER?

MR. WATTRAS: AS FAR AS I KNOW, NO.

MR. BAVEN: NO, SIR.

MR. PAUL: NO, SIR.

MR. HAVEN: AS A MATTER OF FACT, SITE TWO,

IF I'M NOT MISTAKEN, WAS OPERATING FROM 1945 TO 1958 AS A

PESTICIDE MIXING AREA.  AND THE DAY CARE CENTER WAS PROBABLY A

COUPLE OF DECADES LATER.

MRS. WOOD: OH, NO.  No.

MR. HAVEN: IT CAME ABOUT THE '60S.

MRS. WOOD: No, THAT CAME ABOUT -- YEAH, IT

WAS THERE FOR YEARS BEFORE YOU WERE BORN REALLY.  I HAD IT IN

HERE, BUT IT CAME IN SHORTLY AFTER '58.

MR. HAVEN: IN THE '60S.

MRS. WOOD: AND THEY CLOSED IT DOWN IN THE

'70S, '78 OR SOMETHING LIKE THAT.

MR. WATTRAS: I THINK IT'S ONE ON OF THOSE

SLIDES.  LET ME SEE.  FROM 1945 TO 1958 IS WHAT WE HAVE THROUGH

OUR RECORDS OR IN LOOKING AT INFORMATION THAT'S WHEN IT OPERATED.

MRS. WOOD: THE DAY CARE CENTER WENT IN

ALMOST IMMEDIATELY AFTER THAT.

MR. PAUL: I WANT TO SAY '63 FOR THE DAY

CARE.

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MRS. WOOD: THAT SOUNDS AWFULLY CLOSE.

MR. PAUL: YEAH, IT WAS IN THE EARLY ‘60S,

BUT I DON’T THINK IT WAS A YEAR OR TWO AFTBR.

MRS. WOOD: THEY DIDN’T MOVE ONE OUT AND

PUT ONE IN.

MR. WATTRAS: THESE ARE THE CONCRETE PADS.

THE OBJECT IN THE BACKGROUND IS A MONITORING WELL WHICH WE

INSTALLED. ON THE OTHER SIDE OF THE MONITORING WELL RIGHT UP HERE

IS ANOTHER CONCRETE PAD. SO, WE HAVE A MONITORING WELL RIGHT IN

THE MIDDLE OF THIS AREA.

WE TOOK A LOT OF SAMPLES THROUGHOUT HERE, A LOT OF SOIL

SAMPLES. WE STARTED AT THE SURFACE AND WORKED OUR WAY DOWN TO THE

WATER TABLE, WHICH IS PROBABLY ABOUT SIX OR SEVEN FEET UP HERE.

AND WE ALSO LOOKED AT THE OTHER AREA AROUND THE BUILDING, JUST TO

MAKE SURE, YOU KNOW, THERE WEREN’T HIGH LEVELS OF PESTICIDES BACK

THERE.

THIS IS THE SECOND PAD THAT I WAS SHOWING YOU IN THAT

PREVIOUS FIGURE. THIS PAD’S PRETTY -

MRS. WOOD: NOW, IS THAT A DITCH OVER THERE

TO THE RIGHT?

MR. WATTRAS: YES, THERE IS A DRAINAGE DITCH,

AND THERE’S A SET OF — THERE’S RAILROAD TRACKS THAT RUN IN THIS

DIRECTION. AND THAT DRAINAGE DITCH RECEIVES SURFACE RUN-OFF.

RARELY IS THERE WATER IN THAT DITCH EXCEPT AFTER A RAINFALL. SO,

IT’S NOT AN INTERMITTENT STREAM; IT’S SIMPLY A DITCH.

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THIS IS THE OPEN AREA, THE STORAGE AREA, I WAS TALKING ABOUT. NOW, TYPICALLY IT'S JUST AN OPEN FIELD. THE EQUIPMENT YOU SEE HERE WAS ASSOCIATED WITH OUR INVESTIGATION. BUT TYPICALLY, THERE'S NOTHING THERE. IT'S JUST AN OPEN FIELD. LOOKING AT HISTORICAL PHOTOGRAPHS -- IN FACT, I BELIEVE THERE'S ONE OVER THERE -- YOU CAN SEE THAT THERE USED TO BE, COMING OFF THAT TRAIN TRACK -- NOW, THE TRAIN TRACKS ARE RUNNING RIGHT OVER HERE, OKAY? BUILDING 712 IS ON ONE SIDE. THIS OPEN FIELD'S ON THE OTHER. THERE USED TO BE A RAILROAD SPUR THAT CAME OFF OF THE MAIN LINE, AND YOU CAN SEE THINGS THAT WERE STORED OVER HERE AT ONE TIME. NOW, THAT RAILROAD SPUR IS GONE AND, AGAIN, NOTHING'S STORED THERE.

TO BE QUITE HONEST WITH YOU, THERE'S NO INFORMATION TELLING US WHAT WAS STORED THERE. YOU CAN SEE OBJECTS IN THE HISTORICAL PHOTOGRAPHS, BUT WE LOOKED THROUGH DIFFERENT RECORDS TO SEE IF -- WHAT MIGHT HAVE BEEN STORED THERE. THERE IS A WATER TREATMENT FACILITY ON THE OTHER SIDE OF THIS ROAD, RIGHT OVER HERE. IT COULD HAVE BEEN -- THE STUFF THAT WAS STORED OVER THERE COULD HAVE BEEN ASSOCIATED WITH THAT TREATMENT FACILITY FOR ALL WE KNOW. BUT WE DON'T HAVE ANY INFORMATION ON EXACTLY WHAT WAS STORED THERE.

STUDIES HAVE BEEN CONDUCTED OUT HERE BEFORE WE DID OUR REMEDIAL INVESTIGATION. I BELIEVE THERE WERE FIVE MONITORING WELLS ALREADY IN PLACE. FOUR OF THE MONITORING WELLS WERE LOCATED AROUND THE BUILDING 712 AREA. AND THE FIFTH MONITORING WELL WAS

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IN THIS OPEN FIELD AREA.

WHAT WE FOUND -- OBVIOUSLY WE FOUND A LOT OF PESTICIDES IN THE SURFACE SOIL AND THE SEDIMENT NEAR THE CEMENT PADS, VERY HIGH LEVELS. THE HIGHEST LEVEL WAS ABOUT ONE MILLION PARTS PER BILLION. WE'RE TALKING PERCENTAGE, SO VERY HIGHLY CONCENTRATED.

SOIL -- OR PESTICIDE LEVELS IN THE SOIL; AS WELL AS THE SEDIMENT IN THE DRAINAGE DITCH, WHICH MAKES SENSE BECAUSE IT'S A PRETTY STEEP DITCH, AND I'M SURE THROUGH RUNOFF A LOT OF STUFF FLOWS RIGHT INTO THAT DITCH.

WITH RESPECT TO GROUNDWATER, WE REALLY DIDN'T FIND MUCH OF A PESTICIDE PROBLEM. WE DID HAVE SOME LOW LEVELS. THE WELL IN BETWEEN THE PADS HAD SOME VERY, VERY LOW LEVELS. I LIKE TO CALL THEM TRACE LEVELS; WE'RE TALKING VERY LOW PARTS PER BILLION. BUT THE MAJOR PROBLEM, WITH RESPECT TO GROUNDWATER, HAPPENED TO BE SOME LEVELS OF ETHYLBENZENE AND XYLENE IN THE FORMER STORAGE AREA.

I MENTIONED JUST A BIT AGO WE HAD ONE WELL OVER IN THE FORMER STORAGE AREA. AND HISTORICALLY, BACK IN THE MID-80S WHEN THAT WELL WAS FIRST INSTALLED, IT HAD SOME LOW LEVELS OF ETHYLBENZENE AND XYLENE, AND THAT WELL'S BEEN SAMPLED ABOUT THREE OR FOUR TIMES, AND THE CONTAMINANTS KEEP SHOWING UP AT SLIGHTLY LOWER LEVELS.

WE LOOKED FOR THE SOURCE OF ETHYLBENZENE AND XYLENE; WE KNOW THOSE ARE ASSOCIATED WITH PETROLEUM PRODUCTS, GASOLINE OR WHATEVER, DIESEL FUEL. WE THOUGHT MAYBE THERE WAS AN UNDERGROUND STORAGE TANK OVER THERE THAT NOBODY KNEW ABOUT. SO, WE LOOKED AT

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THAT, WE DID SOME GEOPHYSICAL WORK TO SEE IF WE COULD SEE A TANK; NOTHING CAME UP.

WE DID SOME EXTENSIVE SAMPLING IN THE FORMER STORAGE AREA THINKING THAT WE'RE GOING TO HIT SOME KIND OF SPILL AREA THAT WOULD HAVE, YOU KNOW, ETHYLBENZENE AND ALL THESE OTHER PRODUCTS, BUT WE REALLY DIDN'T FIND THE SOURCE OF THIS ETHYL BENZENE AND XYLENE.

LET ME TELL YOU ABOUT THE LEVELS JUST A LITTLE BIT MORE. WE ARE TALKING ABOUT LOW LEVELS OF ETHYLBENZENE AND XYLENE. THEY ARE BELOW WHAT'S CALLED FEDERAL DRINKING WATER SATANDARDS. BUT THEY ARE ABOVE THE STATE'S DRINKING WATER STANDARDS. THE STATE'S STANDARDS ARE A LITTLE BIT MORE STRICTER THAN THE FEDERAL STANDARDS (SIC).

THE EXTENT OF THAT CONTAMINATION IS DEFINED. IT'S A VERY SMALL PLUNE. WE HAVE WELLS -- WE HAVE A LOT OF WELLS. AT ONE TIME I MENTIONED THERE WERE FIVE WELLS WHEN WE STARTED. I THINK WE'RE UP TO ABOUT 13 WELLS OR 12 WELLS. WE HAVE A PRETTY GOOD IDEA. WE LOOKED AT THE DEEP GROUNDWATER RIGHT BELOW THAT ETHYLBENZENE PLUME, AND WE DIDN'T FIND ANY ETHYLBENZENE OR XYLENE IN THE DEEP GROUNDWATER. SO, WE KNOW IT'S A SMALL LOCALIZED GROUNDWATER PROBLEM.

TALKING ABOUT THE FINDINGS A LITTLE BIT, I PROBABLY WENT OVER MOST OF THIS, JUMPING AHEAD OF MYSELF. I WILL SAY ANOTHER THING, BY THE CEMENT PAD AREA, WE ALSO FOUND SOME SEMI-VOLATILE ORGANICS LIKE NAPHTHALENE. AGAIN, AT ONE TIME THESE PESTICIDES

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WERE APPLIED WITH A PETROLEUM-BASED SOLVENT, SO SEEING THINGS LIKE
NAPHTALBNE, NAPHTHALENE IS A CONTAMINANT THAT'S ASSOCIATED WITH
PETROLEUM. IF THEY USED PETROLEUM-BASED SOLVENTS TO MIX WITH THE
PBSTICIDES TO APPLY IT, IT MAKES SENSE THAT WE WOULD FIND SOME OF
THESE COMPOUNDS IN THAT SEDIMENT OR IN THE SOIL AND SEDIMENT.

THAT'S PRETTY MUCH JUST WHAT I JUST MENTIONED. LOW
LEVELS OF XYLENE AND ETHYLBENZENE ABOVE THE STATE STANDARDS, BUT
BELOW FEDERAL STANDARDS. I MENTIONED SOME PESTICIDES IN
GROUNDWATER, EVEN OUR UPGRADIENT WELL, FOR WHATEVER REASON, BAD
SOME LOW LEVELS OF PESTICIDES. AGAIN, THESE LOW LEVELS COULD HAVE
BEEN DUE, PRETTY MUCH THE SAME SITUATION WHERE I TALKED BEFORE
ABOUT SITE 24 WHERE YOU START GETTING SOME PARTICULATES INTO THE
SAMPLE, ESPECIALLY IN OUR BACKGROUND WELL. WE WERE A LITTLE BIT
SURPRISED.

WE HAD THE SAME PROBLEM WITH LEAD AND -- METALS SUCH AS
LEAD, CADMIUM AND CHROMIUM IN OUR GROUNDWATER. AND THIS GOES BACK
TO THE WHOLE DISCUSSION WE HAD PREVIOUSLY, AND WE EVEN INCLUDED ON
THERE INCLUDING OUR UPGRADIENT WELL. AGAIN, WE'RE NOT SO SURE
WHETHER THESE METALS WERE REALLY ASSOCIATED WITH THE SITE OR NOT.
WE REALLY BELIEVE THEY ARE NOT.

WITH RESPECT TO DISSOLVED METALS, MANGANESE WAS THE ONLY
CONTAMINANT WHICH EXCEEDED WATER STANDARDS. IT EVEN EXCEEDED IT
IN OUR UPGRADIENT WELL, AND AS WE KNOW, I THINK THROUGHOUT THIS
REGION, MANGANESE SEEMS TO BE EVERYWHERE, REGARDLESS IF IT'S ON
SITE OR OFF-SITE.

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DEEP GROUND WATER; SURPRISINGLY, OUR DEEP WELL, WE WERE LOOKING FOR ETHYLBENZENE, BECAUSE WE WERE INTERESTED IN -- WE HAVE A SHALLOW GROUNDWATER PROBLEM. WE WERE INTERESTED TO SEE HOW FAR DOWN THESE CONTAMINANTS MIGRATE. WE ACTUALLY PICKED UP VERY LOW LEVELS OF TCE IN THE WELL, WHICH WAS SURPRISING BECAUSE THIS SITE, ALL THE SOIL SAMPLES THAT WE'VE TAKEN, ALL THE OTHER MONITORING WELLS HAD NO TCE IN IT. WE FOUND VERY LOW LEVELS OF TCE. SO, WE RE-SAMPLED THE WELL; THE SECOND ROUND WE DIDN'T HAVE IT. NOW, THAT'S NOT UNCOMMON WHEN YOU GET TO LOW LEVELS. IT IS UNCOMMON IF, FOR EXAMPLE, THE FIRST ROUND YOU HAVE 1,000 MICROGRAMS PER LITER, AND THEN THE SECOND TIME YOU SAMPLED IT YOU DIDN'T FIND IT. THAT'S UNUSUAL; SOMETHING'S WRONG THERE. WHEN YOU'RE AT SUCH A LOW LEVEL, FIVE PARTS PER MILLION, THAT'S VERY, VERY LOW TO BEGIN WITH. SO, CAN'T SAY THERE ISN'T ANYTHING THERE, BUT WE'RE SAYING IT'S A PRETTY SMALL PROBLEM. AND AGAIN, WE DON'T BELIEVE IT'S ATTRIBUTABLE TO SITE TWO BASED ON THE DATA THAT WE HAVE OF THIS SITE AND BASED ON THE HISTORY OF THIS SITE, KNOWING IT WAS USED FOR A PESTICIDE STORAGE AREA.

MRS. WOOD: THERE ARE NO WELLS -- WATER WELLS IN THE AREA?

MR. WATTRAS: THERE ARE WATER WELLS, NOT IN THE IMMEDIATE AREA OF SITE TWO. THERE ARE WELLS WITHIN A MILE OF SITE TWO THAT ARE OPERATING AND ARE CLEAN, BUT NOT WITHIN THE IMMEDIATE SITE TWO AREA.

WHILE WE WERE DOING THIS STUDY, WE WERE GETTING THE

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RESULTS IN FROM THE LABORATORY. WE WERE SEEING THESE VERY HIGH
LEVELS OF PESTICIDES. WE TALKED TO THE DEPARTMENT OF THE NAVY AND
MARINE CORPS, AND WE ALERTED THEM THAT, LOOK, WE HAVE SOME
WE HAVE A MAJOR PROBLEM WITH THE SOIL.

THE NAVY AND MARINE CORPS DECIDED TO "LET'S GET RID OF
THE SOILS NOW. LET'S NOT WAIT UNTIL THE STUDY IS OVER. LET'S DO
SOMETHING NOW."

SO, THEY DID WHAT'S CALLED A TIME CRITICAL REMOVAL
ACTION. THEY WENT IN AND THIS IS BEING DOWN RIGHT NOW IN FACT.
THEY'RE EXCAVATING AS WE SPEAK. THERE'S A HOLE IN THE GROUND OUT
AT SITE TWO.

THEY DECIDED, "LET'S NOT WAIT FOR THE CLEANUP. WE KNOW
WE HAVE A PROBLEM THAT WE'RE GOING TO HAVE TO DEAL WITH. WHY WAIT
TO THE END OF THE STUDY TO DEAL WITH IT? LET'S GET RID OF IT
NOW." ESPECIALLY IN LIGHT OF THE FACT THAT THE BUILDING IS BEING
USED AS AN ADMINISTRATIVE OFFICE.

SO, THAT'S GOING ON RIGHT NOW. AND THAT HAPPENS -- I
MEAN, THAT HAPPENS A LOT. IT'S NOT A BAD THING TO DO. IF YOU
KNOW YOU HAVE A PROBLEM, WHY WAIT ANOTHER YEAR OR TWO TO COMPLETE
A STUDY, WHEN AT THE END OF THE STUDY YOU KNOW YOU'RE GOING TO
HAVE TO ADDRESS THAT PROBLEM. IT REALLY MAKES SENSE TO DEAL WITH
THE PROBLEM NOW.

THAT'S BEEN THE WAVE OF THINGS, NOT ONLY IN THE
DEPARTMENT OF DEFENSE, BUT PRETTY MUCH THROUGHOUT THE INDUSTRY, IS
"LET'S NOT WAIT FOR THE END OF THESE STUDIES. WE'LL DEAL WITH THE
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OBVIOUS PROBLEM FIRST, THEN WE'LL WRAP UP ANYTHING IN THE FINAL
STUDY, AND WE'LL DEAL WITH THE RESIDUAL PROBLEM." SAY, IF IT WAS
A GROUNDWATER PROBLEM. YOU KNOW, THERE'S NO RISK TO THE
GROUNDWATER, BUT WE'LL DEAL WITH THAT AT THE END OF THE STUDY.
LET'S DEAL WITH THE PART THAT MIGHT ACTUALLY HAVE A RISK AS WE
SPEAR.

THAT'S JUST THE PAD. CLEANUP IS CURRENTLY UNDERWAY, AS
I SAID. IT'S INVOLVING APPROXIMATELY 500 CUBIC YARDS OF PESTICIDE
CONTAMINATED SOIL. I BELIEVE THEY ARE TAKING THAT SOIL OFF-SITE
TO AN INCINERATOR. IS THAT CORRECT, NEAL?

MR. PAUL: RIGHT.

MRS. WOOD: WHERE IS THE INCINERATOR?

MR. PAUL: IN KENTUCKY.

MRS. WOOD: IN KENTUCKY?

MR. PAUL: ACTUALLY, WE ARE EXCAVATING ALL
THE SOIL AND ARE WAITING FOR CONFIRMATION OF THE SAMPLES BACK TO
MAKE SURE WE HAVE EXCAVATED ALL WE NEED TO DO. HOPEFULLY WE WILL
BE CLOSING THAT JOB OUT. I ANTICIPATE HOPEFULLY NEXT WEEK WE CAN
GO IN AND PUT CLEAN BACK FILL BACK INTO IT.

MRS. WOOD: IS BASE EQUIPMENT DOING THIS?

MR. PAUL: NO, OHM IS DOING IT.

MRS. WOOD: OHM.

MR. PAUL: INTERESTINGLY ENOUGH, I'VE HAD
QUITE A FEW CALLS FROM OTHER CONTRACTORS ON THIS JOB, WANTING TO
KNOW HOW THEY COULD GET INVOLVED IN CONSTRUCTING, AND WE'RE TRYING

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TO GET SOME OF THAT BUSINESS BACK IN NORTH CAROLINA. I'VE GIVEN THEM THE PROJECT FOR OHM -- I'VE GIVEN THEM THEIR PHONE NUMBER TO CONTACT THEM BECAUSE THEY DID NOT USE A NORTH CAROLINA CONSTRUCTION COMPANY. SO, HOPEFULLY WE CAN BRING SOME OF THAT BUSINESS BACK INTO ONSLOW COUNTY AND THE STATE OF NORTH CAROLINA.

MRS. WOOD: I MEAN, THEY HAD TO HAVE THE SPECIFIC SITE, ANYTHING THAT'S RUN AROUND THIS --

MR. PAUL: TRIPLE ACTION ALSO WANTS IT BECAUSE THEY'RE CAPABLE OF CARRYING MAYBE 20 CUBIC YARDS.

MR. WATTRAS: I'M SURE THEY HAVE A WEIGHT RESTRICTION, YOU KNOW?

MR. PAUL: WHAT'S THAT?

MR. WATTRAS: I WAS GOING TO SAY ABOUT 15 CUBIC YARDS.

MR. PAUL: YEAH. YOUR BASIC DUMP TRUCK CAN CARRY NINE.

MRS. WOOD: NOW, THAT WOULD HAVE TO BE COVERED, WOULDN'T IT?

MR. PAUL: OH, YEAH.

MR. WATTRAS: OH, YEAH. I'M SURE THEY ARE.

MR. PAUL: AND WE WEIGH THEM ON BASE TO INSURE THAT --

MRS. WOOD: AND THEN THEY WEIGH IT OUT.

MR. PAUL: THEN THEY WEIGH IT OUT TO MAKE SURE WE'RE NOT PAYING FOR ANYMORE THAN WHAT WE 'RE ACTUALLY PAYING.
GETTING.

MRS. WOOD: SO THEY DON'T STOP OFF AND DUMP IT TO SAVE GAS.

MR. PAUL: EVEN THOUGH IT'S NON-HAZARDOUS,

YOU STILL MANIFEST IT TO INSURE THAT IT DOES GET SOME DISPOSABILITY.

MR. WATTRAS: NOW, WITH RESPECT TO THE RISK ASSESSMENT, WE LOOKED AT TWO SCENARIOS. SINCE WE KNEW THERE WAS REMOVAL ACTION TAKING PLACE, WE SAID WHAT WOULD BE THE RISK FOLLOWING THE REMOVAL OF THE SOIL, BECAUSE AS I MENTIONED, WE WERE GOING AFTER THE OBVIOUSLY PROBLEM, BUT WE HAVE TO FIGURE OUT IN THE TOTAL SCHEME OF THINGS, IS THERE GOING TO BE SOME RISK EVEN AFTER REMOVING THE SOIL, BECAUSE WE'RE ONLY ADDRESSING THE HOT SPOT, AND IT'S PRETTY WELL DEFINED.

WE ALSO LOOKED AT WHAT WOULD BE THE RISK WITHOUT REMOVING THE SOIL. ALTHOUGH WE KNEW THEY WERE REMOVING IT, WE WANTED TO MAKE A COMPARISON OF WHAT IS THE REAL IMPACT OF DOING THIS.

SO, HUMAN HEALTH LOOKED AT, BEFORE THIS REMOVAL ACTION, AND IT WAS PRETTY OBVIOUS THAT IF THE SOIL SEDIMENTS WEREN'T REMOVED, THERE WOULD BE WHAT WE WOULD CONSIDER AN UNACCEPTABLE RISK FOR THOSE PEOPLE THAT WOULD, YOU KNOW, BE WORKING IN THE AREA OR WHATEVER. THERE WAS A HIGH RISK.

BUT AFTER THE SOIL IS REMOVED -- NOW, WHEN WE DO THIS STUDY, WE KNOW A CERTAIN AREA IS GOING TO BE REMOVED AND WE THROW July 27, 1994
OUT THOSE RESULTS. OKAY. NOW, WE LOOK AT WHAT'S THE OTHER
CONCENTRATIONS OF THE CONTAMINANTS IN THE AREA. WE HAD, WITHIN
THE OTHER PARTS OF THE LAWN, WE HAD SOME PESTICIDES AT WHAT I
WOULD CALL TYPICAL LEVELS THAT YOU FIND THROUGHOUT LEJEUNE. I
KNOW YOU'VE HEARD ME TALK ABOUT OUR PESTICIDES THROUGHOUT CAMP
LEJEUNE THAT I SAID IF I SEE SOMETHING WITH 10 OR 50 PARTS PER
BILLION, I REALLY DON'T RAISE AN EYEBROW, BECAUSE I SEE THAT
EVERYWHERE. YOU KNOW, THAT DOESN'T TELL ME THAT THERE'S A SOURCE.
SO, THROUGHOUT THE LAWN AREA, AND EVEN IN SOME OF THE
BACKGROUND SAMPLES, WE HAVE SOME LOW LEVELS OF PESTICIDES. WELL,
WHEN WE USE THAT DATA IN THE RISK ASSESSMENT AFTER REMOVING THIS
HOT SPOT; THERE IS NO UNACCEPTABLE HEALTH RISK. EVERYTHING, YOU
KNOW, PUTTING CLEAN SOIL BACK IN THE HOLE, REGRADING IT, THERE IS
NO UNACCEPTABLE HEALTH RISK AFTER THIS HOT SPOT IS REMOVED.
COLONEL WOOD: WHO ASSUMES RESPONSIBILITY FOR
LOOKING INTO THE WELFARE OF THE PEOPLE WHO MAY HAVE BEEN EXPOSED
OVER THE YEARS WHILE THEY WERE OUT THERE?
MR. HAVEN: A LOT OF WHAT WENT ON THERE
WAS THERE WERE DIFFERENT RISK ASSESSMENTS DONE LIKE HEALTH RISK
ASSESSMENT TO HUMAN RECEPTORS IS --
MR. BIXIE: AS I HAD MENTIONED BEFORE AN
AGENCY FOR TOXIC SUBSTANCES HAS ALSO TAKEN THAT INTO ACCOUNT AND
THEY'RE CONDUCTING A PROGRAM.
COLONEL WOOD: DO THEY HAVE ACCESS?
MR. HAVEN: EVERYTHING -- ALL THE

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INFORMATION THEY HAVE REQUESTED THEY FORWARD TO US AND WE'RE WORKING WITH MANPOWER, FOR EXAMPLE, BASE HOUSING TO GET THEM ALL THE INFORMATION THAT THEY WANT. THEY HAVE ALSO GONE THROUGH, I BELIEVE, SOME MEDICAL RECORDS AND THINGS LIKE THAT TO GET MORE INFORMATION, AND THEY ARE ESSENTIALLY LOOKING AT THAT POSSIBILITY.

COLONEL WOODS: DO YOU KEEP THAT

MR. HAVEN: NO, SIR.

COLONEL WOOD: WILL THEY USE THE FACILITY?

MR. HAVEN: HERE AGAIN, THE ATSTR MANAGER -- BASICALLY BEFORE WE PUT IN MANPOWER, BASE HOUSING --

COLONEL WOOD: DOES ATSTR SAY THEY HAVE THE RESPONSIBILITY FOR IT?

MR. HAVEN: YES, SIR. THEY'D HAVE RESPONSIBILITY FOR IT.

MR. WATTRAS: SEE, THAT'S THE MAIN DIFFERENCE. I BELIEVE LAST NIGHT YOU ASKED A QUESTION ABOUT ATSTR AND THE RISK ASSESSMENT THAT THEY DO. AS I SEE IT, HERE'S THE DIFFERENCE: WHEN WE DO A RISK ASSESSMENT UNDER CERCLA, WE LOOK AT WHAT'S THE CURRENT RISK AND WHAT'S THE FUTURE RISK.

ATSTR, THEY GET INTO THE MORE OF THE -- THOSE F.D. STUDIES, WHAT ARE THEY CALLED? WHATEVER THEY'RE CALLED. THEY WILL DO THAT. THAT'S THE MAIN DIFFERENCE. THEY LOOK AT LOOKING AT BIRTH DEFECTS OR WHATEVER. WE DON'T DO THAT UNDER OUR RISK ASSESSMENT. THAT'S -- WE LOOK AT CURRENT SITUATION. WE DON'T LOOK AT THE PAST. THAT IS PART OF THEIR MISSION. THEY WILL AT July 27, 1994
WHAT HAS HAPPENED IN THE PAST AND LOOKING FOR TRENDS IN CANCER IN
THE AREA, OR BIRTH DEFECTS OR THINGS LIKE THAT. THAT'S THE MAIN
DIFFERENCE IN OUR RISK ASSESSMENT AND THEIR PUBLIC HEALTH
ASSESSMENT. IT'S EITHER CALLED -- IT'S CALLED A PUBLIC HEALTH
ASSESSMENT, WHEREAS OURS IS CALLED A RISK ASSESSMENT, A HUMAN
HEALTH RISK ASSESSMENT.

THEY'RE NOT GOING TO TELL YOU NUMBERS THAT THERE IS --
YOU KNOW, WE COME UP WITH THESE INCREMENTAL CANCER RISKS, YOU
KNOW, WHAT'S THE CHANCES OF ACQUIRING CANCER. THEY DON'T DO THAT
PART OF IT; THEY LOOK AT MORE OF A TREND-TYPE THING. THAT'S THE
MAIN DIFFERENCE. SO, THAT'S THEIR MISSION, AND I BELIEVE THEY'RE
PROBABLY LOOKING AT THAT ASPECT.

WITH RESPECT TO ECOLOGICAL RISKS, I'LL LET TOM BIXIE
TALK ABOUT THIS AGAIN, HIS SPECIALTY HERE.

MR. BIXIE: AGAIN, WHEN WE WENT THROUGH OUR
ANALYSIS, WE DID FIND THAT PESTICIDES, AND THAT WAS NO SURPRISE,
WAS THE MAIN PROBLEM OR THE MAIN CONTAMINANT BEFORE THE TIME
CRITICAL REMOVAL ACTION.

NOW, THE DRAINAGE DITCH GOES TO OVERS CREEK, THAT'S
WHERE THE DRAINAGE DITCH GOES. THAT'S PARALLEL TO THE SITE.
BASED ON OUR SAMPLING, WE DIDN'T SEE CONTAMINANTS REALLY MIGRATING
DOWN TO THERE. AGAIN, RAY WENT OVER THE PESTICIDES, WHAT THEY DO,
THEY ADHERE TO THE SEDIMENTS OR PARTICLES; THEY DON'T TRANSFER
DOWNSTREAM READILY.

AND SO, THE AREA OF CONCERN WAS LIMITED TO RIGHT NEXT TO

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THE SITE AND ON-SITE. WE WENT THROUGH AND LOOKED AT CERTAIN
SEDIMENT, COMPARED IT TO STANDARDS AND VALUES THAT WOULD EVALUATE
THE HEALTH OF AQUATIC ORGANISMS EXPOSED, AND ALSO WE WENT THROUGH
THE TERRESTRIAL SCENARIO I MENTIONED BEFORE, ASSUMING THAT A DEER
OR RABBIT WAS ON-SITE EATING PLANTS AND BEING EXPOSED TO THAT.

MRS. WOOD: WHAT ABOUT THE BURROWERS, OUR
EVER-PRESENT MOLES AND THINGS LIKE THAT?

MR. DIXIE: TYPICALLY WE LOOK AT BURROWING
WILDLIFE WHEN THERE'S A VERY HIGH RISK OF VOLATILES IN THE SOIL.

MRS. WOOD: BUT THEY WOULD NOT BE AFFECTED
BY PESTICIDES?

MR. BIXIE: THEY WOULD. IN FACT, THEY
WOULD BE IN CONTACT WITH THEM THE SAME WAY A RABBIT WOULD AND THE
SAME WAY A BIRD WOULD. THEIR EXPOSURE WOULD BE GREATER BECAUSE
THEY WOULD BE BURROWING INTO THEM. BUT THE DATABASE AND THE
LITERATURE, REALLY, I DON'T THINK HAS ADVANCED FAR ENOUGH TO
ASSUME THAT IF A GROUND SQUIRREL OR A MOLE WAS IN CONTACT WITH THE
SOIL, HOW MUCH OF IT IT ABSORBS. TYPICALLY, THE EXPOSURE IS
EVALUATED BASED ON THEM EATING WORMS THAT EAT THE DIRT, THEN
EATING DIRT JUST BY GOING THROUGH THE SYSTEM, EATING PLANTS AND
THINGS LIKE THAT. SO, IT'S PRIMARILY THAT EXPOSURE.

MRS. WOOD: BUT THEY ARE IN THE MODEL?

MR. DIXIE: EXCUSE ME?

MRS. WOOD: I MEAN, THE MOLES, ARE THEY THE
BURROWING ANIMAL THAT'S IN YOUR MODEL?

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MR. DIXIE: NO, IN OUR MODEL, WE HAVE RABBITS, DEER AND BIRDS.

MRS. WOOD: I WOULD THINK IF THAT STUFF IS GOING DOWN IT SEEMS APPROPRIATE TO --

MR. DIXIE: WELL, IN THIS PARTICULAR AREA, BASED ON, YOU KNOW, HOW THE PAD WAS AND LOOKING AT THE TYPES OF HABITATS, WE FELT THOSE WERE THE CRITICAL WILDLIFE SPECIES.

MR. WATTRAS: PLUS YOU HAVE TO REMEMBER THIS IS AN AREA, IT'S NOT IN THE MIDDLE OF THE WOODS. IT'S A MOWED LAWN.

MRS. WOOD: RIGHT. YEAH.

MR. WATTRAS: I MEAN, THAT HAS TO BE CONSIDERED, TOO. SO, NOT TO SAY THERE COULDN'T BE A MOUSE OR A MOLE.

COLONEL WOOD: WE'VE GOT MOLES IN OUR LAWN AT HOME.

MR. WATTRAS: OH, I KNOW. I'M NOT SAYING IT'S NOT --

MRS. WOOD: I WAS THINKING OF A MOLE, TOO.

MR. WATTRAS: -- YOUR TYPICAL ENVIRONMENT.

WE HAVE THEM, TOO. I KNOW WHAT YOU'RE SAYING.

MR. BIXIE: I GUESS, ON THE OTHER SIDE, TOO, IS WHENEVER WE PICK WILDLIFE THAT WE'RE GOING TO EXAMINE, IT'S TYPICALLY WILDLIFE THAT HAS A LARGE HISTORY OF BEING STUDIED.

FOR INSTANCE, THERE'S BEEN A LOT OF HISTORY ON THE EFFECTS OF

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CHEMICALS ON RABBITS, ON CHICKENS, ON DEER.

MRS. WOOD: SO, YOU HAVE YOUR --

MR. BIXIE: AND WE KNOW PRETTY MUCH HOW

MUCH A RABBIT EATS, HOW MUCH WATER A RABBIT NEEDS, WHAT THE AREA

THAT A RABBIT WOULD -- ITS HOME RANGE, BECAUSE THAT HAS TO BE

TAKEN INTO CONSIDERATION. WHEN WE LOOK AT A DEER THAT HAS A VERY

BIG HOME RANGE. SO, YOU ASSUME THAT THE ACTUAL FOOTPRINT THAT IS

CONTAMINATED, MAYBE IT'S 100 FEET BY 100 FEET, MAY ONLY BE ONE

PERCENT OF ITS HOME RANGE. THE OTHER 99 PERCENT OF ITS TIME, YOU

ASSUME THAT IT'S IN DIFFERENT AREAS THAT ARE NOT CONTAMINATED.

SO, THAT HAS TO BE FACTORED INTO THE MODEL.

THAT COMES INTO PLAY, FOR INSTANCE, WHEN WE -- WE DON'T

TYPICALLY LOOK AT, LIKE, TURTLES OR SNAKES BECAUSE THERE'S NOT A

LOT OF -- ALTHOUGH THEY ARE IMPORTANT, AS WILDLIFE, THERE'S NOT A

LOT OF INFORMATION IN TERMS OF HOW MUCH WATER DOES A SNAKE DRINK.

MRS. WOOD: YEAH.

MR. DIXIE: SO, YOU REALLY HAVE TO BASE A

LOT OF, WHEN YOU SELECT YOUR WILDLIFE, ON WHAT TYPE OF INFORMATION

YOU HAVE ON HOW MUCH IT EATS. SO, THAT COMES INTO PLAY, TOO.

WHEN WE WENT THROUGH THIS MODEL AND BEFORE THE TIME

CRITICAL ACTION, WE AGAIN DETERMINED IF PESTICIDES WOULD PRESENT

A PROBLEM TO THESE WILDLIFE BEING EXPOSED, AND DO PRESENT A

PROBLEM TO ANY TYPE OF AQUATIC ORGANISMS BEING EXPOSED IN THAT

DITCH.

NOW, WE DID REALIZE THAT THE DITCH WAS A DRAINAGE DITCH

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AND THERE WASN'T OBVIOUSLY A VIABLE POPULATION OF FISH. THERE MAY
BE SOME FROGS, MAYBE A TADPOLE OR SOMETHING LIKE THAT, BUT TO BE
CONSERVATIVE, WE TREATED IT AS A SERVICE WATER BODY AND COMPARED
IT TO THOSE STANDARDS. I THINK THE NEXT SLIDE --

MR. WATTRAS: WELL, THIS ONE BASICALLY SAYS
BEFORE -- IF YOU DIDN'T REMOVE THE SOIL, WE FOUND THAT THERE WOULD
BE A DECREASE IN VIABILITY, WHICH IS PRETTY OBVIOUS WITH THOSE
LEVEL OF PESTICIDES. THEN WE LOOKED AT IT FROM A STANDPOINT,
OKAY, AFTER THE SOIL IS REMOVED, AND IT HAS BEEN REMOVED, TOM AND
HIS GROUP LOOKED AT WHAT WOULD BE THE IMPACTS AFTER THAT.

MR. BIXIE: AND AFTER WE SAW THAT THERE
-- BASED ON THE TERRESTRIAL RECEPTORS IN OUR MODEL, THERE WOULD BE
NO DECREASE IN THE VIABILITY OF THE TERRESTRIAL RECEPTORS. THERE
WOULD STILL BE A VERY SLIGHT DECREASE IN TERMS OF THE AQUATIC
RECEPTORS, BUT WHAT WE SEE THIS IS, AND RAY MENTIONED THIS, IS TO
THE LEVELS OF PESTICIDES THAT WE SEE THROUGHOUT THE BASE FROM A
NORMAL SPRAYING. THE AREAS THAT HAVE VERY HIGH LEVELS THAT REALLY
WOULD PRESENT A SIGNIFICANT RISK TO AQUATIC ORGANISMS IN THIS
DRAINAGE DITCH, WERE BEING REMOVED BASED ON SOME OF THE REMOVAL
ACTIONS. SO, WE FELT LIKE IT ADDRESSED THE SIGNIFICANT RISKS.

MRS. WOOD: WE'VE GOT A DECREASE. IT'S NOT
NEUTRALIZED, BUT IT'S --

MR. BIXIE: AND THEN, THAT LOW LEVEL,
AGAIN, WOULD EXIST THROUGHOUT ANY AREA, A GOLF COURSE, WOULD HAVE
THOSE PESTICIDES, BUT IT WASN'T AT THAT HIGH LEVEL.

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MR. WATTRAS: THE FEASIBILITY STUDY, BECAUSE NOW, AFTER REMOVING THE SOIL, AND WE DID AN EVALUATION OF THE RISKS AND WE DETERMINED THERE WAS NO MORE UNACCEPTABLE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT, WE THEN LOOKED AT OUR ONLY PROBLEM REMAINING, WHICH HAPPENED TO BE THIS SMALL PLUME OF ETHYL BENZENE AND XYLENE IN GROUNDWATER.

WE LOOKED AT SIX ALTERNATIVES THAT WE COULD DO WITH THIS CONTAMINATION PROBLEM. ALTERNATIVE ONE BEING NO ACTION; ALTERNATIVE TWO BEING INSTITUTIONAL CONTROL WHERE WE WOULD JUST KEEP MONITORING THE PROBLEM. AGAIN, IN THIS CASE EVEN -- ALTHOUGH WE HAVE SOME SUPPLY WELLS WHICH ARE QUITE FAR FROM THE SITE, IT WOULD INCLUDE SAMPLING OF THOSE WELLS TO MAKE SURE NOTHING IS WRONG WITH THEM. IT WOULD INCLUDE, OBVIOUSLY, NOT LETTING ANYBODY PUT ANY WELLS ON THE SITE.

THE THIRD ALTERNATIVE WOULD BE TO EXTRACT THE GROUNDWATER WITH THE WELL, OR WELLS, TREAT IT ON-SITE, AND THEN DISCHARGE IT THROUGH A SANITARY SEWER LINE TO THE SEWAGE TREATMENT PLANT.

THE FOURTH ALTERNATIVE WOULD BE SIMPLY TO COLLECT IT, DISCHARGE IT TO THE SEWAGE TREATMENT PLANT WITHOUT TREATMENT. THE REASON THAT WAS SELECTED IS BECAUSE, NUMBER ONE, WE'RE TALKING ABOUT SOME PRETTY LOW LEVELS TO BEGIN WITH. LEVELS THAT, AS I MENTIONED BEFORE, ARE BELOW STATE STANDARDS FOR GROUNDWATER, BUT ARE JUST SLIGHTLY ABOVE -- I'M SORRY, THAT ARE BELOW THE FEDERAL STANDARDS FOR GROUNDWATER BUT ARE SLIGHTLY ABOVE STATE STANDARDS.

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AND AT THOSE LEVELS, PUTTING IN A SANITARY SEWER LINE AND SENDING IT TO THE SEWAGE TREATMENT PLANT WOULD PROBABLY BE FEASIBLE FOR TREATING IT DOWN TO A FURTHER LEVEL.

MRS. WOOD: OKAY, NOW, THIS IS GOING TO BE ONE THAT A PIPE SWINGS IN? IT'S GOING TO THE FRENCH CREEK PLANT?

OR ARE YOU -

MR. WATTRAS: WE WOULD SEND IT TO THE NEAREST SANITARY SEWER LINE. AND I KNOW YOU'RE TALKING ABOUT THE FUTURE TREATMENT PLANT.

MRS. WOOD: YEAH, THEY WERE TALKING ABOUT --

MR. WATTRAS: YEAH, IT WOULD GO TO, PROBABLY BY THE TIME, IT WOULD PROBABLY GO TO THAT TREATMENT PLANT.

MRS. WOOD: SO, I MEAN, THIS IS NOT GOING TO BE DONE INSTANTLY?

MR. WATTRAS: BUT THAT'S NOT GOING TO BE THE SELECTED ALTERNATIVE ANYWAY. BUT IT REALLY WOULDN'T MATTER -- HADNOT POINT, EVEN IF HADNOT POINT IS OPERATING, WHICH IT STILL IS, SENDING IT INTO A SANITARY SEWER LINE AND TAKING IT ALL THE WAY DOWN TO HADNOT POINT WOULD STILL BE ACCEPTABLE. THEY HAVE A BIOLOGICAL TRICKLING FILTER, AND THEY HAVE AN AERATION POND, THAT WOULD PROBABLY BE ABLE TO REMOVE THESE LEVELS OF ETHYLBENZENE AND XLENE. WE'RE TALKING ABOUT SOME VERY LOW LEVELS.

COLONEL WOOD: BUT YOU'RE ALSO TALKING ABOUT PLANTS THAT ARE BEYOND THE -- USABILITY.

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MRS. WOOD: THEY'RE UNDER WAIVER, LET'S PUT IT THAT WAY.

COLONEL WOOD: THEY'RE DISCHARGING LOTS OF WATER INTO THE RIVER THAT THEY SHOULD NOT BE. IN OTHER WORDS, THEY'RE OVER THE STATE STANDARDS.

MR. PAUL: THAT'S CORRECT.

MRS. WOOD: LET'S NOT GET OFF ON THAT.

MR. WATTRAS: YES, I KNOW WHAT YOU'RE TALKING ABOUT.

MR. PAUL: YEAH. YEAH, LET'S DON'T GET -- THE BOTTOM LINE HERE IS WE'RE NOT GOING TO -- IT'S NOT ECONOMICALLY FEASIBLE TO CHASE THESE TRACE AMOUNTS OF CONTAMINATION.

MR. WATTRAS: THE FIFTH ALTERNATIVE WOULD BE TO COLLECT IT AND DISCHARGE IT AND PIPE IT OUT TO SITE 82. NOW, SITE 82 IS LOCATED ABOUT TWO MILES DOWN THE ROAD, AND WE'RE BUILDING A TREATMENT PLANT TO DEAL WITH A MAJOR GROUNDWATER PROBLEM OUT THERE. AND WE SAID, WELL, LET'S JUST COLLECT IT AND SEND IT TO SITE 82.

AND THE SIXTH ALTERNATIVE WOULD INVOLVE IN SITU TREATMENT. AND IT'S PRETTY MUCH WHAT I TALKED ABOUT BEFORE WHERE WE WOULD TRY SOMETHING LIKE VAPOR EXTRACTION TO PULL OUT THESE VOLATILES.

THE COST OF THESE ALTERNATIVES GO FROM ZERO; THE MOST EXPENSIVE ALTERNATIVE WOULD BE TO BUILD AN ON-SITE TREATMENT.

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PLANT, WHICH IS PRETTY OBVIOUS BECAUSE OF THE CAPITAL COSTS, WE'RE LOOKING AT ALMOST TWO MILLION DOLLARS TO DO THAT.

TO JUST MONITOR IT AND TO SEE WHAT'S HAPPENING OVER TIME WOULD COST THE DEPARTMENT OF THE NAVY ABOUT $350,000. THAT'S MAINLY AN ANALYTICAL COST. WE'RE TALKING ABOUT USING ABOUT FIVE OR SIX MONITORING WELLS, TAKING SAMPLES QUARTERLY, MAYBE OVER TIME TAKING THEM BI-ANNUALLY, AND ANALYZING THEM FOR CONTAMINANTS OF CONCERN HERE.

MRS. WOOD: WELL, NOW, THAT 350,000 IS PROJECTED OVER WHAT PERIOD OF YEARS?

MR. WATTRAS: THAT'S PROJECTED OVER 30 YEARS.

MRS. WOOD: 30 YEARS, OKAY.

MR. WATTRAS: THAT'S A STANDARD TIME FRAME THAT WE LOOK AT THINGS --

MRS. WOOD: OKAY. RIGHT, I REMEMBER THAT CAME UP EARLIER.

MR. WATTRAS: -- WHEN WE DO COST ANALYSES,

AND THESE ARE PRESENT WORTH COSTS.

MRS. WOOD: OKAY.

MR. WATTRAS: THAT WOULD BE THE MONEY YOU'D HAVE TO SET ASIDE TODAY AND DRAW FROM.

ALTERNATIVE NUMBER FOUR IS SENDING IT DOWN TO -- THROUGH A SANITARY SEWER LINE DOWN TO HADNOT POINT WOULD BE ABOUT 1.3 MILLION. ALTERNATIVE FIVE -- THAT'S STILL BACKWARDS. I'M SORRY.

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MRS. WOOD: YEAH, IT'S GOING TO 82.

MR. WATTRAS: OR, ALTERNATIVE FIVE IS TO

COLLECT IT AND SEND IT DOWN TO SITE 82. THAT ONE IS ABOUT 1.4

MILLION. AND ALTERNATIVE SIX IS TO DO THE IN SITU STUDY, OR THE

IN SITU REMEDIATION; THAT WOULD BE ABOUT 1.3 MILLION. NOW --

MR. PAUL: EXCUSE ME, RAY, IS THERE A

MINIMUM AMOUNT OF ALTERNATIVES YOU HAVE TO COME UP WITH? I DON'T

KNOW IF YOU PROBABLY KNOW THIS ANSWER, BUT I KNOW YOU HAVE TO USE

ALTERNATIVES IN YOUR FEASIBILITY STUDIES.

MR. WATTRAS: MISSED YOUR QUESTION. I

COULDN'T HEAR YOU.

MR. PAUL: IS THERE A MINIMUM --

MR. WATTRAS: AMOUNT OF ALTERNATIVES?

MR. PAUL: RIGHT. I KNOW YOU HAVE TO USE

NOTHING AS ONE.

MR. WATTRAS: YOU ALWAYS HAVE TO USE NO

ACTION. YOU ALWAYS SHOULD CONSIDER A TREATMENT, TOTAL TREATMENT

ALTERNATIVE.

MR. PAUL: RIGHT.

MR. WATTRAS: YOU SHOULD ALWAYS CONSIDER A

CONTAINMENT ALTERNATIVE. I BELIEVE THOSE ARE AT LEAST THREE

ALTERNATIVES THAT YOU ALWAY HAVE TO CONSIDER. CONTAINMENT, TOTAL

REMEDIATION AND NO ACTION. AND INNOVATIVE -- WELL, TREATMENT IS

PREFERRED.

MS. TOWNSEND: YOU START LOOKING AT -- AT --

July 27, 1994
OF THOSE THREE OPTIONS, THEN YOU LOOK AT LANDFILL ON-SITE,
LANDFILL OFF-SITE. YOU GET INTO THOSE BREAK-UPS WHERE IT'S REALLY
THREE CATEGORIES.

MR. PAUL: I KNOW YOU GUYS ALWAYS DO A
REAL GOOD JOB OF PROPOSING QUITE A FEW ALTERNATIVES FOR US.

MR. WATTRAS: YEAH, THERE ARE CERTAIN ONES
THAT YOU ALWAYS HAVE TO CONSIDER, UNLESS THERE'S A SITUATION WHERE
YOU FIND OUT THAT YOU SAMPLE A SITE AND SOMETIMES YOU MIGHT -- YOU
DON'T EVEN NEED A FEASIBILITY STUDY IF YOU DETERMINE THAT, AFTER
SAMPLING, YOU DON'T HAVE A PROBLEM, THEN IT DOESN'T MAKE SENSE TO
DO A FEASIBILITY STUDY, BUT THAT'S KIND OF RARE.

AS I MENTIONED BEFORE, SOIL -- WE'RE NOT GOING TO DO
ANYTHING MORE TO THE SOIL. WE'RE DEALING WITH IT NOW, AND WHAT'S
REMAINING IS ACCEPTABLE. IT'S NOT AT HIGH LEVELS THAT'S GOING TO
CAUSE A PROBLEM.

GROUNDWATER, THE PROPOSED ALTERNATIVE HERE IS TO NOT
TREAT IT, BUT TO JUST PERFORM INSTITUTIONAL CONTROLS, AND I'LL
EXPLAIN A LITTLE BIT ABOUT THIS APPROACH.

THE INSTITUTIONAL CONTROLS WOULD INCLUDE AN ORDINANCE
RESTRICTION FOR PUTTING ANY SUPPLY WELLS IN THIS AREA. IT WOULD
INVOLVE LONG TERM GROUNDWATER MONITORING OF THE SHALLOW AND OF THE
DEEP AND OF A FEW OF THE SUPPLY WELLS.

COLONEL WOOD: WHAT IS LONG TERM?

MRS. WOOD: 30 YEARS.

MR. WATTRAS: IT WOULD BE 30 YEARS, BUT I,LL

July 27, 1994
QUALIFY THAT. EVERY FIVE YEARS -- WHEN YOU SELECT AN ALTERNATIVE
THAT IS NOT A FINAL REMEDY, IN OTHER WORDS, A CONTAINMENT
ALTERNATIVE, FOR EXAMPLE, OUT AT HADNOT POINT WHERE WE'RE
CONTAINING THAT PLUME, THAT'S NOT A FINAL REMEDY. EVERY FIVE
YEARS, UNDER CERCLA, IT'S A REQUIREMENT THAT YOU LOOK AT THE
PROBLEM AGAIN TO SEE IF THE ALTERNATIVE IS, NUMBER ONE, EFFECTIVE;
WHETHER IT'S EFFECTIVE FROM THE STANDPOINT THAT YOU ARE REDUCING
CONTAMINATION OR YOU'RE PREVENTING MIGRATION; OR IN SOME CASES,
YOU KNOW, I GUESS IT'S POSSIBLE THAT THINGS COULD GET WORSE IN
FIVE YEARS, THAT THE ALTERNATIVE THAT YOU SELECTED WASN'T THE BEST
ALTERNATIVE. BUT WHEN I SAY 30 YEARS, SAY IN FIVE OR TEN YEARS,
AND YOU HAVE TO DO THIS EVERY FIVE YEARS, IN TEN YEARS, WE MONITOR
THIS PROBLEM AND WE SEE THAT, OVER TIME, THESE ETHYLBENZENE AND
THE XYLENE HAS DECREASED IN CONCENTRATION TO THE POINT THAT
THEY'RE NOT A PROBLEM ANYMORE, IT WOULD BE DONE. SO,
THEORETICALLY 30 YEARS. POSSIBLY AS LITTLE AS FIVE YEARS,
SOMEBWHERE IN BETWEEN THERE.

MRS. WOOD: SO, WHEN THEY GET DOWN TO BELOW
STATE REQUIREMENTS --

MR. WATTRAS: BELOW STATE STANDARDS.

MRS. WOODS: -- THAT'S IT.

MR. WATTRAS: THE REASON WE SELECTED THIS
ALTERNATIVE AS OPPOSED TO TREATMENT IS, NUMBER ONE, THERE IS NO
RISK. WE'RE TALKING ABOUT A VERY SMALL POCKET OF GROUNDWATER.
WE'VE DISCUSSED BEFORE ABOUT THE FACT THAT THERE IS NO EXPOSURE

July 27, 1994
BECAUSE EVERYBODY'S GETTING THEIR WATER FROM THE SUPPLY WELL.

THE OTHER ASPECT HAS TO DO WITH THE CONTAMINANTS THEMSELVES, XYLENES AND ETHYLBENZENES, THEY'RE RELATED TO PETROLEUM PRODUCTS. OVER TIME, I MENTIONED THAT SAMPLES WERE FIRST BEING TAKEN IN THE MID-80S, CONCENTRATIONS HAVE BEEN DECREASING. WE HAVE A HANDLE ON THE LIMITED AREA OF CONTAMINATION. THESE ARE CONTAMINANTS THAT CAN, THROUGH NATURAL PROCESSES, BIODEGRADE IN THE AQUIFER. THEY ARE SEEING THAT AT A LOT OF SITES NOW WITH PETROLEUM. IF I'M NOT MISTAKEN, THE STATE -- MAYBE, PATRICK, I DON'T KNOW IF YOU CAN ADD ANYTHING TO THIS, THE STATE OF NORTH CAROLINA IS LOOKING AT A LOT OF PETROLEUM GROUNDWATER PROBLEMS WHERE THEY'RE LOOKING AT POSSIBLY JUST MONITORING THAT PROBLEM. IF IT'S A LOW LEVEL PROBLEM. I MEAN, OBVIOUSLY, WE'RE NOT TALKING ABOUT A MAJOR PROBLEM HERE WHERE THE STATE WOULD JUST SAY, "OH, LET'S JUST MONITOR IT."

BUT IN A SITUATION LIKE THIS WHERE YOU'RE JUST AT THE LEVELS, WE'RE LOOKING AT IT FROM THE STANDPOINT IT BECOMES REALLY NOT A FEASIBLE IDEA TO GO AHEAD IN THERE, INVEST ALL THAT CAPITAL TO START TREATING WHEN IT'S COST-EFFECTIVE TO JUST MONITOR THIS PROBLEM, WE THEN -- THEORETICALLY, WE'VE BEEN MONITORING IT SINCE THE MID-80S AND HAVE FOUND THAT THE LEVELS HAVE BEEN SLOWLY DECREASING, AND, DUE TO THE NATURE OF THESE CONTAMINANTS, WE BELIEVE, JUST THROUGH NATURAL ATTENUATION, THAT IT WILL CLEAN ITSELF UP THROUGH TIME.

MRS. WOOD: AND IT'S AN AREA WHERE YOU'VE

July 27, 1994
GOT TIME.

COLONEL WOOD: DO YOU HAVE AN APPROXIMATE DATE TO EXPECT IT MAY BE CLEAN?

MR. WATTRAS: NO, WE DO NOT. WE DON'T HAVE AN APPROXIMATE DATE. WE WILL BE MONITORING THIS, LIKE I SAID, OVER TIME, AND IN FIVE YEARS, WE'LL DO A PRETTY GO ANALYSIS OF WHAT HAS CHANGED WITHIN THE LAST FIVE YEARS.

THERE ARE MODELS, COMPUTER MODELS, THAT WE COULD THEORETICALLY COME UP WITH A DATE, BUT YOU KNOW WHAT, THAT'S A THEORETICAL MODEL, SO NOTHING'S GUARANTEED. MODELING IS VERY -- THERE'S A LOT OF GOOD ASPECTS ABOUT USING COMPUTER MODELS. YOU COULD USE IT IN THIS CASE, AND IT WILL POP OUT A NUMBER, BUT IT'S JUST GOING TO BE A BEST GUESS OF A NUMBER OF YEARS.

BUT AT THESE LEVELS, I WOULD BE, YOU KNOW, KIND OF SURPRISED IF A MODEL CAME OUT AND SAID IT'S GOING TO TAKE A HUNDRED YEARS, YOU KNOW. I THINK AT THESE LEVELS, BY JUST LEAVING THE PROBLEM GO AND SEEING THE DECREASE OVER TIME, THAT WE HAVE SEEN, THAT WE WOULD BE IN PRETTY GOOD SHAPE.

THAT CONCLUDES THIS OPERABLE UNIT, AND DO YOU HAVE ANY QUESTIONS?

MRS. WOOD: No, I JUST ENJOYED THIS VERY MUCH. WE APPRECIATE THIS.

(WHERE UPON, THESE PROCEEDINGS CONCLUDED AT 8:58 P.M.)

July 27, 1994
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC

EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/Base San LDFL (SITE 5)
USMC/Chem LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/15/1994
Operable Unit: 01
ROD ID: EPA/ROD/R04-94/195

Media: soil, groundwater

Contaminant: PCBs, pesticides
Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

The 236 square mile U.S. Marine Corps Camp Lejeune site is located in Onslow County, North Carolina. Camp Lejeune is bound on the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The site has been used since 1945 and is currently active. The water body receiving overland surface drainage is Brinson Creek.

Operable Unit 10, Site 35, the Fuel Farm at Camp Geiger, is located in the extreme southwest corner of Camp Lejeune and refers primarily to five 15,000 gallon aboveground storage tanks, a pump house, and a fuel loading pad. The aboveground storage tanks (AST) at Site 35 are currently used to dispense gasoline, diesel, and kerosene to government vehicles and to supply underground storage tanks in the area. A leak in the underground line from the ASTs to the dispensing island was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period. The leaking line was subsequently sealed and replaced. Reports of a release from an underground distribution line near one of the ASTs date back to 1957. The leak occurred as a result of damage to a dispensing pump, and it was estimated that thousands of gallons of fuel were released. Interceptor trenches were excavated and the captured fuel was ignited and burned. In addition, in April 1990, an undetermined amount of fuel was discovered along the unnamed drainage channels located to the north of the site. This fuel was believed to be an unauthorized discharge from an unidentified tanker truck. The Fuel Farm was scheduled to be decommissioned in 1994.

Operable Unit 5, primarily Site 2, covers approximately five acres and is bordered to the north by a wooded area that generally drains north toward Overs Creek; to the west by Holcomb Boulevard; and to the east by a water treatment plant. Within the site are two areas of concern. Building 712, which is the mixing and lawn areas, and the former storage area.

OU1 covers approximately 690 acres. OU1 is located approximately one mile east of the New River and two miles south of State Route 1. It is bounded by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Main Service Road to the southwest, and woodlands and Cogdels Creek to the southeast.
Site 21 has had a history of pesticide usage and reported transformer oil disposal. One portion of the site was used as a pesticide mixing area and as a cleaning area for pesticide application equipment from 1958 to 1977. Chemicals reportedly stored at this site included diazinon, chlordane, lindane, DDT, malathion, mirex, 2,4-D, silvex, and dalapon. The Former Transformer Oil Disposal Pit was located in the NE portion of the site. The pit was reportedly used as a disposal area for transformer oil between 1950 and 1951. The pit reportedly measured 25 to 30 feet long by 6 feet wide by 8 feet deep. The quantity of oil disposed in this pit is unknown.

Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980.

With respect to Site 78, the Hadnot Point Industrial Area (HPIA) was the first developed area at MCB, Camp Lejeune. It was comprised of approximately 75 buildings and facilities including: maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, and storage yards. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks, drums, and uncontained waste storage areas. It appears that several general building areas within Site 78 may be potential source areas of contamination.

From 1945 to 1958, Building 712 was used for storing, handling, and dispensing of pesticides. Building 712 was later used as a children's day care center. Currently the building houses administrative offices. Chemicals known to have been used include chlordane, DDT, diazinon, and 2,4-D. Chemicals known to have been stored on site include dieldrin, lindane, malathion, silvex, and 2,4,5-T. Contamination at the site is believed to have occurred as a result of small spills, washout and excess product disposal. The estimated quantity involved is on the order of 100 to 500 gallons of liquid containing various concentrations of product. Solid residues in cracks and crevasses may total 1 to 5 pounds. The former storage area was used to store bulk materials and vehicles.

During 1984 through 1987, Confirmation studies at OU1 were conducted which focused on potential source areas identified in the IAS. A groundwater study was conducted at the Hadnot Point Fuel Farm (Site 22) as part of the MCB, Camp Lejeune UST Program. A Supplemental Characterization Step was performed in 1980 and 1991 for Site 78 to further evaluate the extent of contamination in the deep
portion of the aquifer at the site and to characterize the contamination within the shallow soils at suspected source locations. A Remedial Investigation was conducted in 1991 to investigate shallow soils and the deeper portions of the aquifer at Site 78. An IRA RI and IRA Feasibility Study for the surficial aquifer at Site 78, and an RI for OU1 were initiated in 1993.

The proposed remedial action identified in this ROD is the overall final cleanup strategy for the entire operable unit in that it remedies both media of concern, ground water and soil. An IRA will be implemented to contain two plumes of contamination in the surficial aquifer at Site 78. Under this IRA, contaminated groundwater will be extracted and treated on-site within one of two groundwater treatment systems.

**Remedy:** The remedy includes collecting additional contaminated groundwater in the surficial aquifer through a series of extraction wells installed within two plume areas with the highest contaminant levels; treating the extracted groundwater for organics and inorganics removal via the treatment systems included under the IRA OU1; restricting the use of nearby water supply wells which are currently inactive/closed, and restricting the installation of any new water supply wells within the OU area; implementing a long-term ground water monitoring program to monitor the effectiveness of the groundwater remedy and to monitor nearby potable water supply wells; excavating approximately 1,050 cubic yards of soil primarily contaminated with PCBs and pesticides for off-site dis

**Text:** Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 01
ONSLOW COUNTY, NC
09/15/1994
FINAL

RECORD OF DECISION
FOR OPERABLE UNIT NO.1
(SITES 21, 24, and 78)

MARINE CORPS BASE,
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0177

SEPTEMBER 8, 1994

Prepared For:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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Site Name and Location
Operable Unit No. 1 (Sites 21, 24, and 78)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose
This decision document presents the selected remedy for Operable Unit (OU) No. 1 (Sites 21, 24, and 78) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The selected remedy specified in this document was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the operable unit.

The Department of the Navy (DON) and the Marine Corps have obtained concurrence from the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Assessment of the Sites
Actual or threatened releases of hazardous substances from this operable unit consisting of three sites, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of Selected Remedy
The selected remedy for OU No. 1 is the final action to be conducted at the three sites. Separate from this final action, an interim remedial action (IRA) will be implemented to contain two plumes of contaminated groundwater in the surficial aquifer at Site 78. Under the IRA, contaminated groundwater will be extracted and treated on site within one of two groundwater treatment systems. The treated water will be discharged to the Hadnot Point Sewage Treatment Plant (STP). The design of the IRA has been completed and implementation is planned for 1994. The selected final remedial action included in this ROD addresses the principal threats remaining at the operable unit by treating contaminated groundwater and soils.

The principal threats include the potential ingestion of contaminated groundwater within OU No. 1, and the potential exposure to contaminated soil from limited areas within Site 21 and Site 78. The primary goals of the selected remedy are: (1) to prevent current or future exposure to the contaminated groundwater and contaminated soils, (2) to remediate groundwater contamination for future potential use of the aquifer, and (3) to treat or remove contaminated soils from designated areas of concern (AOCs).

The major components of the selected remedy, not including the IRA, for OU No. 1 include:

- Collecting additional contaminated groundwater in the surficial aquifer through a series of extraction wells installed within two plume areas with the highest contaminant levels.
- Treating the extracted groundwater for organics and inorganics removal via the treatment systems included under the IRA for OU No. 1.
- Restricting the use of nearby water supply wells which are currently inactive/closed, and restricting the installation of any new water supply wells within the operable unit area.
• Implementing a long-term groundwater monitoring program to monitor the effectiveness of the groundwater remedy and to monitor nearby potable water supply wells.

• Excavating approximately 1,050 cubic yards of soil primarily contaminated with polychlorinated biphenyls (PCBs) and pesticides for off-site disposal.

**Statutory Determinations**

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 or provides adequate justification for not complying with the requirements, and is cost-effective. In addition, this remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. A five-year review will be necessary for this remedial action to ensure complete groundwater remediation.

_____________________________  _________________________
Signature (Commanding General, MCB Camp Lejeune)                Date
1.0 SITE LOCATION AND DESCRIPTION

Marine Corps Base (MCB), Camp Lejeune is a training base for the United States Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB, Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

The study area, operable unit (OU) No. 1, is one of 13 operable units within MCB Camp Lejeune. An "operable unit," as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is a discrete action that comprises an incremental step toward comprehensively addressing site problems. The cleanup of a site can be divided into a number of operable units depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action. With respect to MCB, Camp Lejeune, operable units were developed to combine one or more individual sites where Installation Restoration Program (IRP) activities are or will be implemented. The sites which are combined into a operable unit share a common element. As the case with OU No. 1, Sites 21, 24, and 78 are geographically close.

OU No. 1 covers an area of approximately 690 acres. OU No. 1 is located approximately one mile east of the New River and two miles south of State Route 24 (see Figure 1). The operable unit is bordered by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Main Service Road to the southwest, and woodlands and Cogdels Creek to the southeast.

Site 21, which is identified as Transformer Storage Lot 140, is located within the northwest section of Site 78. The site is bordered by Ash Street to the southwest, Center Road to the southeast, and a wooded area to the northwest. Figure 2 presents a site plan of Site 21. A dirt road surrounds most of the site along with surface drainage ditches. The southern and central portions of the site (approximately 220 feet by 900 feet) include several fenced-in areas, while the northern section (approximately 500 feet long) is an open area. A water tower is located in the fenced portion of the site. Surface cover within the site consists of gravel, sandy soil, and concrete with a few vegetated areas. In the northern portion of the site, a small area, slightly depressed in elevation, is evident. This may have been the reported former transformer oil disposal pit.

The southern portion of the site is periodically utilized for storage by Marine Corps Reserve units. Currently this portion of the site is being used for storage of military vehicles.

A few potential areas of concern exist within Site 21, as shown on Figure 2. The two primary areas of concern are the Former Pesticide Mixing/Disposal Area and the Former PCB Transformer Disposal Area. As shown on Figure 2, the Former Pesticide Mixing/Disposal Area is located in the southwestern portion of the site, and the Former Transformer PCB Disposal Area is located in the northeastern portion of the site. With the exception of a low depressed area at the northern portion of the site, there are no visual signs of waste disposal throughout the site.

Site 24, which is referred to as the Industrial Fly Ash Dump, is located adjacent to the southeast portion of Site 78. Specifically, the site is located south and east of the intersection of Birch and Duncan Streets and extends south toward Cogdels Creek. Figure 3 presents a site plan of Site 24, with suspected areas of former disposal shown. The site is primarily a wooded area, approximately 100 acres in size, that is somewhat overgrown. The site is hilly and unpaved with site drainage toward Cogdels Creek. Dirt roads are interspersed throughout, which lead to the suspected disposal areas. The roads are periodically utilized for military vehicle maneuvers. Several areas indicating past disposal activities are evident throughout the site (i.e., surficial deposits of fly ash and mounding). Site 24 is not currently used for the disposal of wastes.

Site 78, which is referred to as the Hadnot Point Industrial Area or HPIA, is located adjacent to the northwest portion of Site 24 and houses the industrial area of MCB, Camp Lejeune. This area is comprised of maintenance shops, warehouses, painting shops, printing shops, auto body shops, and other similar industrial facilities. In general, the HPIA is defined as the
area bounded by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Duncan Street to the southeast, and Main Service Road to the southwest. Figure 4 presents a plan view of Site 78 and the approximate site boundary. The site boundaries for Sites 21 and 24 are also shown on this figure. The location of the Hadnot Point Fuel Farm (Site 22) is shown although it is not a part of the operable unit addressed in this Record of Decision (ROD). Site 78 covers approximately 590 acres. The majority of the site area is paved (e.g., roadways, parking lots, loading dock areas, and storage lots), however, there are many small lawn areas associated with individual buildings within the site and along lengthy stretches of roadways. In addition, there are several acres of woods in the southern portion of the site. Recreational ballfields and a parade ground are located in the southwest corner of the site.

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2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

This section of the ROD provides background information on each of the three sites' history and enforcement actions taken to date. Specifically, the land use history of each of the sites and the previous investigations which have been conducted are briefly discussed below.

Site History

Site 21

Site 21 has had a history of pesticide usage and reported transformer oil disposal. One portion of the site was used as a pesticide mixing area and as a cleaning area for pesticide application equipment from 1958 to 1977. This area, the Former Pesticide Mixing/Disposal Area, appears to be located throughout the southern portion of the site. Chemicals reportedly stored at this site included diazinon, chlordane, lindane, DDT, malathion (46% solution), mirex, 2,4-D, silvex, dalapon and dursban. In 1977, before these mixing/cleaning activities were moved to a different location, overland discharge of washout fluids was estimated to be approximately 350 gallons per week. It is not clear for how long this discharge of washout fluids occurred. The Former Transformer Oil Disposal Pit was located in the northeastern portion of the site. The pit was reportedly used as a diaposal area for transformer oil during a one year period between 1950 and 1951. The pit reportedly measured 25 to 30 feet long by 6 feet wide by 8 feet deep. Sand was occasionally placed in the pit when oil was found standing in the bottom of the pit. The total quantity of oil disposed in this pit is unknown. A small area, slightly depressed in elevation, which may be the former oil pit, is evident in the northern portion of Site 21.

Site 24

Site 24 was used for the disposal of fly ash, cinders, solvents, used paint stripping compounds, sewage sludge, and water treatment spiractor sludge from the late 1940s to 1980. Spiractor sludge from the wastewater treatment plant and sewage sludge from the sewage treatment plant were reportedly disposed at this site since the late 1940s. Construction debris was reportedly disposed at the site in the 1960s. During 1972 to 1979, fly ash and cinders were dumped on the ground surface, and solvents used to clean out boilers were poured onto these piles. Furniture stripping wastes were also reported to be disposed in this area. Due to these past waste disposal activities, there are five primary areas of concern within Site 24: the Spiractor Sludge Diaposal Area; the Fly Ash Disposal Area; the Borrow and Debris Disposal Area; and two Buried Metal Areas.

Site 78

With respect to Site 78, the HPIA was the first developed area at MCB, Camp Lejeune. It was comprised of approximately 75 buildings and facilities including maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, and storage yards. Due to the industrial nature of the site, many spills and leaks have occurred over the years. Most of these spills and leaks have consisted of petroleum-related products and solvents from underground storage tanks (USTs), drums, and uncontained waste storage areas. It appears that several general building areas within Site 78 may be potential source areas of contamination.

Previous Investigations
Initial Assessment Study

In 1983 an Initial Assessment Study (IAS) was conducted at MCB, Camp Lejeune which identified a number of areas within the facility, including Sites 21 and 24, as potential sources of contamination. Site 78 was later added to the list of sites to be further evaluated. As a result of this study, the DON initiated further investigations at these sites.

Confirmation Study

During 1984 through 1987, Confirmation Studies at OU No. 1 were conducted which focused on potential source areas identified in the IAS. The results of the Confirmation Study conducted for Site 21 indicated that the soil within the site may be contaminated with pesticides and possibly polychlorinated biphenyls (PCBs). Groundwater at Site 21 did not appear to be impacted. The results of the Confirmation Study conducted for Site 24 indicated that several metals were present in the groundwater. Metals were also detected in the surface water and sediment samples collected from Cogdels Creek. The Confirmation Study results for Site 78 indicated that the shallow groundwater near the Hadnot Point Fuel Farm (Site 22) was contaminated with fuel-related volatile organic compounds (VOCs) such as benzene and toluene. In addition, VOCs such as trichloroethene (TCE), benzene, trans-1,2-dichloroethene (T-1,2-DCE), and tetrachloroethylene (PCE) were detected in nearby water supply wells. As a result, four supply wells were immediately shut down by Camp Lejeune utilities staff.

The groundwater results from Site 78 triggered additional investigations under the Confirmation Study. The results from these additional investigations indicated there were several primary potential source areas for waste solvent and fuel-related material throughout Site 78. Groundwater samples indicated that three primary zones of contamination were present in the shallow portion of the aquifer, centered in the vicinity of Building 902 (northeast area of the site), Site 22, and Building 1601 (southwest area of the site).

Groundwater Study at Hadnot Point Fuel Farm

A groundwater study was conducted at the Hadnot Point Fuel Farm (Site 22) as part of the MCB, Camp Lejeune UST Program. Although this study was conducted for Site 22 and not Site 78, the results are applicable to Site 78 given the proximity of the sites (Figure 4). The fuel farm consisted of several USTs which had contained either diesel fuel, leaded gasoline, unleaded gasoline, or kerosene. The study concluded that fuel losses of gasoline/fuels had occurred predominantly through leaks in the transfer lines or valves. Laboratory analyses indicate that the floating product has contributed significant levels of dissolved petroleum compounds including benzene, toluene, ethylbenzene, xylene (BTEX) into the groundwater. Trace levels of non-petroleum VOCs including TCE and PCE were also detected within the fuel farm area. Based on these results, a product recovery/groundwater treatment system was designed for the fuel farm. The system began operation in the latter part of 1991.

Supplemental Characterization Step

A Supplemental Characterization Step was performed in 1990 and 1991 for Site 78 to further evaluate the extent of contamination in the deep portion of the aquifer at the site and to characterize the contamination within the shallow soils at suspected source locations. The soil sample results from this study detected VOCs and a few semivolatile organic compounds (SVOCs) near Building 902. Fuel-related VOCs were detected near Building 1202. Pesticides were detected near Buildings 1103 and 1601. PCBs and pesticides were identified near Building 1300. The results of the shallow groundwater sampling yielded similar results as with the previous studies. The results from the intermediate and deep monitoring wells indicated that BTEX constituents were detected downgradient of the fuel farm and at other areas of the site.

Remedial Investigation for the Shallow Soils and Castle Hayne Aquifer

A Remedial Investigation (RI) was conducted in 1991 to investigate shallow soils and the deeper portions of the aquifer (the Castle Hayne aquifer) at Site 78. This RI did not involve any additional field investigations. The RI was conducted using data from the previous Confirmation Study and Supplemental Characterization Step. The RI report concluded that while TCE and other VOCs were the primary concern during the soil gas survey, these compounds were detected in only a few of the soil samples collected. The only TCE detected in soils appeared to be associated
with an UST at Building 902, which reportedly was used to store spent solvents. The detected SVOCs were fuel related and fit with the use of the area (Building 1202) for vehicle repairs and maintenance. Many of the metals detected were found in all samples analyzed and therefore, may be indicative of the naturally occurring soil matrix and associated clays.

Interim Remedial Action Remedial Investigation and Feasibility Study for the Surficial Aquifer

Baker Environmental, Inc. (Baker) conducted an IRA RI and IRA Feasibility Study (FS) for the surficial aquifer at Site 78. The RI report used the data from previous investigations only; no additional field studies were conducted. The IRA RI report concluded that three contaminant plumes were identified within the surficial aquifer at Site 78; however, one plume was associated with the Hadnot Point Fuel Farm (Site 22) which is being remediated under a separate investigative program. The second plume was located east of Cedar Street and extended from the vicinity of the 902/903 Building area to the tank farm. The plume exhibited solvent contamination (e.g., TCE) and low levels of fuel-related contamination (e.g., BTEX). The third plume was believed to originate in the vicinity of Buildings 1502, 1601, and 1602. This plume was contaminated with the same constituents as the second plume with the addition of lead.

As part of the IRA RI, a qualitative risk assessment (RA) was performed to identify receptors and exposure pathways, quantify exposure levels, and evaluate human and/or environmental risk. The qualitative RA concluded that benzene and TCE could impact human health if shallow groundwater were to migrate into the deep aquifer (used as a source of potable water), or if the surficial aquifer were to be utilized in the future as a potable water source.

Based on the results of the IRA RI for the surficial aquifer, Baker prepared an IRA FS Report. The IRA FS developed and evaluated several IRA alternatives for the impacted shallow groundwater. The preferred alternative as presented in the Proposed Remedial Action Plan (PRAP) for OU No. 1 involved two on-site pump and treat systems to contain the two fuel/solvent-contaminated plumes at the site. Following extraction, the groundwater was to be treated on site via air stripping, carbon adsorption, and metals removal, then discharged to the Hadnot Point Sewage Treatment Plant (STP). This IRA alternative was accepted by the United States Environmental Protection Agency (USEPA), the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR), and the public. The extraction/treatment systems have been designed and construction will be initiated in 1994.

Remedial Investigation for OU No.1

An RI for OU No. 1 was initiated by Baker in 1993. The RI field investigations commenced in April 1993 and continued through December 1993. The field program initiated at OU No. 1 consisted of a soil gas survey; a preliminary site survey; a soil investigation which included drilling and sampling, a groundwater investigation which included well installation and sampling; test pit sampling; and a surface water/sediment investigation. A human health RA and ecological RA were also conducted as part of this RI. The results of the RI are summarized in Section 5.0 - Site Characteristics and Section 6.0 - Summary of Site Risks of this document.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Final RI Report for OU No. 1 at MCB, Camp Lejeune, North Carolina was released to the public on June 24, 1994. The Final FS Report and the Final PRAP were released to the public on July 25, 1994. These documents were made available to the public at an information repository maintained at the Onslow County Public Library and at Camp Lejeune, Building 67, Room 237. The notice of availability of the PRAP and RI/FS documents was published in the "Jacksonville Daily News" during the period July 21 to 27, 1994. A public comment period was held from July 27, 1994, to August 27, 1994. In addition, a public meeting was held on July 27, 1994. At this meeting, representatives from DON/Marine Corps discussed the remedial action alternatives (RAAs) currently under consideration and addressed community concerns. Response to the comments received during the comment period is included in the Responsiveness Summary (Section 11.0), which is part of this ROD.

This decision document presents the Final RAAs for OU No. 1 at MCB, Camp Lejeune, North Carolina, chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the NCP. The selected decision for OU No. 1 is based on the
4.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The proposed remedial action identified in this ROD is the overall final cleanup strategy for the entire operable unit in that it remediates both media of concern groundwater and soil. The contaminated groundwater plumes will be remediated along with contaminated soils. An IRA will be implemented to contain two plumes of contamination in the surficial aquifer at Site 78. Under this IRA, contaminated groundwater will be extracted and treated on site within one of two groundwater treatment systems. The treated water will be discharged to the Hadnot Point STP. Design for this IRA has been completed and implementation is planned for 1994. Implementation of the proposed remedial action in conjunction with the IRA will reduce the potential for the migration of contamination, which in turn will reduce risks to human health and to the environment. Documents on the IRA are located at the information repository maintained at the Onslow County Public Library and at MCB, Camp Lejeune.

Surface water and sediment will not be addressed under this action for the following reasons:

- The overall risk to human health posed by either Cogdels Creek or Beaver Dam Creek is acceptable.
- Potential adverse impacts to terrestrial organisms at OU No. 1 appear to be low.
- There are no known spawning and nursery areas for resident fish species within Cogdels or Beaver Dam Creeks, therefore, there is no potential for decreased viability of fish spawning or nursing.

5.0 SITE CHARACTERISTICS

This section of the ROD presents an overview of the nature and extent of contamination at OU No. 1 with respect to known or suspected sources of contamination, types of contamination, and affected media. Based on the results of the RI, there are several potential sources of contamination throughout OU No. 1. The nature and extent of the contamination identified at three sites and the two nearby surface water bodies, Cogdels and Beaver Dam Creek, are itemized below.

Site 21 - Transformer Storage Lot 140

Soils

Pesticides and PCBs were the dominant contaminants detected in soils at Site 21. The majority of the pesticides were detected in surface soils collected in the vicinity of the Former Pesticide Mixing/Disposal Area. Detected concentrations of pesticides ranged from 4.6 microgram per kilogram (μg/kg) to 34,000 μg/kg. The pesticides were detected in an area covering approximately 150,000 square feet.

PCBs, specifically PCB-1260, were present primarily in surface soils in the vicinity of the Former PCB Transformer Disposal Area (approximately 20,000 square feet). PCBs were also detected in two other areas of the site. The maximum detected concentration was 4,600 μg/kg.

VOCs and SVOCs were not extensively found in Site 21 soils.

Groundwater

VOCs in the groundwater at Site 21 were primarily detected in the northeastern portion of the site. Concentrations of TCE, benzene, toluene, ethylbenzene, and total xylenes (BTEX) were detected at this area above Federal and/or State standards. Based on the distribution of groundwater contaminants at this site, the groundwater contamination is most likely related to Site 78, specifically the edge of a contaminated groundwater plume located near the 901/903 Series buildings (note that Site 21 is located within Site 78). Pesticides and PCBs, which were found extensively in site soils, were not detected in the groundwater at Site 21.

Metals were the most prevalent contaminants in shallow groundwater at Site 21. Concentrations of
arsenic, cadmium, chromium, beryllium, lead, nickel and manganese were found above Federal drinking water standards and/or North Carolina groundwater standards in seven of the eight wells sampled. It is important to note that elevated metal concentrations have been detected in shallow groundwater throughout MCB, Camp Lejeune.

Surface Water and Sediments

Surface water present at the site (only in the northern section of the site) did not appear to be contaminated. Pesticides and PCBs were the dominant contaminants present in sediments collected from the drainage ditch surrounding Site 21. The highest pesticide levels were detected at locations downgradient of the suspected pesticide mixing area, along the southwestern portion of the site (along approximately 600 feet of the drainage ditch). The concentrations of the pesticides detected in this area ranges from 20 µg/kg to 3,500 µg/kg. PCBs were detected near the Former PCB Transformer Disposal Area. The detected PCB concentrations ranged from 43 µg/kg to 120 µg/kg.

Site 24 - Industrial Fly Ash Dump

Soils

Analytical results indicated that pesticides and metals were the predominant contaminants detected in the soils at Site 24. The low pesticide levels detected at the site appear to be the result of historical pest control spraying activities rather than disposal due to their relatively low concentrations and widespread detections (the highest detected pesticide concentration was 350 µg/kg). The highest concentrations of metals in surface and subsurface soils were detected within the Fly Ash Disposal Area and one of the Buried Metal Areas (an area covering approximately 180,000 square feet). Arsenic, beryllium, copper, chromium, lead, and manganese were detected at levels above base-specific background levels. Some of these metals concentrations were comparable to those detected at Sites 21 and 78.

Test pit samples, which were collected in the vicinity of the Buried Metal Areas and the Fly Ash Disposal Area, were tested for leachability via Resource Conservation Recovery Act (RCRA) Toxicity Characteristics Leaching Procedure (TCLP). The samples tested yielded results below the TCLP regulatory levels indicating that the soils are not RCRA characteristically hazardous. Additionally, the soils classified as nonhazardous under RCRA for ignitability, corrosivity, and reactivity. Low levels of TCE, pesticides, and several metals were detected in some of the test pit samples.

Groundwater

The analytical findings indicated that metals were the predominant contaminants detected in the shallow groundwater at Site 24. The metals that were detected above the Federal drinking water standards and/or State groundwater standards included: arsenic, chromium, lead, manganese, cadmium, mercury, and nickel. The metals concentrations detected in the shallow groundwater at Site 24 were similar to the metals concentrations detected at Site 21 and Site 78.

The pesticide, heptachlor epoxide, was detected in the shallow groundwater at Site 24 near the Spirator Sludge Disposal Area and south of the Fly Ash Disposal Area. Although the concentrations of heptachlor epoxide appeared to be low, they exceeded the State groundwater standard. It is relevant to note that low levels of heptachlor epoxide (5.0 µg/kg) was detected in only one soil sample collected at the site.

Site 78 - HPIA

Soils

Soil samples were collected around six building areas within Site 78. The buildings were selected based on previous investigation findings and from the results of the geophysical survey conducted within Site 78 to locate suspected USTs. The soil around the suspected UST at Building 903 was primarily contaminated with SVOCs. The detected SVOC concentrations in the surface and subsurface soil samples ranged from 74 µg/kg to 2,600 µg/kg. The extent of the contamination appeared to be limited to the suspected UST area.
Pesticides and SVOCs were the primary contaminants detected in the soil samples collected around Building 1103. (Pesticides were detected in this area during a previous study.) Detected pesticide concentrations ranged from 9.7 µg/kg to 19,000 µg/kg. Detected SVOC concentrations ranged from 46 µg/kg to 1,700 µg/kg. The impacted area appeared to be limited, less than 2,000 square feet.

Although PCBs were expected to be found in the soils near Building 1300, only one detection was found. The PCB concentration (100 µg/kg) does not appear to present a contamination problem at this building area.

Pesticides were the primary contaminants detected in the soils around Building 1502. Detected pesticide concentrations ranged from 6.2 µg/kg to 16,000 µg/kg. A limited area (approximately 400 square feet) at the northeastern side of the building had the highest level of pesticide contamination. These pesticide levels are higher than typical levels, but disposal is not documented.

The soils sampled near Buildings 1601 and 1608 did not appear to be impacted.

Groundwater

The analytical findings indicated that shallow groundwater at Site 78 was impacted by organics and metals. The primary organic contaminants were VOCs, including: BTEX, PCE, TCE, vinyl chloride, 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), T-1,2-DCE, and 1,2-dichloropropane. The highest concentrations of these compounds were detected in wells located near the northeastern portion of Site 78 in the vicinity of the 901/903 buildings and in the southwestern portion of the site near Buildings 1601 and 1709. There was no particular area which exhibited excessive metals contamination since the entire site (as with Sites 21 and 24) appeared to be impacted.

The intermediate wells sampled at Site 78 exhibited low levels of VOCs and only a few metals which exceeded Federal and/or State standards. Benzene, TCE, 1,2-DCE, vinyl chloride, and dichloromethane were the most prevalent VOCs detected. The highest VOC concentrations were found in the northeastern and southern portions of the site. Several SVOCs, including naphthalene, acenaphthene, and carbazole were detected in one well in the northern portion of Site 78. Beryllium, cadmium, lead, manganese, and nickel concentrations in the northeastern portion of the site exceeded the Federal and/or State groundwater standards.

Benzene, 1,2-DCE, cis-1,2-DCE, T-1,2-DCE, and TCE were the only organics detected in the deep wells sampled at Site 78. Benzene was detected near Buildings 903, 1301, and 1709. The other volatiles were detected near Building 903, in between Buildings 1103 and 1301, and near Building 1709.

Contamination levels in the shallow groundwater appear to have decreased over time. An increase in contamination levels in some of the deeper wells has been noted.

Cogdels Creek and the New River

Copper, lead, and zinc were detected throughout Cogdels Creek and the New River at concentrations above Federal and/or State surface water standards. No trends were detected. The highest concentrations were detected near the Hadnot Point STP.

The most prevalent contaminants found in Cogdels Creek and New River sediments were polynuclear aromatic hydrocarbon (PAH) compounds, pesticides (particularly 4,4’-DDD), and several inorganics (e.g., lead and zinc). No trends or source areas were identified.

Beaver Dam Creek

The only contaminants that were present in Beaver Dam Creek surface water were inorganics. The inorganics that exceeded Federal and/or State surface water standards included copper, lead, and zinc. No trends or source areas could be identified.

The most prevalent contaminants found in Beaver Dam Creek sediments were PAHs, pesticides, and inorganics (lead was the only inorganic to exceed sediment screening values).
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Notes: CC/NR = Cogdels Creek and New River  
BDC = Beaver Dam Creek
No trends or source areas could be identified.

6.0 SUMMARY OF SITE RISKS

As part of the RI, a baseline human health RA and an ecological RA were conducted to evaluate the current or future potential risks to human health and the environment resulting from the presence of contaminants identified at OU No. 1. A summary of the key findings from both of these studies is presented below.

Human Health Risk Assessment

The human health RA was conducted for several environmental media including soil (surface and subsurface), groundwater, surface water, and sediments. Contaminants of concern (COCs) for each of these media were selected based on prevalence, mobility, persistence, and toxicity. Table 1 lists the potential COCs which were evaluated in the RA for each media. For soil, the potential COCs included pesticides, PCBs, and inorganics. For groundwater, the potential COCs included VOCs, one SVOC (phenol), and inorganics. Surface water COCs included one VOC (TCE) and inorganics. Sediment COCs included PAHs, pesticides, and inorganics.

The exposure routes evaluated in the RA included: ingestion, dermal contact, and particulate inhalation of surface soils; ingestion and dermal contact of subsurface soils; future potential ingestion, dermal contact, and inhalation of VOCs in groundwater; and ingestion and dermal contact of surface water and sediments. Several exposed populations were evaluated in the RA with respect to both current and future potential land use scenarios for the operable unit. For surface soil and groundwater, current military personnel and future on-site residents (adults and children) were retained as potentially exposed populations. Site construction workers were retained as potentially exposed populations for subsurface soils. Future potential adult and adolescent residents were retained for surface water and sediment exposures.

As part of the RA, incremental cancer risks (ICRs) and hazard indices (HIs) were calculated for each of the exposure routes and potentially exposed populations. An ICR refers to the cancer risk that is over and above the background cancer risk in unexposed individuals. For example, an ICR of 1.0E-04 means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure to site contaminants if no actions are conducted. The HI refers to noncarcinogenic effects and is a ratio of the level of exposure to an acceptable level for all COCs. A HI greater than or equal to unity (i.e., 1.0) indicates that there may be a concern for noncarcinogenic health effects. A summary of the site risks in terms of ICRs and HIs calculated for OU No. 1 are presented on Table 2.

With respect to OU No. 1, all of the exposure routes/exposure populations evaluated had ICRs within the USEPA's acceptable risk range of 1.0E-04 to 1.0E-06 except for groundwater. The ICRs which were found above this acceptable range are summarized as follows and are highlighted on Table 2. Groundwater at OU No. 1 had calculated ICRs of 7E-04 and 2E-03 for future on-site resident children, and future on-site resident adults, respectively.

The HIs were below 1.0 except for groundwater. The calculated HI values for groundwater were 29 and 13 for future on site resident children and future on-site resident adults, respectively.
<table>
<thead>
<tr>
<th>Receptors</th>
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<tr>
<td>Cogdell Creek</td>
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</tbody>
</table>

(1) ICR = incremental lifetime cancer risk  
(2) HI = hazard index  
(3) NA = not applicable

Note: The shaded areas identify the ICRs and HIs which are above the acceptable levels.
As shown on Table 2, the only ICRs and HIs above the acceptable levels are related to future residential land use. Based on the MCB, Camp Lejeune Master Plan, OU No. 1 is to remain as an industrial area in the future. No residential developments are planned for any of the site areas. Therefore, the RA presents a conservative risk estimate.

It is important to note that actual or threatened releases of hazardous substances from OU No. 1, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

Ecological Risk Assessment

An ecological RA was conducted at OU No. 1 in conjunction with the RI. The objectives of this RA were to determine if past reported disposal activities are adversely impacting the ecological integrity of Cogdels Creek and Beaver Dam Creek; and to evaluate the potential effects on sensitive environments at the operable unit such as wetlands, protected species, and fish nursery areas.

The ecological RA was conducted for several environmental media including surface water, sediments, and soil. Table 3 lists the COCs which were identified and assessed in the ecological RA for each media. Surface water COCs included one VOC (TCE), and inorganics. Sediment COCs included PAHs, pesticides, and inorganics. For soil, the potential COCs included PAHs, pesticides, PCBs, and inorganics.

The aquatic environment was assessed in the ecological RA. Based on the potential habitat, and other physical characteristics, the most significant populations of aquatic organisms at OU No. 1 were in Cogdels Creek and Beaver Dam Creek since the surface water in the drainage ditch at Site 21 was either shallow or nonexistent, and intermittent in flow.

Chromium, copper, lead, and zinc were the only COCs detected in the surface water in Cogdels Creek at concentrations that exceeded any of the water quality standards. These same four constituents, along with silver, several PAHs and pesticides were detected in sediments at concentrations that potentially may decrease the viability of aquatic life. The PAH and pesticide concentrations may be related to past disposal practices. However, the pesticide concentration in Cogdels Creek may also be due to the widespread pesticide spraying that has occurred at MCB, Camp Lejeune.
### TABLE 3

**SUMMARY OF CONTAMINANTS OF CONCERN EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT**

**RECORD OF DECISION - CTO-0177**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Surface Water</th>
<th>Sediments</th>
<th>Surface Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC/NR BDC</td>
<td>CC/NR BDC</td>
<td>Site 21 Site 24 Site 78</td>
</tr>
</tbody>
</table>

**Contaminant of Concern**

**Volatile**

- Trichloroethene

**Semivolatile**

- Phenanthrene
- Anthracene
- Carbazole
- Fluoranthene
- Pyrene
- Benzo(a)anthracene
- Chrysene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(a)pyrene
- Indeno(1,2,3-cd)pyrene
- Benzo(g,h,i)perylene

**Pesticide**

- 4,4'-DDE
- 4,4'-DDD
- 4,4'-DDT
- Dieldrin
- alpha-Chlordane
- gamma-Chlordane

**PCBs**

- Aroclor - 1254
- Aroclor - 1260

**Notes:** CC/NR = Cogdels Creek and New River  
BDC = Beaver Dam Creek
### TABLE 3 (Continued)

#### SUMMARY OF CONTAMINANTS OF CONCERN EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT RECORD OF DECISION - CTO-0177

**MCB CAMP LEJEUNE, NORTH CAROLINA**

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<th>Sediments</th>
<th>Surface Soils</th>
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<td>Site 21 Site 24 Site 78</td>
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</table>

**Notes:** CC/NR = Cogdels Creek and New River  
BDC = Beaver Dam Creek
Copper and zinc were the only COCs detected in surface water at Beaver Dam Creek that exceeded any of the water quality standards. Lead, several PAHs and several pesticides were detected in sediment samples from Beaver Dam Creek.

Overall, pesticides appear to be the most significant site related COCs that have the potential for decreasing the viability of aquatic organisms at OU No.1. There is some aquatic life inhabiting Cogdels Creek and Beaver Dam Creek including fish, tadpoles, and benthic macroinvertebrates. In addition, some terrestrial invertebrates probably inhabit the undeveloped areas within OU No.1. Pesticides are not only potentially toxic to aquatic life through a direct exposure pathway, but as indicated by their high bioconcentration factor value, they have a high potential to bioconcentrate pesticides in organisms. Therefore, other fauna that feed upon these organisms will be exposed to pesticides via this indirect exposure pathway.

The terrestrial environment was assessed in the ecological RA. Based on the soil toxicity data for plants and terrestrial invertebrates (earthworms), lead and chromium were detected in concentrations that potentially may decrease the viability of terrestrial invertebrates and floral species at Site 21. Lead and chromium, along with beryllium, copper, mercury, and vanadium were detected in concentrations that potentially may decrease the viability of terrestrial invertebrates and floral species at Site 24. At Site 78, lead and chromium were once again detected in concentrations that potentially may decrease the viability of terrestrial invertebrates and floral species, along with beryllium and zinc. Other terrestrial organisms (e.g., rabbits, birds, deer) may be exposed to contaminants in the surface soils and surface water by ingestion. Overall, pesticides appear to be the most significant site-related COCs that have the potential for decreasing the viability of terrestrial organisms at OU No. 1. Potential adverse impacts to these threatened or endangered species from contaminants at OU No. 1 appear to be low.

No wetlands were identified within OU No. 1 from available wetland maps, although some wetland areas border the tributaries to Cogdels Creek.

There are no known spawning and nursery areas for resident fish species within Cogdels Creek or Beaver Dam Creek. Therefore, there is no potential for decreased viability of fish spawning or nursing in Cogdels Creek or Beaver Dam Creek.

With respect to surface water and groundwater, fish, crab, benthic macroinvertebrates, birds, and other aquatic and terrestrial life were evaluated as potentially exposed populations. Bottom feeding fish and crabs, benthic macroinvertebrates, aquatic vegetation, and other aquatic life were evaluated with respect to sediment exposure. For soil, terrestrial species were evaluated as the potentially exposed population.

It is important to note that actual or threatened releases of hazardous substances from OU No. 1, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

7.0 DESCRIPTION OF ALTERNATIVES

Several Remedial Action Alternatives (RAAs) have been developed to address the contaminated groundwater and/or soils at various areas of concern (AOCs) within OU No. 1. The AOCs were identified based on a comparison of the media-specific contaminant concentrations detected at the operable unit to the media-specific remediation levels developed in the FS. The AOCs identified for OU No. 1 include:

- VOC-contaminated plume located near the 900-Series Building area within Site 78 (referred to as Groundwater AOC 1).
- Three small areas of groundwater contamination (PCE only) located throughout Site 78 (Groundwater AOCs 2, 4, and 8).
- A fuel-contaminated plume located near the Hadnot Point Fuel Farm (Groundwater AOC 3).
- A VOC-contaminated plume located near the 1600 and 1700 Series Building area of Site 78 (Groundwater AOC 5).
• Two areas of groundwater contamination located within Site 24 (heptachlor epoxide only) (Groundwater AOCs 6 and 7).

• Northern portion of Site 21 with elevated levels of PCBs in soil (Soil AOC 1).

• Southwest portion of Site 21 with elevated PCB concentrations in surface soil (Soil AOC 2).

• Southwest portion of Site 21 with elevated pesticides concentrations in surface soil (Soil AOC 3).

• Northeastern edge of Building 1502 within Site 78 with elevated levels of pesticides in surface soil (Soil AOC 4).

Figures 5 and 6 show the general location of the above-mentioned AOCs for groundwater and soil, respectively.

Based on the AOCs identified above, five groundwater RAAs and four soil RAAs were developed and evaluated in the FS.

It is important to note that the groundwater RAAs only include remediation of the groundwater from Groundwater AOCs 1 and 5. No additional remedial actions, other than long-term monitoring, will be performed for Groundwater AOCs 2, 3, 4, 6, 7, and 8 under any of the Groundwater RAAs. This decision for most of the AOCs was based on the low contaminant concentrations, the lack of a source area, the technical impracticality of remediation, and the lack of human health or environmental exposure. For example, PCE at a concentration of 1.0 \( \mu \text{g/L} \) was the only contaminant found above the remediation levels at Groundwater AOCs 2, 4, and 8. The State groundwater standard for PCE is 0.7 \( \mu \text{g/L} \) and the Federal drinking water standard is 5.0 \( \mu \text{g/L} \). Since the detected level of PCE was below the Federal standard and only slightly above the State standard, additional monitoring of these areas appears to be the most appropriate measure at this time. If the monitoring indicates that the groundwater at these areas is deteriorating, additional measures will be taken. Once the remediation levels have been obtained for these areas, monitoring will no longer be necessary.

With respect to Groundwater AOCs 6 and 7, only one contaminant, heptachlor epoxide, was detected in the groundwater samples. The detected concentrations of this contaminant were 0.083 \( \mu \text{g/L} \) at 24GW08, 0.13 \( \mu \text{g/L} \) at 24GW09, and 0.078 \( \mu \text{g/L} \) at 24GW10. The State groundwater standard for heptachlor epoxide is 0.038 \( \mu \text{g/L} \) and the Federal drinking water standard is 0.20 \( \mu \text{g/L} \). The detected levels were all below the Federal standard, but exceeded the State standard. There is no known source for this pesticide or any known history of the disposal of this contaminant. As with Groundwater AOCs 2, 4, and 8, additional monitoring of Groundwater AOCs 6 and 7 appears to be the most appropriate measure at this time. If monitoring indicates that the groundwater at these areas is deteriorating, additional measures will be taken. Once the remediation levels have been obtained at these two areas, monitoring will no longer be necessary.

No additional actions will be implemented at Groundwater AOC 3 since this is the area of the Hadnot Point Fuel Farm (Site 22). A fuel recovery system/groundwater treatment is currently operating at this area. Investigations/remediations related to the Fuel Farm are being handled under the UST Program not CERCLA. Therefore, only monitoring will be conducted near this area.

A brief overview of each of the RAAs per media is included below. All costs and implementation times are estimated.

Groundwater RAAs
The following groundwater RAAs were developed and evaluated for OU No. 1:

- RAA No. 1 No Action
- RAA No. 2 Institutional Controls
- RAA No. 3 Source Control (Interim Action Treatment System Extension)
- RAA No. 4 Source Control (Air Sparging)
- RAA No. 5 Source Control and Vertical Containment

Common Elements - All of the Groundwater RAAs will have a few common components. Specifically, the components of the IRA to be implemented at Site 78 will be included under all of the Groundwater RAAs. RAA Nos. 2 through 5 have several common remedial elements between them including aquifer-use restrictions, deed restrictions, and long-term monitoring of existing monitoring wells. Each of the common elements are briefly discussed below.

The IRA includes the installation of two groundwater pump and treat systems within Site 78, a long-term groundwater monitoring program, and institutional controls. The primary objective of the IRA is to contain the migration of two shallow groundwater plumes located within Site 78. In terms of the FS for the entire operable unit, the IRA will contain the shallow groundwater contamination from Groundwater AOCs 1 and 5.

The IRA groundwater treatment systems will include air stripping, carbon adsorption, oil/water separation, and metals removal. One treatment system is to be located within the northeast contaminated plume (Groundwater AOC 1). Four extraction wells will be initially installed near the downgradient edge of this plume. The second treatment system is to be located within the southwest contaminated plume (Groundwater AOC 5). Five extraction wells will be initially installed along the downgradient edge of this second plume. Approximately three to five gallons of groundwater per minute are anticipated to be extracted from each well. Each of the treatment units will be designed to handle a maximum influent of 80 gallons per minute (gpm).

In addition to the pump and treat systems, the IRA will include a long-term groundwater monitoring program. Under this program, 20 existing monitoring wells will be sampled for the contaminants of concern (i.e., VOCs and inorganics) on a quarterly basis. As shown on Figure 7 in green text and listed below, the wells to be monitored include 16 shallow monitoring wells, two intermediate wells, and two deep wells.

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<td>78GW22-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78GW23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78GW24-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>78GW25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The institutional controls under the interim action include placing aquifer-use restrictions on the shallow aquifer and keeping the closed water supply wells out of service.

Under RAA Nos. 2 through 5, aquifer-use restrictions will be remain on water supply wells HP-601, HP-602, HP-608, HP-634, and HP-637. Deed restrictions restricting the placement of additional water supply wells within the entire OU No. 1 will also be included with these four RAAs.

<IMG SRC 0494195F>
In addition to the twenty wells included under the long-term monitoring program for the IRA for Site 78, an additional five shallow monitoring wells and the nearby water supply wells will also be included under a long-term monitoring program for the groundwater RAA Nos. 2, 3, 4, and 5. The five shallow monitoring wells will include: 78GW15, 78GW39, 24GW08, 24GW09, and 24GW10. Several of these wells are associated with the newly identified Groundwater AOCs. Both active and inactive water supply wells will be monitored. The active supply wells include HP-603, and HP-642. The inactive supply wells to be monitored include HP-601, HP-602, HP-608, HP-630, HP-634, and HP-637. Additional wells may be added to the monitoring program, if necessary.

For the monitoring wells included in the long-term program but not included under the IRA, samples will be collected on a semiannually basis for five years and analyzed for Target Compound List (TCL) VOCs, Target Analyte List (TAL) inorganics, total dissolved solids (TDS) and total suspended solids (TSS). As required, after five years the operable unit will be re-evaluated to determine the effectiveness of the implemented remedial action. Based on the semiannual groundwater data and the data from the IRA, a less frequent sampling program may be implemented (such as annually), or it may be determined that sampling is no longer required at certain areas. In time, the results of the monitoring program may indicate that one or more of the currently inactive water supply wells can be considered for use.

The Groundwater RAAs will only include active remediation of the groundwater from Groundwater AOCs 1 and 5. No additional remedial actions, other than the long-term monitoring, will be performed for Groundwater AOCs 2, 3, 4, 6, 7, and 8 under any of the Groundwater RAAs. As previously discussed, this decision for most of the AOCs was based on the contaminant concentrations and since no apparent source(s) were identified (e.g., PCE was the only contaminant detected at three of the Groundwater AOCs at levels above the State groundwater standard). If the monitoring indicates that the groundwater at these areas is deteriorating, additional measures will be taken. This will be evaluated every five years. Once the remediation levels have been obtained for these areas, monitoring will no longer be necessary.

No additional actions will be implemented at Groundwater AOC 3 since this is the area of the Hadnot Point Fuel Farm (Site 22). A fuel recovery system/groundwater treatment is currently operating at this area. Investigations/remediations related to the Fuel Farm are being handled under the UST Program, not CERCLA. Therefore, only monitoring will be conducted near this area.

A description of the remaining remedial actions associated with each alternative as well as the estimated cost and timeframe to implement the alternative follows:

- **RAA No. 1: No Action**
  
  Capital Cost: $0  
  Annual Operation and Maintenance (O&M) Costs: $0  
  Net Present Worth (NPW): $0  
  Months to Implement: None

The No Action RAA is required under CERCLA to be evaluated through the nine point evaluation criteria summarized on Table 4. This RAA provides a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented (note that the IRA to contain the migration of two shallow plumes and prevent exposure to groundwater contamination would still be implemented under this RAA).

- **RAA No. 2: Institutional Controls**
  
  Capital Cost $0  
  Annual O&M Costs: $26,000 for Years 1 through 5, $13,000 for Years 6 through 30  
  NPW: $260,000  
  Months to Implement: 3-6

Under RAA No. 2, no additional remedial actions will be performed to reduce the toxicity, mobility, or volume of the contaminants at OU No. 1. This RAA will include only the common institutional controls of monitoring, ordinances or directives preventing the operation of nearby supply wells, and access restrictions for prohibiting construction of potable supply wells.
TABLE 4

GLOSSARY OF EVALUATION CRITERIA

• Overall Protection of Human Health and Environment - addresses whether or not an alternative 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 or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs) or other Federal and State environmental statutes.

• Long-term Effectiveness and Permanence - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

• Reduction of Toxicity, Mobility, or Volume through Treatment - entails the anticipated performance of the treatment options that may be employed in an alternative.

• Short-term Effectiveness - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

• Implementability - entails the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.

• Cost - includes capital and operation and maintenance costs. For comparative purposes, presents present worth values.

• USEPA/State Acceptance - Evaluates the technical and administrative issues and concerns the USEPA and State have regarding each of the alternatives. This criterion is addressed in the ROD once comments on the RI/FS report and PRAP have been received.

• Community Acceptance - Evaluates the issues and concerns the public may have regarding each of the alternatives. This criterion is addressed in the ROD once the comments on the RI/FS reports and the PRAP have been received.
• **RAA No. 3: Source Control (Interim Remedial Action Treatment System Extension)**

  - **Capital Cost:** $180,000
  - **Annual O&M Costs:** $30,000 for Years 1 through 5, $15,000 for Years 6 through 30
  - **NPW:** $460,000
  - **Months to Implement:** 10

In general, RAA No. 3 is a source control alternative with the primary objective to remediate the source(s) of shallow groundwater contamination. Under this alternative three additional shallow extraction wells will be installed at areas exhibiting the highest VOC contamination. The contaminated groundwater will be pumped to the interim action groundwater treatment systems. Two of the extraction wells will be installed near existing monitoring wells 78GW24-1 and 78GW23 within Groundwater AOC 1. The third extraction well will be installed near existing monitoring well 78GW09-1 within Groundwater AOC 5. The extraction wells will be designed the same as for the interim action wells (i.e., 6-inch minimum diameter, approximately 35 feet deep). Based on site geology, it is anticipated that the wells will produce three to five gpm of water.

No extraction wells will be placed in the deeper portions of the aquifer under this alternative. It is believed that once the contaminants in the source of deep groundwater contamination (i.e., the shallow aquifer) are removed and treated, the contaminant levels in the deeper portions of the aquifer will be reduced in time. Deeper extraction wells could actually draw the existing shallow contamination down into the deeper portions of the aquifer, and thereby increase the vertical extent of the contaminant plume. The deeper aquifer will be monitored to determine the effectiveness of the RAA.

• **RAA No. 4: Source Control (Air Sparging)**

  - **Capital Cost:** $230,000
  - **Annual O&M Costs:** $110,000 for Years 1 through 5
  - **NPW:** $690,000
  - **Months to Implement:** 12

In general, RAA No. 4 is a source control alternative with the primary objective to remediate the highly contaminated shallow aquifer, which is the source of deep groundwater contamination. Under this alternative, two in situ air sparging/soil venting treatment systems will be installed at areas of the highest VOC contamination. One of the units will be installed near existing monitoring well 78GW24-1 (Groundwater AOC 1). The other treatment system will be installed near existing monitoring well 78GW09-1 (Groundwater AOC 5).

The treatment systems will be designed to primarily treat the shallow (source) contamination. It is believed that once the source of contamination (the shallow aquifer) is remediated, the contaminant levels in the deeper portions of the aquifer will be reduced in time.

• **RAA No. 5: Source Control and Vertical Containment**

  - **Capital Cost:** $310,000
  - **Annual O&M Costs:** $32,000 for Years 1 through 5, $16,000 for Years 6 through 30
  - **NPW:** $615,000
  - **Months to Implement:** 15

In general, RAA No. 5 is a source control and vertical containment alternative with the primary objectives to remediate the source(s) of groundwater contamination and to mitigate the vertical migration of the contamination. The source control component of this alternative is the same as with RAA No. 3. In such, three additional shallow extraction wells will be installed at areas of the highest VOC contamination and connected to the interim action groundwater treatment systems. Two of the extraction wells will be installed near existing monitoring wells 78GW24-1 and 78GW23 within Groundwater AOC 1. The third extraction well will be installed near existing monitoring well 78GW09-1 within Groundwater AOC 5. The extraction wells will be designed the same as for the IRA wells (i.e., 6-inch minimum diameter, approximately 35 feet deep). Based on site geology, it is anticipated that the wells will produce a flow of approximately three to five gpm.
The vertical containment component of this alternative included the installation of two extraction wells at the areas of the highest VOC contamination in the deeper portions of the aquifer at OU No. 1. One of the wells will be installed near existing monitoring well 78GW24-3 within Groundwater AOC 1. The second extraction well will be installed near existing monitoring wells 78GW4-2 and 78GW4-3 within Groundwater AOC 5. The extraction wells will be 6-inch minimum diameter and installed at approximately 75 feet below ground surface.

Soil RAAs

The following Soil RAAs were developed and evaluated for OU No.1:

- RAA No.1 No Action
- RAA No.2 Capping
- RAA No.3 On-Site Treatment
- RAA No.4 Off-Site Treatment/Disposal

A description of each alternative as well as the estimated cost and timeframe to implement the alternative follows:

- RAA No. 1:  No Action
  
  Capital Cost:  $0
  Annual O&M Costs:  $0
  NPW:  $0
  Months to Implement:  None

The No Action RAA is required under CERCLA to establish a baseline for comparison. Under this RAA, no further action at the operable unit will be implemented to prevent exposure to contaminated soil.

- RAA No. 2:  Capping
  
  Capital Cost:  $260,000
  Annual O&M Costs:  $60,000 for 30 years
  NPW:  $1.2 million
  Months to Implement:  6

In general, Soil RAA No. 2 includes the installation of an asphalt or concrete cap over the contaminated soil areas within Site 21 and Site 78. The thickness of the cap will be approximately four to eight inches. To ensure the integrity of the capping system, periodic maintenance (e.g., applying a sealant over asphalt) will be required. In order to monitor the effectiveness of the cap (i.e., the prevention of migration of the COCs), groundwater sampling will be conducted semiannually. Groundwater samples will be collected from six monitoring wells: 21GW01, 21GW02, 21GW03, 21GW04, 78GW09-1, and 78GW10. The capped areas will be fenced to restrict access to the capped areas and reduce damage to the caps. New fencing may not be required for Soil AOC 3. This RAA will require approximately 900 linear feet of new chain-link fence to be installed. The fence will be of sufficient height and construction so as to limit access to the area. In addition, "No Trespassing" signs will be posted along the fences to further deter access. Routine maintenance and repairs of the fence, as necessary, are also included under this RAA. In addition to the fence, deed restrictions restricting the use of the area in and around the capped areas will be implemented. Any soil excavated during potential future construction activities will require appropriate disposal in accordance with applicable Federal and State regulations.

The objectives of this RAA are to prevent the potential for direct contact with the soils, and to prevent the potential for the horizontal or vertical migration of contaminants via storm water infiltration.
• RAA No. 3: On-Site Treatment
  
  Capital Cost: $650,000 (incineration); $1.4 million (dechlorination)
  Annual O&M Costs: $0
  NPW: $650,000 (incineration); $1.4 million (dechlorination)
  Months to Implement: 8-12

RAA No. 3 includes the excavation of up to 1,050 cubic yards of contaminated soil from Soil AOCs 1 through 4 and treatment on site via either chemical dechlorination, or incineration. Following treatment, any residual soils will be removed from the treatment unit, analyzed, and if permitted (based on final treatment levels), used as backfill at the site. If not permitted, the treated soils will be properly disposed off site. The excavated areas will be graded to conform to the surrounding terrain. Clean fill may be added to the excavated areas as necessary to bring the areas up to grade. The excavated areas will be revegetated.

! RAA No. 4: Off-Site Treatment/Disposal

  Capital Cost: $480,000 (disposal); $1.3 million (treatment)
  Annual O&M Costs: $0
  NPW: $480,000 (disposal); $1.3 million (treatment)
  Months to Implement: 8-12

Soil RAA No. 4 includes the excavation of soil from all of the Soil AOCs (1,050 cubic yards) and off-site treatment and/or disposal. The treatment/disposal facility will have to be permitted to accept low levels (i.e., less than 50 parts per million) of PCBs and pesticides.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the Groundwater and Soil RAAs using the nine evaluation criteria in order to select a site remedy. Tables 5 and 6 present a summary of this detailed analysis for Groundwater RAAs and Soil RAAs, respectively. A brief summary of each RAA's strengths and weaknesses with respect to the evaluation criteria follows. A glossary of the evaluation criteria has previously been noted on Table 4.
### TABLE 5
**SUMMARY OF DETAILED ANALYSIS - GROUNDWATER RAA**
**RECORD OF DECISION CTO-0177**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
<th>RAA No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Control</td>
<td>No Action</td>
<td>Institutional Controls</td>
<td>Remedial Action Treatment (System Extension)</td>
<td>Source Control</td>
<td>Source Control and Vertical Containment</td>
</tr>
<tr>
<td>OVERALL PROTECTIVENESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Health Protection</td>
<td>Potential risks associated with groundwater exposure are mitigated due to the interim remedial action and long-term monitoring program.</td>
<td>Potential risks associated with groundwater exposure are mitigated due to the interim remedial action and long-term monitoring program.</td>
<td>Although treatment is employed, aquifer is not usable until remediation levels are met. The alternative is protective of public health by implementing institutional controls (i.e., monitoring and restrictions on potable supply wells).</td>
<td>Although treatment is employed, aquifer is not usable until remediation levels are met. The alternative is protective of public health by implementing institutional controls (i.e., monitoring and restrictions on potable supply wells).</td>
<td>Although treatment is employed, aquifer is not usable until remediation levels are met. The alternative is protective of public health by implementing institutional controls (i.e., monitoring and restrictions on potable supply wells).</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>Migration of contamination is reduced via the interim remedial action.</td>
<td>Migration of contamination is reduced via the interim remedial action.</td>
<td>Migration of contaminated groundwater is reduced by pump and treat.</td>
<td>Migration of contaminated groundwater is reduced by in situ treatment.</td>
<td>Migration of contaminated groundwater is reduced by pump and treat.</td>
</tr>
</tbody>
</table>

### COMPLIANCE WITH ARARs

<table>
<thead>
<tr>
<th></th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
<th>RAA No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical-Specific ARARs</td>
<td>Will exceed Federal and/or NC groundwater quality ARARs.</td>
<td>Will exceed Federal and/or NC groundwater quality ARARs.</td>
<td>Since organic and total metals above State and Federal standards will remain untreated in some portions of the operable unit, a Corrective Action Plan will need to be prepared in accordance with Title 15A NCAC 2L.0106(k) and (1). These portions are outside of the primary VOC plumes. All other chemical-specific ARARs will be met over time.</td>
<td>Since organic and total metals above State and Federal standards will remain untreated in some portions of the operable unit, a Corrective Action Plan will need to be prepared in accordance with Title 15A NCAC 2L.0106(k) and (1). These portions are outside of the primary VOC plumes. All other chemical-specific ARARs will be met over time.</td>
<td>Since organic and total metals above State and Federal standards will remain untreated in some portions of the operable unit, a Corrective Action Plan will need to be prepared in accordance with Title 15A NCAC 2L.0106(k) and (1). These portions are outside of the primary VOC plumes. All other chemical-specific ARARs will be met over time.</td>
</tr>
<tr>
<td>Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
</tr>
<tr>
<td>Action-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs.</td>
</tr>
</tbody>
</table>
### SUMMARY OF DETAILED ANALYSIS—GROUNDWATER RAA RECORD OF DECISION CTO-0177

**McB Camp Lejeune, North Carolina**

<table>
<thead>
<tr>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
<th>RAA No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>Institutional Controls</td>
<td>Source Control (Interim Remedial Action Treatment System Extension)</td>
<td>Source Control (Air Sparging)</td>
<td>Source Control and Vertical Containment</td>
</tr>
<tr>
<td><strong>Evaluation Criteria</strong></td>
<td><strong>Source Control</strong></td>
<td><strong>Interim Remedial Action Treatment</strong></td>
<td><strong>System Extension</strong></td>
<td><strong>Long-Term Effectiveness and Permanence</strong></td>
</tr>
<tr>
<td>Magnitude of Residual Risk</td>
<td>Risk reduced via the interim remedial action.</td>
<td>Shallow groundwater in the operable unit that will not be addressed pose no current risk since the shallow aquifer is not utilized for potable supply. Future use of the shallow aquifer is unlikely due to poor transmissivity. The long term effectiveness of pump and treat is unknown. Contaminant levels may decrease in time, but could potentially increase if the extraction/treatment system is shut down. Institutional controls will prevent residual risk.</td>
<td>Shallow groundwater in the operable unit that will not be addressed pose no current risk since the shallow aquifer is not utilized for potable supply. Future use of the shallow aquifer is unlikely due to poor transmissivity. The long term effectiveness of pump and treat is unknown. Contaminant levels may decrease in time, but could potentially increase if the extraction/treatment system is shut down. Institutional controls will prevent residual risk.</td>
<td>Shallow groundwater in the operable unit that will not be addressed pose no current risk since the shallow aquifer is not utilized for potable supply. Future use of the shallow aquifer is unlikely due to poor transmissivity. The long term effectiveness of pump and treat is unknown. Contaminant levels may decrease in time, but could potentially increase if the extraction/treatment system is shut down. Institutional controls will prevent residual risk.</td>
</tr>
<tr>
<td>Adequacy and Reliability of Controls</td>
<td>Not applicable - no additional controls.</td>
<td>Institutional controls are reliable to prevent potential human health exposure. Periodic operation and maintenance and monitoring will ensure that the treatment system is effective.</td>
<td>Institutional controls are reliable to prevent potential human health exposure. Periodic operation and maintenance and monitoring will ensure that the treatment system is effective.</td>
<td>Institutional controls are reliable to prevent potential human health exposure. Periodic operation and maintenance and monitoring will ensure that the treatment system is effective.</td>
</tr>
<tr>
<td>Need for 5-year Review</td>
<td>Review would be required to ensure adequate protection of human health and the environment is maintained.</td>
<td>Review not needed once remediation levels are met.</td>
<td>Review not needed once remediation levels are met.</td>
<td>Review not needed once remediation levels are met.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
</tr>
<tr>
<td>---------------------</td>
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<td>-----------</td>
</tr>
<tr>
<td>Source Control</td>
<td>No Action</td>
<td>Institutional Controls</td>
<td>Source Control (Interim)</td>
<td>Source Control (Remedial Action Treatment System Extension)</td>
</tr>
<tr>
<td>RAA No. 1</td>
<td></td>
<td></td>
<td>RAA No. 4</td>
<td>RAA No. 5</td>
</tr>
<tr>
<td>Treatment Process Used</td>
<td>No additional treatment other than the IRA treatment system.</td>
<td>No additional treatment other than the IRA treatment system.</td>
<td>Treatment train for metals removal, air stripping, and activated carbon.</td>
<td>In addition to IRA treatment train, includes air sparging and soil vapor extraction.</td>
</tr>
<tr>
<td>Amount Destroyed or Treated</td>
<td>Contaminants in groundwater at the outer edges of two plumes.</td>
<td>Contaminants in groundwater at the outer edges of two plumes.</td>
<td>Majority of contaminants in groundwater plumes.</td>
<td>Majority of contaminants in groundwater.</td>
</tr>
<tr>
<td>Reduction of Toxicity, Mobility or Volume</td>
<td>Reduced volume and toxicity of contaminated groundwater via the IRA.</td>
<td>Reduced volume and toxicity of contaminated groundwater via the IRA.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
<td>Reduced volume and toxicity of contaminated groundwater.</td>
</tr>
<tr>
<td>Residuals Remaining After Treatment</td>
<td>Source areas will be a continuing source of contamination.</td>
<td>Source areas will be a continuing source of contamination.</td>
<td>Potentially minimal residuals after goals are met.</td>
<td>Potentially minimal residuals after goals are met.</td>
</tr>
<tr>
<td>SHORT TERM EFFECTIVENESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Protection</td>
<td>Risks to community not increased by remedy implementation.</td>
<td>Risks to community not increased by remedy implementation.</td>
<td>Minimal, if any, risks during extraction and treatment.</td>
<td>Possible migration of toxic vapors, should be controlled with the soil vapor extraction system.</td>
</tr>
<tr>
<td>Worker Protection</td>
<td>No significant risk to workers.</td>
<td>No significant risk to workers.</td>
<td>Protection required during treatment.</td>
<td>Protection required during treatment.</td>
</tr>
</tbody>
</table>
### TABLE 5 (Continued)

**SUMMARY OF DETAILED ANALYSIS - GROUNDWATER RAAs**

**RECORD OF DECISION CTO-0177**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>RAA No. 1</th>
<th>Source Control</th>
<th>Institutional Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>No Action</td>
<td>Continued impacts from existing conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Environmental Impacts: Continued environmental concern.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time Until Action is Complete: Estimated 30 years.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability to Construct and Operate: No significant difficulties are anticipated to construct or operate the system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability to Monitor Effectiveness: Adequate system monitoring.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Availability of Services and Capacities: None required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Costs: $0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RAA No. 2</th>
<th>Source Control (Interim Remedial Action Treatment System Extension)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Controls</td>
<td>Aquifer drawdown during extraction.</td>
</tr>
<tr>
<td></td>
<td>Possible migration of toxic vapors, should be controlled with the soil vapor extraction system.</td>
</tr>
<tr>
<td></td>
<td>Potential vertical migration of contaminants may occur via remediation of the Castale Hayne aquifer.</td>
</tr>
<tr>
<td></td>
<td>Will require a pilot study.</td>
</tr>
<tr>
<td></td>
<td>Adequate system monitoring.</td>
</tr>
<tr>
<td></td>
<td>Services and materials are available.</td>
</tr>
<tr>
<td></td>
<td>Costs: $240,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RAA No. 3</th>
<th>Source Control (Remedial Action Treatment System Extension)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Control</td>
<td>Aquifer drawdown during extraction.</td>
</tr>
<tr>
<td>Remedial Action Treatment</td>
<td>Continued impacts from existing conditions.</td>
</tr>
<tr>
<td>System Extension</td>
<td>Water table drawdown during extraction.</td>
</tr>
<tr>
<td></td>
<td>Environmental Impacts: Continued environmental concern.</td>
</tr>
<tr>
<td></td>
<td>Time Until Action is Complete: Estimated 30 years.</td>
</tr>
<tr>
<td></td>
<td>Ability to Construct and Operate: No significant difficulties are anticipated to construct or operate the system.</td>
</tr>
<tr>
<td></td>
<td>Ability to Monitor Effectiveness: Adequate system monitoring.</td>
</tr>
<tr>
<td></td>
<td>Availability of Services and Capacities: None required.</td>
</tr>
<tr>
<td></td>
<td>Costs: $460,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RAA No. 4</th>
<th>Source Control (Air Sparging)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Sparging</td>
<td>Aquifer drawdown during extraction.</td>
</tr>
<tr>
<td></td>
<td>Continued impacts from existing conditions.</td>
</tr>
<tr>
<td></td>
<td>Environmental Impacts: Continued environmental concern.</td>
</tr>
<tr>
<td></td>
<td>Time Until Action is Complete: Estimated 5 years.</td>
</tr>
<tr>
<td></td>
<td>Ability to Construct and Operate: No significant difficulties are anticipated to construct or operate the system.</td>
</tr>
<tr>
<td></td>
<td>Ability to Monitor Effectiveness: Adequate system monitoring.</td>
</tr>
<tr>
<td></td>
<td>Availability of Services and Capacities: None required.</td>
</tr>
<tr>
<td></td>
<td>Costs: $690,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RAA No. 5</th>
<th>Source Control and Vertical Containment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Control and Vertical Containment</td>
<td>Aquifer drawdown during extraction.</td>
</tr>
<tr>
<td>Source Control</td>
<td>Continued impacts from existing conditions.</td>
</tr>
<tr>
<td>Vertical Containment</td>
<td>Environmental Impacts: Continued environmental concern.</td>
</tr>
<tr>
<td></td>
<td>Time Until Action is Complete: Estimated 30 years.</td>
</tr>
<tr>
<td></td>
<td>Ability to Construct and Operate: No significant difficulties are anticipated to construct or operate the system.</td>
</tr>
<tr>
<td></td>
<td>Ability to Monitor Effectiveness: Adequate system monitoring.</td>
</tr>
<tr>
<td></td>
<td>Availability of Services and Capacities: None required.</td>
</tr>
<tr>
<td></td>
<td>Costs: $615,000</td>
</tr>
</tbody>
</table>

### IMPLEMENTABILITY

- **RRA No. 1**: Will require a pilot study.
- **RRA No. 2**: Will require a pilot study.
- **RRA No. 3**: Will require a pilot study.
- **RRA No. 4**: Will require a pilot study.
- **RRA No. 5**: Will require a pilot study.
<table>
<thead>
<tr>
<th>Evaluation</th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERALL PROTECTIVENESS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>No reduction in risk to ecological receptors.</td>
<td>Would reduce potential for exposure and migration.</td>
<td>Reduces overall risk to ecological receptors.</td>
<td>Reduces overall risk to ecological receptors.</td>
</tr>
<tr>
<td><strong>COMPLIANCE WITH ARARs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical-Specific ARARs</td>
<td>Will exceed ARARs.</td>
<td>Will exceed ARARs.</td>
<td>Will meet contaminant-specific ARARs.</td>
<td>Will meet ARARs.</td>
</tr>
<tr>
<td>Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
<td>Will meet location-specific ARARs.</td>
</tr>
<tr>
<td>Action-Specific ARARs</td>
<td>Not applicable.</td>
<td>Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs.</td>
<td>Will meet action-specific ARARs.</td>
</tr>
<tr>
<td><strong>LONG-TERM EFFECTIVENESS AND PERMANENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnitude of Residual Risk</td>
<td>Source has not been removed. Potential risks not reduced.</td>
<td>Contaminated soils are not removed from the site, but potential risk due to exposure to COCs are reduced as long as the cap is maintained.</td>
<td>Soil AOCs will be remediated. Remaining contaminants do not present an unacceptable human health or environmental risk.</td>
<td>Contaminated soil is removed from the site. No residual wastes will remain onsite.</td>
</tr>
<tr>
<td>Adequacy and Reliability of Controls</td>
<td>Not applicable - no controls.</td>
<td>Multilayered cap controls contaminated soil - can be a reliable option if maintained properly.</td>
<td>Soil will be treated to meet risk-based action levels. Treated soil will be analyzed to ensure that remediation levels are met.</td>
<td>No residual wastes will remain onsite. Wastes will be treated offsite and disposed of in a suitable landfill.</td>
</tr>
<tr>
<td>Need for 5-year Review</td>
<td>Review would be required to ensure adequate protection of human health and the environment is maintained.</td>
<td>Review would be required to ensure adequate protection of human health and the environment is maintained.</td>
<td>Review not needed unless the treatment process last longer than five years.</td>
<td>Review not needed since contaminated soil removed.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>REDUCTION OF TOXICITY,</strong> <strong>MOBILITY, OR VOLUME THROUGH TREATMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Process Used</td>
<td>None.</td>
<td>None.</td>
<td>Chemical dechlorination, or incineration.</td>
<td>Off-site treatment</td>
</tr>
<tr>
<td>Amount Destroyed or Treated</td>
<td>None.</td>
<td>None.</td>
<td>Majority of soil COCs.</td>
<td>Majority of soil COCs.</td>
</tr>
<tr>
<td>Reduction of Toxicity, Mobility or Volume</td>
<td>None.</td>
<td>No reduction in toxicity or volume.</td>
<td>Reduction in toxicity, mobility and volume of contaminated soil.</td>
<td>Reduction in toxicity, mobility and volume of contaminated soil.</td>
</tr>
<tr>
<td>Residuals Remaining After Treatment</td>
<td>Not applicable - no treatment.</td>
<td>Contaminated soil is capped.</td>
<td>Residuals remaining on site will be below remediation goals.</td>
<td>No residuals will remain onsite.</td>
</tr>
<tr>
<td><strong>SHORT-TERM EFFECTIVENESS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Protection</td>
<td>Risks to community not increased by remedy implementation.</td>
<td>Temporary potential risks during soil grading and cap installation activities.</td>
<td>Limited potential risks during soil excavation and treatment activities.</td>
<td>Limited potential risks during soil excavation and transport activities.</td>
</tr>
<tr>
<td>Worker Protection</td>
<td>No significant risks to workers.</td>
<td>Temporary potential risks during soil grading and cap installation activities.</td>
<td>Potential risks during soil excavation and treatment activities.</td>
<td>Potential risks during excavation and transportation activities.</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>Continued impacts from existing conditions.</td>
<td>No additional environmental impacts.</td>
<td>Air quality and odors - but treatment system will be designed to meet standards.</td>
<td>No additional environmental impacts.</td>
</tr>
<tr>
<td>Time Until Action is Complete</td>
<td>Not applicable.</td>
<td>Less than one year. Monitor for 30 years.</td>
<td>Less than one year.</td>
<td>Less than one year.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>IMPLEMENTABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to Construct and Operate</td>
<td>No construction or operation activities.</td>
<td>Simple to construct and maintain. Requires materials handling procedures.</td>
<td>Requires soil excavation activities. Requires assembly of treatment systems.</td>
<td>Requires soil excavation activities. No other on-site operations.</td>
</tr>
<tr>
<td>Ability to Monitor Effectiveness</td>
<td>No monitoring included.</td>
<td>Cap maintenance and groundwater monitoring will adequately monitor effectiveness.</td>
<td>Adequate system monitoring.</td>
<td>No monitoring other than confirmation soil sampling.</td>
</tr>
<tr>
<td>Availability of Services and Capacities; Equipment</td>
<td>None required.</td>
<td>No special services or equipment required. Cap materials should be readily available.</td>
<td>Qualified vendors available to perform on-site treatment.</td>
<td>Off-site treatment and disposal facilities should have adequate capacity.</td>
</tr>
<tr>
<td>COSTS</td>
<td>NPV</td>
<td>$1.2 million</td>
<td>$650,000 (incineration)</td>
<td>$480,000 (disposal)</td>
</tr>
<tr>
<td>NPV</td>
<td>0</td>
<td>$1.2 million</td>
<td>$650,000 (incineration)</td>
<td>$480,000 (disposal)</td>
</tr>
</tbody>
</table>
Overall Protection of Human Health and the Environment

All of the groundwater RAAs evaluated in the detailed evaluation will provide adequate protection of human health and the environment. At a minimum, all of the RAAs will contain the horizontal migration of the shallow contamination within Groundwater AOCs 1 and 5. The No Action RAA will provide protection through the implementation of the IRA. In addition, all of the RAAs except RAA No. 1 will provide protection via applying aquifer-use and deed restrictions RAA Nos. 3, 4, and 5 provide additional protection since the primary sources of contamination are remediated.

Although, initially RAA No. 5 appears to present a more complete remediation plan (i.e., remediating both the surficial and the deeper portions of the aquifer), it may not provide the most protection to human health and the environment. Since the primary source of groundwater contamination is in the surficial aquifer, the operation of "deep" extraction wells could cause increased migration of the shallow VOCs into the deeper portion of the aquifer.

Compliance with ARARs

Groundwater RAA Nos. 1 and 2 may not be able to meet the chemical-specific ARARs since these two RAAs are containment options and do not specifically remediate the source(s) of contamination. Groundwater RAA Nos. 3, 4, and 5 should be able to meet their respective Federal and State ARARs except for the chemical-specific ARARs associated with total metals and some organics in limited areas of the operable unit. A Corrective Action Plan (CAP) will be prepared (under separate cover) in accordance with Title 15A NCAC 2L.0106(k) and (l) for these exceptions. Due to the complex nature of groundwater contamination, the time to reach the remediation levels cannot be determined.

Note that both inorganic and organic contaminants above State and/or Federal Standards will not be remediated in some portions of the operable unit due to the impracticality of remediation, and/or the lack of human health and ecological exposure to the contaminants. All of the Groundwater RAAs will met the location-specific and action-specific ARARs.

Long-Term Effectiveness and Permanence

Risks will be reduced under all of the RAAs through the implementation of the IRA, institutional controls, and/or other forms of treatment. In time, RAA Nos. 3, 4, and 5 will be effective, but the permanent effectiveness of a pump and treat system is unknown. Contaminant levels will initially decrease until equilibrium is reached; however, once pumping is terminated, contaminant levels could increase. All of the RAAs include treatment of the COCs in the groundwater aquifer. All of the RAAs will require a five year evaluation review to determine their effectiveness. This review may not be needed for RAAs No. 3, 4, and 5 once the remediation levels are met and maintained.

Reduction of Toxicity, Mobility, or Volume Through Treatment

All of the RAAs will provide reduction of toxicity, and/or volume of contaminants in the groundwater aquifer via treatment. All of the RAAs will utilize the IRA treatment systems consisting of air stripping, carbon adsorption, oil/water separation, and metals removal. RAA No. 4 will include air sparging/soil venting, a relatively new remedial technology. RAA Nos. 3 and 4 should provide for the greatest extent of contaminant reduction and will reduce contaminant mobility. RAA No. 5 may actually increase the mobility of the VOC contamination in the surficial aquifer since this alternative includes the installation and operation of deeper extraction wells. All of the RAAs will satisfy the statutory preference for treatment.

Short-Term Effectiveness

Risks to community and workers will not be increased with the implementation of RAA Nos. 1 and 2 since no additional site activities will be included (except for additional groundwater sampling for RAA No. 2). Under RAA Nos. 3 and 5, risks to the community and workers will be slightly increased due to the temporary increase in dust production and volatilization during the installation of the piping for the groundwater extraction and/or treatment systems. Additional
Aquifer drawdown will occur under RAA Nos. 3 and 5. This drawdown is not anticipated to affect Beaver Dam or Cogdels Creek. The discharge of the treated effluent to the Hadnot Point STP and ultimately to the New River is not expected to increase risks to the environment. Under RAA No. 4, there is a potential for the migration of contaminated vapors to off-site areas. This is due to the fact that it is difficult to anticipate and control the movement of the vapors generated during in situ air sparging.

With respect to the time required to meet the remedial response objectives, for all of the RAAs, once implemented, it is expected that the alternatives will immediately reduce the levels of the contaminants in the groundwater. The time to reach the remedial response objectives will vary. It is estimated that RAA Nos. 1, 2, 3, and 5 will be implemented for at least 30 years and RAA No. 4 for 5 years.

Implementability

No additional construction, operation, or administrative activities other than the ones associated with the IRA are associated with RAA No. 1. The only additional site activities associated with RAA No. 2 are groundwater sampling activities, which can be easily performed. The implementation of RAA Nos. 3 and 5 will require the installation of additional extraction wells and connection to the IRA treatment systems. RAA No. 3 will require the installation of three additional extraction wells (shallow) and their associated piping. RAA No. 5 will require the installation of three additional shallow extraction wells and two deeper extraction wells and their associated piping. RAA No. 4 may be the most difficult alternative to implement (primarily since the other "additional treatment" alternatives will only require connection to an existing treatment system). RAA No. 4 will require a pilot study to determine the effectiveness of air sparging/soil vapor extraction at Site 78.

Cost

In terms of the NPW, the No Action Alternative (RAA No. 1) would be the least expensive RAA to implement, followed by RAA No. 2, RAA No. 3, RAA No. 5, and then RAA No. 4. The estimated NPW values in increasing order are $0 (RAA No. 1), $260,000 (RAA No. 2), $460,000 (RAA No. 8), $615,000 (RAA No. 5), and $690,000 (RAA No. 4).

Soil RAA Comparative Analysis

Overall Protection of Human Health and the Environment

All of the Soil RAAs, with the exception of the No Action RAA (No.1), provide some type of protection to human health and the environment. RAA No. 2 (Capping) provides protection in the form of reducing the potential for direct contact with the contaminated soil and reducing the mobility of the contaminated soil. RAA Nos. 3 and 4 provide protection through removing and/or treating the contaminated soils.

Compliance with ARARs

All of the RAAs should meet all of the chemical-, action-, and location-specific ARARs. The (risk-based) remediation levels for the soil COCs will not be met with RAA Nos. 1 and 2.

Long-Term Effectiveness and Permanence

RAA No. 1 is not an effective or permanent alternative. RAA No. 2 will provide long-term effectiveness as long as the caps are maintained. RAA Nos. 3 and 4 provide the highest degree of long-term effectiveness and permanence since the contaminated soils are removed and/or treated.

RAA Nos. 1 and 2 will require a 5-year review. RAA No. 3 will only require a 5-year review if the duration of the treatment process is greater than five years RAA No. 4 will not require the 5-year review.

Reduction of Toxicity, Mobility, or Volume Through Treatment

No form of treatment is included under RAA Nos. 1 and 2. Even though RAA No. 2 does not
implement any form of treatment, the contaminated soils will be capped. Treatment is included under the other two RAAs. Therefore, these "treatment" RAAs will reduce the toxicity, mobility, and/or volume of the COCs through treatment.

RAA Nos. 1 and 2 do not satisfy the statutory preference for treatment, whereas the other two RAAs to satisfy the preference.

Short-Term Effectiveness

Risks to community and workers are not increased with the implementation of RAA No. 1, but current potential human health risks from existing conditions will continue to exist. Under RAA Nos. 2, 3, and 4, risks to the community and workers will be temporarily increased during soil grading and/or excavation activities. Risks will also be increased temporarily during the installation of the caps/covers (RAA No. 2). With respect to RAA No. 3, risks will be increased during the operation of the treatment options.

Implementability

With respect to implementability, RAA No. 1 would be the easiest alternative to implement since there are no activities associated with it. RAA No. 2 should be the next easiest to implement since the primary construction activities only require common earth construction equipment. RAA No. 4 may be more difficult to implement due to the unknown availability/capacity of an appropriate treatment and/or disposal facility. The implementability of RAA No. 3 is dependent on the availability of mobile treatment units.

Cost

No costs are associated with RAA No. 1. The estimated NPW of the other Soil RAAs, in increasing order are: $480,000 (RAA No. 4 - off-site disposal); $650,000 (RAA No. 3 - incineration); $1.2 million (RAA No. 2 - capping); $1.3 million (RAA No. 4 - off-site treatment); and $1.4 million (RAA No. 3 - chemical dechlorination).

9.0 SELECTED REMEDY

This section of the ROD focuses on the selected remedy for OU No. 1. The major treatment components, engineering controls, and institutional controls of the remedy will be discussed along with the estimated costs to implement the remedial action. In addition, the remediation levels to be attained at the conclusion of the remedial action will be discussed.

Remedy Description

The selected remedy for OU No. 1 is a combination of Groundwater RAA No. 3 [Source Control (Interim Remedial Action Treatment System Extension)] and Soil RAA No. 4 (Off-Site Disposal). Overall, the major components of the selected remedy include:

- Collecting additional contaminated groundwater in the surficial aquifer by installing three additional extraction wells within the areas with the highest contaminant levels. The three extraction wells will be installed to a depth of approximately 35 feet and pumped at a rate of three to five gpm.

- Restricting the use on nearby water supply wells which are currently inactive/closed (HP-601, HP-602, HP-608, HP-630, HP-634, and HP-637), and restricting the installation of any new water supply wells within the operable unit area.

- Implementing a long-term groundwater monitoring program to monitor the effectiveness of the groundwater remedy and to monitor the nearby water supply wells. In addition to the twenty wells included under the monitoring program for the IRA for Site 78, five shallow monitoring wells and eight local supply wells will be included in the long-term monitoring program for OU No.1. The additional wells to be sampled include 78GW15, 78GW39, 24GW08, 24GW09, 24GW10, HP-601, HP-602, HP-603, HP-608, HP-630, HP-34, HP-637, and HP-642. Additional wells may be added to the monitoring program, if necessary.
• Groundwater samples will be collected on a semiannual basis for five years and analyzed for TCL VOCs, TAL metals, TDS, and TSS. After five years, the data will be evaluated to determine the effectiveness of the remediation. A less frequent sampling program (such as annually) may be implemented, or it may be determined that sampling is no longer required from certain areas. In time, the results of the monitoring program may indicate that one or more of the currently inactive water supply wells can be activated.

• Excavating approximately 1,050 cubic yards of PCB- and pesticide-contaminated soils for off-site disposal. A possible off-site landfill which may be capable of receiving these soils is located in Pinewood, South Carolina, approximately 200 miles away from the operable unit.

The proposed locations of the major components of the selected remedy are presented on Figures 8 and 9.

Estimated Costs

The estimated capital costs associated with the selected remedy is approximately $659,000. Annual O&M costs of approximately $30,000 are projected for the sampling of the monitoring wells and supply wells for the first 5 years. The annual O&M costs will be reduced to approximately $15,000 for years 6 through 30. Assuming an annual percentage rate of 5 percent, these costs equate to a NPW of approximately $1.0 million. Table 7 presents a summary of this cost estimate for the major components of the selected remedy.
TABLE 7

ESTIMATED COST SUMMARY FOR THE SELECTED REMEDY
RECORD OF DECISION – CTO-0177
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Cost Component</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital Costs:</strong></td>
<td></td>
</tr>
<tr>
<td>! Groundwater Remediation</td>
<td></td>
</tr>
<tr>
<td>Mobilization</td>
<td>$25,000</td>
</tr>
<tr>
<td>Extraction Well System</td>
<td>$89,000</td>
</tr>
<tr>
<td>Treatment System*</td>
<td>0</td>
</tr>
<tr>
<td>Discharge System*</td>
<td>0</td>
</tr>
<tr>
<td>Demobilization</td>
<td>$17,000</td>
</tr>
<tr>
<td>Pilot Studies</td>
<td>$7,000</td>
</tr>
<tr>
<td>Engineering and Contingencies</td>
<td>$39,000</td>
</tr>
<tr>
<td></td>
<td>$177,000</td>
</tr>
<tr>
<td>! Soil Remediation</td>
<td></td>
</tr>
<tr>
<td>Site Preparation</td>
<td>$75,000</td>
</tr>
<tr>
<td>Off-Site Landfilling</td>
<td>$260,000</td>
</tr>
<tr>
<td>Site Restoration</td>
<td>$22,000</td>
</tr>
<tr>
<td>Demobilization</td>
<td>$15,000</td>
</tr>
<tr>
<td>Engineering and Contingencies</td>
<td>$110,000</td>
</tr>
<tr>
<td></td>
<td>$482,000</td>
</tr>
</tbody>
</table>

| Operation and Maintenance Costs:      |                |
| ! Groundwater Remediation             |                |
| Groundwater Monitoring [Years 1 through 5] | $30,000 |
| Groundwater Monitoring [Years 6 through 30] | 15,000 |

| TOTAL CAPITAL COST                    | $659,000       |
| TOTAL OPERATION AND MAINTENANCE COSTS | $30,000 (Years 1-5) |
|                                        | $15,000 (Years 6-30) |

| TOTAL NET PRESENT WORTH               | $1.0 million   |
| (Using 5% discount rate)              |                |

* Costs for the groundwater treatment and discharge systems are included in the Interim Remedial Action for OU No.1.
Remediation Levels

The selected remedy will be operated until the remediation levels developed in the FS are met. The remediation levels for the groundwater COCs and the soil COCs are listed on Table 8. Where applicable, the groundwater remediation levels were based on Federal Maximum Contaminant Levels (MCLs) and North Carolina groundwater standards. In the absence of the above-mentioned criteria, a risk-based remediation level (based on an ICR of 1.0E-4 and an HI of 1.0) was developed. For soil, the USEPA Region III risk-based soil screening criteria for industrial soils were used.

For groundwater, the monitoring results of the groundwater plumes will determine when the remedial action has met the remediation levels. Confirmation soil sampling results during excavation activities will be used to determine that soil exceeding the remediation levels has been removed from the site.

USEPA/State Acceptance

USEPA Region IV and the NC DEHNR have reviewed the PRAP for OU No. 1. Both agencies have concurred with the selected remedy outlined in this ROD.

A Corrective Action Plan (CAP) will be submitted (under separate cover) to the NC DEHNR to justify not remediating the limited areas of groundwater with PCE and heptachlor epoxide concentrations slightly exceeding the State groundwater standards. In addition, the CAP will provide justification for not remediating of groundwater throughout the OU due to elevated total metals since the total metals are not elevated due to diaposal activities.

Community Acceptance

The selected remedy for OU No. 1 was provided to the community during the public comment period and during the public meeting (refer to Section 3.0 of this document). The limited number of community-generated comments and the nature of these comments (refer to Section 11.0 of this document), indicate that the selected remedy has achieved community acceptance.
<table>
<thead>
<tr>
<th>Media</th>
<th>Contaminant of Potential Concern</th>
<th>Remediation Goal</th>
<th>Unit (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>Benzene</td>
<td>1.0</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>1,2-Dichloroethene (total)</td>
<td>70</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Ethylbenzene</td>
<td>29</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Heptachlor Epoxide</td>
<td>0.2</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Tetrachloroethene</td>
<td>0.7</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Toluene</td>
<td>1,000</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Trichloroethene</td>
<td>2.8</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Vinyl Chloride</td>
<td>0.015</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Xylenes (total)</td>
<td>400</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Arsenic</td>
<td>50</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Barium</td>
<td>1,000</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Beryllium</td>
<td>4</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
<td>50</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Manganese</td>
<td>50</td>
<td>μg/L</td>
</tr>
<tr>
<td></td>
<td>Vanadium</td>
<td>110</td>
<td>μg/L</td>
</tr>
<tr>
<td>Soil</td>
<td>PCBs (total)</td>
<td>370</td>
<td>μg/kg</td>
</tr>
<tr>
<td></td>
<td>4,4'-DDD</td>
<td>12,000</td>
<td>μg/kg</td>
</tr>
<tr>
<td></td>
<td>4,4'-DDT</td>
<td>8,400</td>
<td>μg/kg</td>
</tr>
<tr>
<td></td>
<td>Chlordane (total)</td>
<td>2,200</td>
<td>μg/kg</td>
</tr>
</tbody>
</table>

(1) μg/L = microgram per liter
   μg/kg = microgram per kilogram
A selected remedy must satisfy the statutory requirements of CERCLA Section 121 which include:
(1) be protective of human health and the environment, (2) comply with ARARs (or justify noncompliance), (3) be cost-effective, (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The evaluation of how the selected remedy for OU No. 1 satisfies these requirements is presented below.

Protection of Human Health and the Environment

The selected remedy provides protection to human health and the environment through additional extraction and treatment of groundwater, implementation of groundwater-related institutional controls, and the excavation and removal of PCB- and pesticide-contaminated soils. The institutional controls, which include aquifer use restrictions, well placement restrictions, and groundwater monitoring, will reduce the potential for ingestion of contaminated groundwater. By removing and disposing the PCB- and pesticide-contaminated soils off site, the potential risks associated with exposure to these contaminants is eliminated.
<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL/CONTAMINANT-SPECIFIC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe Drinking Water Act</td>
<td>Standards for protection of drinking water sources serving at least 25 persons. MCLs consider health factors, as well as economic and technical feasibility of removing a contaminant; MCLGs do not consider the technical feasibility of contaminant removal. For a given contaminant, the more stringent of MCLs or MCLGs is applicable unless the MCLG is zero, in which case the MCL applies.</td>
<td>Relevant and appropriate in developing remediation levels for contaminated groundwater used as a potable water supply. The Castle Hayne aquifer is a potable water supply.</td>
</tr>
<tr>
<td>a. Maximum Contaminant Levels (MCLs) 40 CFR 141.11-141.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Maximum Contaminant Level Goals (MCLGs) 40 CFR 141.50-141.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Doses (RfDs), EPA Office of Research and Development</td>
<td>Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to characterize risks due to exposure to contaminants.</td>
<td>TBC requirement for the public health risk assessment.</td>
</tr>
<tr>
<td>Carcinogenic Potency Factors, EPA Environmental Criteria and Assessment Office;</td>
<td>Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to compute the individual incremental cancer risk resulting from exposure to carcinogens.</td>
<td>TBC requirement for the public health risk assessment.</td>
</tr>
<tr>
<td>EPA Carcinogen Assessment Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Advisories, EPA Office of Drinking Water</td>
<td>Non-enforceable guidelines for chemicals that may intermittently be encountered in public water supply systems. Available for short- or long-term exposure for a child and/or adult.</td>
<td>TBC requirement for the public health risk assessment.</td>
</tr>
<tr>
<td>National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61)</td>
<td>Standards promulgated under the Clean Air Act for significant sources of hazardous pollutants, such as vinyl chloride, benzene, trichloroethylene, dichlorobenzene, asbestos, and other hazardous substances. Considered for any source that has the potential to emit 10 tons of any hazardous air pollutant or 25 tons of a combination of hazardous air pollutants per year.</td>
<td>Remedial actions (e.g., air stripping) may result in release of hazardous air pollutants. The treatment design may elect to control equipment air emissions using the same or similar methods.</td>
</tr>
<tr>
<td>ARAR/TBC Citation</td>
<td>Requirement/Description</td>
<td>Consideration as an ARAR or TBC</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>National Ambient Air Quality Standards (40 CFR 50)</td>
<td>Standards for the following six criteria pollutants: particulate matter; sulfur dioxide; carbon monoxide; ozone; nitrogen dioxide; and lead. The attainment and maintenance of these standards are required to protect the public health and welfare.</td>
<td>Relevant and appropriate requirements for remedial actions requiring discharge to the atmosphere.</td>
</tr>
<tr>
<td>EPA Ambient Water Quality Criteria (Section 304(a)(1) of the Clean Water Act)</td>
<td>Non-enforceable criterion for water quality for the protection of human health from exposure to contaminants in drinking water and from ingestion of aquatic biota and for the protection of fresh-water and salt-water aquatic life.</td>
<td>TBC requirement for groundwater treatment.</td>
</tr>
</tbody>
</table>

**STATE/CONTAMINANT-SPECIFIC**

<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of North Carolina Department of Environment, Health, and Natural Resources Division of Environmental Management 15A NCAC 2B.0200 - Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina</td>
<td>Surface water quality standards based on water use and criteria class of surface water.</td>
<td>Relevant and appropriate for remedial actions requiring discharge to surface water.</td>
</tr>
<tr>
<td>North Carolina Anti-Degradation Policy for Surface Water (Water Quality Standards Title 15A, Chapter 2, Subchapter 2B)</td>
<td>Provides for an anti-degradation policy for surface water quality. Pursuant to this policy, the requirements of 40 CFR 131.12 are adopted by reference in accordance with General Statute 150B-14(b).</td>
<td>This policy is a TBC requirement for remedial actions requiring discharge to surface water.</td>
</tr>
<tr>
<td>North Carolina Groundwater Standards Applicable Statewide (NCAC Title 15A Chapter 2 Subchapter 2L)</td>
<td>Establishes maximum contaminant concentrations to protect groundwater. These standards are mandatory.</td>
<td>Relevant and appropriate for remedial actions requiring discharge to groundwater.</td>
</tr>
</tbody>
</table>
### CHEMICAL-SPECIFIC ARARs AND TBCs FOR OU NO. 1
#### RECORD OF DECISION CTO-0177

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina DEHNR Regulations</td>
<td>Standards for protection of health of consumers using public drinking water supplies. Establishes MCLs for given contaminants.</td>
<td>Relevant and appropriate in developing remediation levels for contaminated groundwater used as a potable water supply.</td>
</tr>
<tr>
<td>North Carolina DEHNR Toxic Air Pollutant Rule</td>
<td>A facility shall not emit any toxic air pollutants (as listed in rule .1104) that may cause or contribute beyond the premises (contiguous property boundary) to any significant ambient air concentration that may adversely affect human health.</td>
<td>Potentially relevant and appropriate for remedial actions requiring discharge to the atmosphere.</td>
</tr>
<tr>
<td>Statutory Authority</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G.S. 143-215.107(a)(1),(3),(4),(5); 143-B-282</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Carolina DEHNR Regulations for Hazardous (15A NCAC 13A) and Solid Waste (15A NCAC 13B)</td>
<td>Standards and requirements for management and disposal of hazardous and solid waste.</td>
<td>Potentially relevant and appropriate for remedial actions requiring management and disposal of hazardous and/or solid waste.</td>
</tr>
</tbody>
</table>

**ARAR =** Applicable or Relevant and Appropriate Requirement.  
**TBC =** To Be Considered Criteria
<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL AND STATE/LOCATION-SPECIFIC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish and Wildlife Coordination Act 16 USC 661-666</td>
<td>Requires action to protect fish and wildlife from actions modifying streams or areas affecting streams.</td>
<td>Beaver Dam and Cogdels Creek are located near and within the operable unit boundaries. If remedial actions are implemented that modify these creeks, this will be an applicable ARAR.</td>
</tr>
<tr>
<td>Federal Endangered Species Act 16 USC 1531, 50 CFR 200, and 50 CFR 402</td>
<td>Requires action to avoid jeopardizing existence of listed endangered species or modification of their habitat.</td>
<td>Many protected species have been cited near and on MCB, Camp Lejeune such as the American alligator, the Bachmans sparrow, the Black skimmer, the Green turtle, the Loggerhead turtle, the piping plover, the Red-cockaded woodpecker, and the rough-leaf loosestrife. Therefore, this will be considered as an ARAR.</td>
</tr>
<tr>
<td>North Carolina Endangered Species Act GS 113-331 to 113-337</td>
<td>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.</td>
<td>Since the American alligator has been sighted in nearby surface water features, this will be considered as an ARAR.</td>
</tr>
<tr>
<td>Executive Order 11990 on Protection of Wetlands</td>
<td>Establishes special requirements for Federal agencies to avoid the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practicable alternative exists.</td>
<td>Based on a review of Wetland Inventory Maps, portions of Cogdels Creek are wetlands. Therefore, this will be an applicable ARAR.</td>
</tr>
</tbody>
</table>
### TABLE 10 (Continued)

**LOCATION-SPECIFIC ARARs AND TBCs FOR OU NO. 1**  
**RECORD OF DECISION CTO-0177**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Order 11988 on Floodplain Management</td>
<td>Establishes special requirements for Federal agencies to evaluate the adverse impacts associated with direct and indirect development of a floodplain.</td>
<td>Based on the Federal Emergency Management Agency’s Flood Insurance Rate Map for Onslow County, the site is primarily within a minimal flooding zone (outside the 500-year floodplain). The creek is within the 100-year floodplain (FEMA, 1987). Therefore, this may be an ARAR for the operable unit.</td>
</tr>
<tr>
<td>Executive Order Number 11988, and 40 CFR 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCRA Location Requirements 40 CFR 264.18</td>
<td>Limitations on where on-site storage, treatment, or disposal of RCRA hazardous waste may occur.</td>
<td>These requirements may be applicable if the remedial actions for the operable unit includes the on-site storage, treatment, or disposal of RCRA hazardous waste. Therefore, these requirements may be an applicable ARAR for the operable unit.</td>
</tr>
</tbody>
</table>

**ARAR** = Applicable or Relevant and Appropriate Requirement  
**TBC** = To Be Considered Criteria
**TABLE 11**

**ACTION-SPECIFIC ARARs AND TBCs**

**RECORD OF DECISION CTO - 0177**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>ARAR/TBC Citation</th>
<th>Requirement/Description</th>
<th>Consideration as an ARAR or TBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEDERAL AND STATE/ACTION-SPECIFIC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DOT Rules for Hazardous Materials Transportation</td>
<td>Regulates the transport of hazardous waste materials including packaging, shipping, and placarding.</td>
<td>Applicable for any action requiring off-site transportation of hazardous materials.</td>
</tr>
<tr>
<td>(49 CFR Parts 107 and 171.1-500)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Conservation and Recovery Act (RCRA) Subtitle C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identification and Listing of Hazardous Waste</td>
<td>Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing.</td>
<td>Primary site contaminants are not considered to be listed wastes. However, contaminated media may be considered hazardous by characteristic.</td>
</tr>
<tr>
<td>(40 CFR Part 261)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment, Storage, and Disposal of Hazardous Waste</td>
<td>Regulates the treatment, storage, and disposal of hazardous waste.</td>
<td>During remediation, treatment, storage, and disposal activities may occur. Materials may be classified as hazardous wastes.</td>
</tr>
<tr>
<td>(40 CFR Parts 262-265, and 266)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RCRA Subtitle D</td>
<td>Regulates the treatment, storage, and disposal of solid waste and materials designated by the State as special waste.</td>
<td>Applicable to remedial actions involving treatment, storage, or disposal of materials classified as solid and/or special waste.</td>
</tr>
<tr>
<td>ARAR/TBC Citation</td>
<td>Requirement/Description</td>
<td>Consideration as an ARAR or TBC</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>RCRA Land Disposal Restrictions (LDRs) Requirements</td>
<td>Restricts certain listed or characteristic hazardous waste from placement or disposal on land (includes injection wells) without treatment. Provides treatment standards and Best Demonstrated Available Technology (BAT).</td>
<td>LDRs may prohibit or govern the implementation of certain remedial alternatives. Extraction and treatment and/or movement of RCRA hazardous waste may trigger LDR requirements for the waste. Rejection of treated groundwater into or above an underground source of drinking water may be exempt from LDRs given the treatment of the groundwater meets exemption requirements.</td>
</tr>
<tr>
<td>Control of Air Emissions from Superfund Air Strippers</td>
<td>Guidance that establishes criteria as to whether air emission controls are necessary for air strippers. A maximum 3 lbs/hr or 15 lbs/day or 10 tons/yr of VOC emissions is allowable; air pollution controls are recommended for any emissions in excess of these quantities.</td>
<td>TBC requirement for remedial actions that include air stripping.</td>
</tr>
<tr>
<td>Control of Air Emissions from Superfund Air Strippers at Superfund Ground Water Sites (OSWER Directive 9355.0-28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Pretreatment Regulations for Existing and New Sources of Pollutants (40 CFR Part 403)</td>
<td>Regulations promulgated under the Clean Water Act. Includes provisions for effluent discharge to Publicly Owned Treatment Works (POTW). Discharge of pollutants that pass through or interfere with the POTW, contaminate sludge, or endanger health/safety of POTW workers is prohibited. These regulations should be used in conjunction with local POTW pretreatment program requirements.</td>
<td>Applicable for remedial actions involving discharge to a sanitary sewer.</td>
</tr>
<tr>
<td>ARAR/TBC Citation</td>
<td>Requirement/Description</td>
<td>Consideration as an ARAR or TBC</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Toxic Substance Control Act (TSCA) 40 CFR 761</td>
<td>Establishes regulations for handling PCBs.</td>
<td>Relevant and appropriate for the handling of the contaminated soil at Site 21.</td>
</tr>
<tr>
<td>North Carolina Water Pollution Control Regulations (Title 15, Chapter 2, Section .0100)</td>
<td>Regulates point-source discharges through the North Carolina permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system, and completion of regular discharge monitoring records.</td>
<td>May be applicable for actions requiring discharge to a surface water body.</td>
</tr>
<tr>
<td>Protection of Archaeological Resources (32 CFR Parts 229 and 229.4; 43 CFR Parts 107 and 171.1-5)</td>
<td>Develops procedures for the protection of archaeological resources.</td>
<td>Applicable to any excavation on site. If archaeological resources are encountered during soil excavation, they must be reviewed by Federal and State archaeologists.</td>
</tr>
<tr>
<td>North Carolina Sedimentation Pollution Control Act of 1973 (Chapter 113A)</td>
<td>Regulates stormwater management and erosion/sedimentation control practices that must be followed during land disturbing activities.</td>
<td>Applicable for remedial actions involving land disturbing activities (i.e., excavation of soil and sediment).</td>
</tr>
</tbody>
</table>
Compliance With Applicable or Relevant and Appropriate Requirements

The selected remedy will either comply with the majority of the ARARs or will be justified for not complying with them. The site-specific ARARs applicable to OU No. 1 are summarized on Tables 9, 10, and 11 with respect to chemical-specific, location-specific, and action-specific ARARs. The justification for not complying for a few of the chemical-specific ARARs is described below.

- The metals (total), which were detected in the shallow groundwater at OU No. 1 above the Federal MCLs and/or the State groundwater standards, will not be addressed. There is no known source of this contamination, and no "pattern" which could be associated with a metals contaminant plume or plumes. In addition, total metal concentrations are sporadically elevated throughout MCB, Camp Lejeune (even in background wells), and therefore may be due to natural conditions of soil or to geologic conditions. From an engineering standpoint, it would not be practicable to try to remediate the metal contamination throughout the operable unit. This contamination will be remediated in a limited specific area of concern. Therefore, the justification for not remediating the inorganic contaminants in the groundwater is based on technical impracticability, lack of an apparent source, and the lack of a human health and ecological exposure pathway. It is important to note that the results from the long-term groundwater monitoring program will be used to confirm that the elevated total metals are not due to activities at OU No. 1.

- The pesticide, heptachlor epoxide, which was detected above the State groundwater standard in a limited area within Site 24, will not be addressed. There is no known source of contamination, and the extent of contamination is limited to one shallow monitoring well. From an engineering and public health standpoint, it would not be practicable to remediate this contamination. As part of the long-term monitoring program, the shallow well will be sampled to monitor the level of the pesticide. If the concentrations continually increase, further action may be implemented.

- The surface water contamination (primarily metals) exceeded surface water criteria. There is no known source of the contamination related to former disposal activities. Metal concentrations in surface water bodies near OU No. 1 are similar to metal concentrations in other streams within MCB, Camp Lejeune. In addition, both surface waters receive stormwater runoff from the entire HPIA. Remediation of these streams would not be practical due to this situation. Based on the risk assessment evaluation, the contaminants concentrations will not cause an unacceptable risk to human health. The results of the ecological risk assessment indicate only potential adverse impacts. Therefore, the justification for not remediating the surface water is primarily based on technical impracticability and lack of an unacceptable human health or ecological risk.

Cost-Effectiveness

The selected remedy affords overall effectiveness proportional to its costs. With respect to the groundwater-related remedial actions, the selected remedy is the most cost-effective of the "treatment" alternatives. The only Groundwater RAAs that are more cost-effective than the selected remedy are the Institutional Controls and the No Action RAAs. With respect to the soil-related remedial actions, the selected remedy is the most cost-effective RAA, with the exception of the No Action RAA.

Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy represents a permanent solution with respect to the principal threats posed by the groundwater and soil contamination. Therefore, this remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The groundwater treatment system represents a permanent solution. The contaminated soils will be removed from the site, therefore the option is permanent.

Preference for Treatment as a Principal Element

By treating the extracted groundwater, the selected remedy addresses the principal threat posed
by the operable unit through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

11.0 RESPONSIVENESS SUMMARY

The selected remedy for OU No. 1 is a combination of Groundwater RAA No. 3 (Source Control - IRA Treatment System Extension) and Soil RAA No. 4 (Off-Site Diaposal). Written comments were received from the NC DEHNR during the public comment period. Based on the comments received from the audience at the public meeting of July 27, 1994, the public appears to support the preferred alternative. In addition, the USEPA Region IV and the NC DEHNR are in support of the preferred alternative. Members of the community who attended the public meeting on July 27, 1994, did not appear to have any opposition to the preferred alternative.

Background On Community Involvement

A record review of the MCB, Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and base/community clubs. The file search did not locate written Installation Restoration Program (IRP) concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Sites 21, 24, or 78). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including base personnel, residents, local officials, and off-base residents.
- Prepared a Community Relations Plan, September 1990.
- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local businesses, civic groups, on- and off-base residents, military and civilian interests.
- Established two information repositories.
- Established the Administrative Record for all of the sites at the base.
- Released the PRAP for OU No. 1 for public review in the repositories, July 1994.
- Held a Technical Review Committee meeting, July 26, 1994, to review the PRAP and solicit comments.
- Held a public meeting on July 27, 1994, to solicit comments and provide information. Approximately 10 people attended. A copy of the transcript from the meeting is included as Appendix A of this ROD.

Summary of Comments Received During the Public Comment Period and Agency Responses

As previously mentioned, written comments were only received from the NC DEHNR during the public comment period. In addition, several questions/comments were generated at the July 27, 1994, public meeting. The public meeting was held to discuss the DON/Marine Corps' preferred alternative. A few of the questions pertained to matters that are not specifically related to
the preferred alternative (e.g., a member of the audience inquired as to the depth of groundwater at the site). These types of questions and answers will not be addressed as part of this Responsiveness Summary; however, specific answers to these questions are documented in the transcript to the public meeting which is contained in Appendix A. The transcript has also been included in the Administrative Record. A summary of comments pertaining to the proposed alternatives and site investigations is presented below.

Interim Remedial Action Remediation System

One member from the audience asked what is actually being done when the plume is being "contained". This comment was referring to the interim remedial action that is currently being designed/constructed for the shallow aquifer at Site 78.

DON/Marine Corps Response: It was explained that wells will be installed at the outer limits of the plume and then pumped at a rate of approximately 5 gallons per minutes. The placement of the wells will prevent the contamination from migrating any further.

Underground Storage Tanks

One member from the audience wanted to know if there are still any underground storage tanks with solvents in them that are continuing to cause the groundwater contamination.

DON/Marine Corps Response: There may have been one underground storage tank that was used for spent solvents (near Building 903). It is believed that the tank has been removed (although there is conflicting information regarding the tank removal). There are other existing underground storage tanks located within Site 78 that store fuel. It is not believed that the existing tanks are associated with the contaminated groundwater plumes at the Building 903 or Building 1601 areas. Soil samples collected from these areas revealed very low levels of solvents, which may indicate that the spills happened many years ago.

Metals Contamination

1. One member from the audience wanted an explanation regarding where metals could come from.

DON/Marine Corps Response: It was explained that the metals (lead, chromium, manganese, etc.) can come from the soil itself, naturally occurring. The metals can show up in the groundwater samples because of several reasons. For example, suspended solids, which naturally contain the metals, pass through the slots in the well screen and are pulled up with the samples. A comparison of "total" metal results to "filtered" metal results will typically show a significant difference. The filtered samples screen away the fines in the sample which can contain metals, bacteria, or whatever else may collect in the well. Filtered samples contain very low levels of metals when compared to unfiltered samples.

With respect to OU No. 1, the shallow aquifer indicated a total metals problem, but the deep aquifer did not (with a very few exceptions). The geology of the shallow aquifer is comprised of loosely compacted silts and sands; whereas the geology of the deep aquifer is comprised of very tightly compacted silts and sands. Therefore, suspended material would be (and are) expected to be found in the shallow wells and not the deeper ones.

2. One member from the audience wanted to know if the State had done a general study for the area prior to this study.

DON/Marine Corps Response: The group was informed that the State has not performed any general studies but the DON has. It was mentioned that the DON recently conducted a preliminary study about 2 months ago looking at the metal concentrations detected at approximately 21 sites throughout MCB, Camp Lejeune. The results of this study indicated that elevated total metals were detected throughout the base and even in background wells.

Intermediate and Deeper Groundwater

1. One member from the audience wanted to know if the concentrations found in the intermediate and deeper groundwater aquifers were based on previous study results.
DON/Marine Corps Response: The response to this question was that the wells were sampled several times. A drastic decrease in contaminant concentration between the shallow and the intermediate groundwater has been evident in each sampling event. The concentrations have been even lower in the deeper portion of the aquifer.

It was also explained that there was a pattern of decreasing concentrations over time in the intermediate and deep groundwater until the last sampling event - the concentrations were slightly higher than the previous one.

2. One member from the audience wanted to know where the water in the deep aquifer would migrate to.

DON/Marine Corps Response: The response to this question was that the water would be heading towards the New River. Some portions of the Castle Hayne aquifer would probably migrate upwards as the groundwater moves towards the New River. The deeper portion of the Castle Hayne would probably migrate underneath the river and discharge into the ocean. It was also explained that the New River was sampled as part of the RI to see if there was any impact. No volatile organics were detected in the surface water.

Selected Alternative for OU No. 1

1. One member from the audience wanted to know if there were other problems at OU No. 1 other than the contaminated groundwater and pesticide-contaminated soils. Are there problems with petroleum products or solvents in soil?

DON/Marine Corps Response: It was indicated that the selected remedy for OU No. 1 focuses on contaminated groundwater and PCB- and pesticide-contaminated soil. It was explained that the soil results near the 900 Buildings did not contain elevated levels of solvents that could be associated with a continuing source. If a potential source was found, it would not have been permitted to remain. It would have been addressed and remediated. It appears that the source has been depleted from the soil matrix at this time and is in the shallow groundwater.

With respect to petroleum product, the DON/Marine Corps have implemented a remedial action involving groundwater remediation at Site 22, the HPIA Fuel Farm. In addition, USTs which contain petroleum product are included as part of the UST program.

Extent of Groundwater Contamination

1. During the public comment period, the NC DEHNR expressed concerns regarding having adequate data or rationale to support conclusions on the extent of groundwater contamination throughout the operable unit.

DON/Marine Corps Response: At this time, no other investigations are planned for the deeper groundwater at OU No. 1. The deeper groundwater will be routinely monitored under the proposed remediation plan for OU No. 1. The results of the monitoring will be reviewed every five years. If the conditions of the deeper groundwater are deteriorating, other actions may be implemented at that time. All of the previous groundwater data has indicated that the shallow portion of the aquifer is the source of contamination. The proposed remedy for OU No. 1 will remediate this source, thereby reducing the amount of contaminants that can impact the deeper groundwater. It is also important to note that the contaminant levels in the deeper groundwater at the western boundary of OU No. 1 is significantly less than at the plume areas within Site 78. Therefore, the extent of the contaminated groundwater can be approximated based on available data.

Intermediate and deep groundwater wells were not deemed necessary for Site 24. Metals and pesticides are not very mobile contaminants and therefore are not expected to have a significant impact on deeper groundwater. In addition, the total metals concentrations detected in the Site 24 shallow wells were similar to the concentrations detected in the shallow wells from Site 78 (which has intermediate and deep wells). The intermediate and deep groundwater results from Site 78 were not impacted by either metals (except for manganese) or pesticides. Therefore, it is not expected that the deeper groundwater at an adjacent site (Site 24) would be impacted from these contaminants. The results from the proposed monitoring plan for OU No. 1 will be evaluated every five years to determine if the groundwater conditions are deteriorating. Additional actions may be implemented at that time.
PUBLIC HEARING

ON THE

PROPOSED CLEANUP PLAN FOR OPERABLE UNITS ONE AND FIVE

SITES 21, 24, AND 78

JULY 27, 1994

HELD AT
TARAWA TERRACE ELEMENTARY SCHOOL
CORBIN STREET
JACKSONVILLE, NORTH CAROLINA

REPORTED BY: STACY TONE, CCR

CAPE FEAR COURT REPORTING
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COPY
PRESENTED BY:

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MR. TOM BIXIE
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MR. PAUL: GOOD EVENING. TONIGHT WE'RE GOING TO DISCUSS THE PROPOSED REMEDIAL ACTION PLANS FOR OPERABLE UNIT ONE AND FIVE, NOT TEN WE DISCUSSED THAT LAST NIGHT. THE PUBLIC COMMENT PERIOD WILL BEGIN TODAY, JULY 27TH, AND EXTEND THROUGH AUGUST 27TH OF 1994. I WILL SAVE INTRODUCTIONS TONIGHT BECAUSE YOU GUYS WERE HERE LAST NIGHT AND KNOW PROBABLY WHO EVERYONE IS AND I'LL TURN IT OVER NOW TO MR. RAY WATTRAS FROM BAKER.

MR. WATTRAS: THANK YOU. PRETTY MUCH THE SAME FORMAT AS LAST NIGHT. FEEL FREE TO INTERRUPT ME AT ANY TIME TO DISCUSS SOMETHING THAT MIGHT NOT BE CLEAR AND WE'LL GO FROM THERE; A PRETTY CASUAL FORMAT HERE.

WE'RE FIRST GOING TO BE TALKING ABOUT OPERABLE UNIT NUMBER ONE. THIS OPERABLE UNIT CONSISTS OF THREE SITES. THE MOST NOTABLE SITE MIGHT BE SITE 78, THE HADNOT POINT INDUSTRIAL AREA. IT'S THE MAIN PART OF CAMP LBJEUNE, ONE OF THE FIRST PORTIONS OF THE BASE THAT WAS CONSTRUCTED.

THE OTHER TWO SITES -- SITE 21 IS ACTUALLY LOCATED WITHIN THE BOUNDARY OF HADNOT POINT. IT'S A TRANSFORMER STORAGE LOT. AND SITE 24 IS KNOWN AS THE INDUSTRIAL AREA FLY ASH DUMP. IT'S LOCATED RIGHT OFF OF THE HADNOT POINT AREA.

SITE 21 IS THE SMALLEST OF THE SITES. IT'S ROUGHLY TEN ACRES IN SIZE. THE HISTORY OF THAT SITE TELLS US THAT AT ONE TIME PART OF THIS SITE WAS USED AS A PESTICIDE HANDLING AND MIXING

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AREA. AND ANOTHER PORTION OF THE SITE WAS USED TO EMPTY
TRANSFORMER FLUIDS INTO IT. AND, OF COURSE, AT THAT TIME PCB'S
WERE USED IN THOSE TRANSFORMERS.

THIS IS A SLIDE SHOWING THE -- THE SITE 21. THERE'S
SOME BETTER PICTURES HERE. IN THIS AREA -- THIS IS THE AREA WHERE
THEM DISPOSED OF THE PCB. YOU CAN TELL WHEN YOU'RE OUT THERE --
YOU CAN'T REALLY SEE THIS ON THE FIGURE, BUT WHEN YOU GO OUT THERE
THERE IS A SMALL DEPRESSION IN THE GROUND SURFACE, AND THAT'S
WHERE WE STARTED WITH OUR SAMPLING. WE TOOK OUR SAMPLES IN THE
CENTER OF THAT PIT AND WE WORKED OUR WAY OUTWARD. THIS IS JUST
ANOTHER ANGLE. AGAIN, IT'S VERY DIFFICULT TO TELL, BUT IT'S RIGHT
BEHIND THIS DARK MOUND IS WHERE THIS SMALL PIT IS.

MR. PAUL: IT'S ABOUT THREE OR FOUR FEET
DEEP OR?

MR. WATTRAS: NO, PROBABLY AT BEST A FOOT, I
WOULD SAY, THE DEPRESSION. NOT BEING -- NO, NOT THAT NOTICEABLE.
MAYBE A FOOT IN THE CENTER. YOU CAN BARELY TELL. THIS IS A
PORTION OF THE SITE, AND BY THE WAY, THE SITE IS FENCED IN. AND
IT IS ACTIVELY USED FOR STORAGE WITH THE EXCEPTION OF THIS
DISPOSAL PIT AREA THAT PART IS OUTSIDE OF THE FENCE. BUT THIS IS
THE -- WHAT WE KNOW AS THE PESTICIDE HANDLING AND MIXING AREA OF
THE SITE. IT'S JUST ANOTHER VIEW OF THAT SAME AREA. A LOT OF THE
LOT IS COVERED WITH GRAVEL. AS YOU CAN SEE IT'S STILL USED TO
STORE DIFFERENT THINGS.

SITE 24 IS THE FLY ASH DUMP. IT'S APPROXIMATELY 100

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ACRES IN SIZE. IT WAS REPORTED THAT NUMEROUS THINGS WERE TAKEN
OUT THERE, INCLUDING FLY ASH, SLUDGE, SOLVENTS, CIDERS, PAINT
STRIPPING COMPOUNDS AND CONSTRUCTION DEBRIS.

WE LOOKED AT FIVE AREAS WITHIN THIS 100 ACRE AREA. WE CALL
THES AREAS OF CONCERN. WE NOTED THIS AREAS USING HISTORICAL
AERIAL PHOTOGRAPHS. AND ALSO WE DID A GEOPHYSICAL INVESTIGATION
OUT THERE, WHICH WAS USED TO TRY TO DEFINE THE BOUNDARIES TO SEE
IF THERE WAS ANY BURIED METAL OR BURIED DRUMS OR WHATEVER OUT
THERE SO WE USED GEOPHYSICAL TECHNIQUES TO LOOK AT THAT. AND WE
NAMED THESE AREAS THE SPIRACTOR SLUDGE DISPOSAL AREA, THE FLY ASH
DISPOSAL AREA, THE BORROW AND DEBRIS DISPOSAL AREA, AND TWO BURIED
METAL AREAS.

NOW, THE BURIED METAL AREAS WERE NOTED DURING THE
GEOPHYSICAL INVESTIGATION WHERE WE LOOKED AT SOME ANOMALIES THAT
WE THOUGHT COULD BE ASSOCIATED WITH BURIED METAL; POSSIBLY DRUMS.

THIS IS SOME OF THE FIELD ACTIVITIES AT THE SITE. THIS IS
MORE OF THE -- ONE OF THE OPEN AREAS. A LOT OF THE SITES ARE
HEAVILY VEGETATED. AS YOU'LL SEE IN THIS PHOTO HERE, IT'S GROWN
OVER. THAT'S A PICTURE OF A MONITORING WELL IN THE MIDDLE, BUT
IT'S VERY THICK IN MOST OF THE AREAS OF THE SITE.

THIS IS ANOTHER AREA. THIS IS ONE OF THE BURIED METAL
AREAS THAT WE WERE LOOKING AT. ANY TIME WE DO TEST PITTING
ACTIVITIES WE HAVE TO TAKE PRECAUTIONS AND DON WHAT'S CALLED LEVEL
B PROTECTION WHERE OUR FIELD PEOPLE WILL ACTUALLY USE SCBA'S;
SELF-CONTAINED BREATHING APPARATUSES IN CASE THEY WOULD ENCOUNTER

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SOMETHING AND THEY WOULD EXPOSED TO SOMETHING.

IN THIS CASE, BY THE WAY, WE FOUND THAT WHAT WAS BURIED THERE WAS JUST CONSTRUCTION DEBRIS. SO, THE GEOPHYSICAL INVESTIGATION SAW SOMETHING IN THE SUBSURFACE; WE THOUGHT IT COULD BE DRUMS AND WE CHECKED IT OUT AND IN THIS CASE IT WAS PRETTY MUCH JUST CONSTRUCTION DEBRIS.

MRS. WOOD: WE WENT OVER THAT BECAUSE I THOUGHT WE PRETTY MUCH DISCOUNTED 24 AS NO PROBLEM, BUT YOU WENT BACK AND WENT OVER IT ANYWAY.

MR. WATTRAS: I DON'T BELIEVE -- THIS IS THE FIRST TIME WE'VE -- THERE WERE FIVE EXISTING MONITORING WELLS AT SITE 24 --

MRS. WOOD: YEAH. YEAH, THEY HAD --

MR. WATTRAS: -- THAT WERE PUT IN IN THE MID-80S AND THEY LOOKED AT GROUNDWATER ONLY. THEY NEVER LOOKED AT ANYTHING ELSE. THEY PUT IN FIVE MONITORING WELLS. AND IN THOSE FIVE MONITORING WELLS IF I RECALL THEY REALLY DIDN'T FIND ANY PROBLEMS. THEY HAD A LITTLE BIT OF ELEVATED METALS IN THE SHALLOW GROUNDWATER, BUT AS I REMEMBER THEY DID NOT HAVE ANY VOLATILE ORGANICS OR ANY OTHER TYPE OF ORGANIC COMPOUNDS. BUT THIS IS THE FIRST EXTENSIVE STUDY THAT HAS BEEN DONE AT SITE 24 WHERE WE ACTUALLY DID SOIL SAMPLING AND I'LL DISCUSS A LITTLE BIT LATER WE TOOK SOME SURFACE WATER SEDIMENT SAMPLES AND SO FORTH.

A LITTLE BIT ABOUT THE HADNOT POINT INDUSTRIAL AREA;

THIS IS A HUGE AREA, AS YOU PROBABLY KNOW, IT'S ABOUT 590 ACRES.

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A LOT OF MAINTENANCE SHOPS AND WAREHOUSES AND ADMINISTRATIVE BUILDINGS. WE KNOW BECAUSE OF ALL THE UNDERGROUND STORAGE TANKS, MOST OF THEM USED FOR HEATING FUEL, THAT THERE HAVE BEEN SPILLS AND LEAKS IN THE PAST.

THERE IS ANOTHER SITE, WHICH I HAVE NOT DISCUSSED YET. SITE 22 IS A FUEL FARM. THIS FUEL FARM SITS RIGHT IN THE CENTER OF THE SITE. THE TANKS HAVE BEEN REMOVED. THIS IS FLOATING PRODUCT ON THE GROUNDWATER, BUT THERE IS A -- THERE IS AN ACTIVE REMEDIATION SYSTEM THAT'S COLLECTING THIS FLOATING PRODUCT. WE ARE NOT GOING TO DISCUSS SITE 22 TONIGHT BECAUSE ACTION IS ALREADY BEING TAKEN AT THIS SITE.

MRS. WOOD: IS THAT UNDER YOUR PURVIEW OR IS THAT UNDER THE UST PROGRAM?

MR. WATTRAS: THAT IS ACTUALLY UNDER THE UST PROGRAM. EXACTLY.

MRS. WOOD: HAVE THEY CHANGED THE LEGISLATION ON THAT AT ALL? THEY DON'T DO THE PUBLIC HEARINGS. I HAVEN'T EVEN SEEN ANYTHING. THEY JUST GO AHEAD AND THAT'S THAT.

IS THAT -- IS IT --

MR. WATTRAS: I DON'T KNOW HOW THAT GOES TO BE QUITE HONEST WITH YOU. I'M NOT SURE IF NEAL COULD HELP ANSWER THAT QUESTION.

MR. PAUL: THERE IS A CORRECTIVE -- WHEN YOU GO INTO A CORRECTIVE ACTION PLAN THERE IS A PUBLIC MEETING THAT YOU HAVE TO HAVE BEFORE YOU --

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MRS. WOOD: ONCE YOU'RE UNDERWAY THERE

MR. PAUL: YOU MEAN FOR HADNOT POINT?

MRS. WOOD: WELL, NO, FOR THIS SITE 22

UNDER UST. THEY MAY HAVE THE SAME RESPONSIBILITIES.

MR. PAUL: THERE ARE SOME PUBLIC RELATIONS

REQUIREMENTS AND THIS PREDATES ME. SO, I WASN'T HERE WHEN THIS

SYSTEM STARTED.

MRS. WOOD: WELL, NOTHING IS MENTIONED IN

THIS LETTER TO -- THAT WENT OUT TO THE EPA. AND IT WAS AN

EVALUATION THAT YOU ALL -- NOT YOU PER SE --

MR. PAUL: RIGHT.

MRS. WOOD: -- BUT WHOEVER WAS HERE THEN

HAD NOT INCLUDED 22 IN THIS DATA BECAUSE IF FELL UNDER THE UST

PROGRAM AND THEY GOT A VERY NASTY LETTER BACK FROM THE EPA SAYING

"HEY, SOME OF YOUR CONTAMINANTS ARE COMING OUT OF THIS.

THEREFORE, YOU DO NOT -- YOU MUST INCLUDE IT AS PART OF THE

CLEANING FACTOR GOING ON. BUT IT DID INDICATE --

MS. BERRY: SINCE THAT PREDATED HIM, THEN

WE'LL TAKE A LOOK AT IT AND SEE IF THERE'S OTHER CONTAMINANTS THAT

MUST BE TREATED UNDER THERE.

MRS. WOOD: I THOUGHT IT WOULD BE THERE

BETWEEN THE TWO.

MS. BERRY: EXACTLY.

MRS. WOOD: IN THE MAJORITY OF THE THINGS

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IN THE LIBRARY YOU JUST DON'T SEE THAT. NONE OF THAT'S UNDER YOUR PROGRAM.

MR. PAUL: WELL, WE HAVE -- I HAVE --

MRS. WOOD: NONE OF THAT'S UNDER YOUR PROGRAM.

MR. PAUL: WELL, IT IS UNDER MY PROGRAM BECAUSE I HAVE I.R. SITES AND I ALSO HAVE OTHER PROGRAM SITES. BUT IT HAS TO BE INCLUDED AS PART OF THE RECORD BECAUSE THE STATE OF NORTH CAROLINA ACTUALLY ADDRESSES THE RECORD. THEREFORE, THEY ARE CERCLA REGULATED SITES, WHERE THE STATE HAS JURISDICTION NOT EPA. SO, WE SEND THOSE GUYS QUARTERLY REPORTS, QUARTERLY REPORTS OF HOW MUCH WE PULL OUT OF THE GROUND; WATER WE'VE ACTUALLY TREATED. AND TO DATE THERE'S LIKE 25,000 GALLONS OF GASOLINE FROM THE INVENTORY RECORDS THAT WERE SHOWN TO BE MISSING. AND TO DATE WE HAVE RECOVERED ABOUT 20,000 OF GASOLINE AND WE'VE TREATED OVER 3 MILLION GALLONS OF WATER AND THAT'S BEEN SINCE OCTOBER OF '91. SO, THAT SYSTEM HAS JUST ABOUT DONE EVERYTHING YOU CAN DO. AND WE'LL PROBABLY GO BACK IN A YEAR OR TWO AND ADDRESS THE SOILS THERE, BUT THE PLUME TREATMENT IS PRETTY CLOSE TO BEING REMEDIATED. THE REST OF THE WATER IS DISSOLVING. WE'RE PROBABLY NOT GOING TO BE TAKING ANY FREE PRODUCT, WE'LL JUST BE TREATING THE CONTAMINATED GROUNDWATER. GAS HAS BEEN ACTUALLY DISSOLVED. SO IT REALLY HAS BEEN AN EFFECTIVE SYSTEM. AND IF YOU WANT TO KNOW ANYTHING ABOUT IT FEEL FREE TO GIVE WALT OR MYSELF A CALL.

MRS. WOOD: OH, I WAS --

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MR. PAUL: AND THAT IS REALLY ONE OF OUR BIG SUCCESS STORIES.

MRS. WOOD: JUST TO GO ON, WHAT WOULD YOU EXPECT THE -- WHAT PERCENTAGE WOULD YOU EXPECT TO GET OUT?

MR. PAUL: WITH THE PLUME TREATMENT OPERATING FOR FREE PRODUCT?

MRS. WOOD: NO, IF YOU'VE GOT GASOLINE.

MR. PAUL: AND SOME OF THIS IS STRAIGHT FROM RICH BONNELLI, IS THAT IF YOU GET 75 PERCENT OF THE FREE PRODUCT THAT YOU THINK YOU SPILLED INTO THE GROUNDWATER THEN YOU'RE DOING A GREAT JOB, AND 20 OUT OF 25 IS ALMOST 80 PERCENT. SO, WE DONE PROBABLY AS GOOD AS WE CAN DO. AND EVEN 75 PERCENT IS A GREAT RECOVERY RATE. BUT FROM THE PEOPLE I'VE TALK TO IN THE STATE AGREE IT IS A SUCCESS.

MRS. WOOD: I'M SORRY. GO AHEAD.

MR. WATTRAS: NO, THAT'S FINE. THIS IS HADNOT POINT. CAN I ASK, HAVE YOU BEEN DOWN TO HADNOT POINT OR HAVE YOU EVER BEEN BASE?

MRS. WOOD: OH, FOR YEARS. OH, I HAVE --

MR. WATTRAS: OKAY. SO, YOU HAVE SOME IDEA OF WHAT THIS PLACE LOOKS LIKE?

MRS. WOOD: YEAH, I KNOW THIS WHOLE AREA.

MR. WATTRAS: OKAY. THESE ARE JUST RANDOM PHOTOS IT WASN'T ANYTHING PARTICULAR; JUST GOING AROUND THE HADNOT POINT AREA AND TAKING SOME PICTURES. I WILL SAY MOST OF THIS --

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HAD NOT POINT IS -- YOU KNOW, IT'S VERY INDUSTRIAL IN NATURE FROM
THE STANDPOINT THAT MOST OF THE AREA IS GRAVEL COVERED OR COVERED
WITH CONCRETE OR ASPHALT. THERE'S NOT THAT MANY OPEN AREAS WITHIN
THE MAIN INDUSTRIAL AREA.

MRS. WOOD: WHAT WERE YOUR INDUSTRIAL
BUILDINGS? BUILDING 900 OR --

MR. WATTRAS: YES, WE'RE GOING TO TALK ABOUT
THIS RIGHT NOW. BUILDING 900 AREA IS A FORMER MAINTENANCE AREA.
AND THAT'S WHERE WE KNOW WE HAVE A CONTAMINATE PLUME OF SOLVENTS
IN THE GROUNDWATER AND THAT'S WHERE WE CURRENTLY ARE CONSTRUCTING
A REMEDIATION SYSTEM TO CONTAIN THE MIGRATION OF THIS PLUME AND
WE'RE READY TO -- THEY'RE BUILDING IT RIGHT NOW IN FACT. THIS --
WE DISCUSSED THIS EFFORT ABOUT TWO YEARS AGO. I THINK BACK IN
1992 THE DECISION WAS MADE TO PUT IN SOME CONTAINMENT WELLS TO
CONTAIN ANY MIGRATING OF THIS PLUME BY THE 900 BUILDING AREA AND
ALSO BY THE 1600 BUILDING AREA.

MRS. WOOD: 1600, YES.

MR. WATTRAS: NOW, THERE'S ANOTHER BUILDING
1502, WHICH WE'LL TALK ABOUT. THAT'S A DIFFERENT PROBLEM. THIS
IS JUST THE 900 BUILDING AREA. UNDERNEATH THIS AREA IS WHERE WE
PROBABLY HAVE THE HIGHEST LEVELS OF SOLVENTS IN GROUNDWATER.

MRS. WOOD: SO, YOU'RE TALKING ABOUT THE
TCE'S?

MR. WATTRAS: THE TCB'S, YES. WE ALSO HAVE
A LITTLE BIT OF BENZENE WHICH IS ASSOCIATED WITH FUELS, BUT THE

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TCE IS THE MAIN -- THE SOLVENTS TCE AND OTHER THINGS LIKE THAT ARE THE MAIN CONTAMINANTS IN THIS PLUME.

MRS. WOOD: WELL, NOW, HOW DO YOU -- WHEN YOU SAY "CONTAINING IT" IS IT JUST PULLED OUT OR WHAT? WHAT ARE YOU DOING?

MR. WATTRAS: WHEN I SAY CONTAINED WE HAVE A PLUME -- IT'S PROBABLY ON ONE OF THESE FIGURES OVER HERE. I DON'T KNOW -- LET ME JUST MOVE AHEAD REAL QUICK HERE. I DON'T THINK IT'S ON THE SLIDE.

WE WILL PUT WELLS AT THE EDGE WHERE WE BELIEVE THE EDGE OF THE PLUME TO BE, THE OUTER LIMITS OF THE PLUME, AND WE KNOW THAT MY SAMPLING MONITORING WELLS. AND IN THE SOURCE AREA, FOR EXAMPLE, WE MIGHT HAVE 10,000 PARTS PER BILLION OF THE SOLVENTS. AS WE PUT IN WELLS AWAY FROM THAT ALONG THE OUTER EDGES WE MIGHT 50 OR A HUNDRED PARTS PER BILLION. SO WE SEE A NICE PATTERN GOING FROM HIGH CONCENTRATION DOWN TO LOW CONCENTRATION AND IT FOLLOWS THE FLOW. GROUNDWATER AT HADNOT POINT PRETTY MUCH FLOWS IN A, I BELIEVE, A SOUTHWEST DIRECTION -- SOUTHWEST OR SOUTHEAST DIRECTION, AND WE CAN FOLLOW THAT. AND WE PUT IN WELLS. THE WELLS ARE BEING CONSTRUCTED RIGHT NOW TO PUMP GROUNDWATER AT A RATE OF ABOUT FIVE GALLONS PER MINUTE, AND THE WELLS ARE AT THE EDGES OF THIS PLUME TO PREVENT IT FROM GOING ANY FURTHER AND THAT'S WHAT WE CALL CONTAINMENT.

MRS. WOOD: NOW, WHAT HAPPENS IF YOU GET, YOU KNOW, HEAVY EXTENDED RAINS?

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MR. WATTRAS: NOT ONE OR TWO TIME EVENTS OF
RAIN, IT WILL NOT EFFECT -- OTHER THAN THE WATER LEVEL RISING A
LITTLE BIT.

MRS. WOOD: YEAH.

MR. WATTRAS: BUT IT REALLY WOULD NOT DO MUCH
TO THE CONCENTRATIONS. I MEAN, THESE PROBLEMS AT HADNOT POINT
HAVE BEEN AROUND FOR YEARS.

IN FACT, THIS PLUME THAT I'M TALKING ABOUT RIGHT NOW WAS
FIRST STUDIED IN THE MID 1980'S AND THE CONCENTRATIONS HAVEN'T
DIFFERED THAT MUCH. YOU KNOW, WE -- FOR EXAMPLE BACK IN THE
1980'S THEY SAW VERY SIMILAR LEVELS. IT'S NOT LIKE IN 1985 THEY
SAMPLED IT AND MEASURED 10,000 AND THEN IN 1994 WE SAMPLED IT AND
SAW 1,000. THAT WOULD BE A PRETTY DRASTIC CHANGE IN CONCENTRATION
OVER SUCH A SHORT PERIOD. WE'VE SEEN VERY SIMILAR LEVELS.

MRS. WOOD: NOW, ARE THEY SAYING THAT -- I
MEAN, WHAT ARE THEY DOING NOW TO CONTROL THIS?

MR. WATTRAS: CONTROL?

MRS. WOOD: I MEAN, DO THEY HAVE
UNDERGROUND TANKS WHERE THESE SOLVENTS ARE OR IS IT JUST --

MR. WATTRAS: NO, THE SOLVENTS, THEY'RE -- WE
BELIEVE THERE MAY HAVE BEEN ONE TANK THAT WAS USED FOR SPENT
SOLVENTS. THAT TANK AS FAR AS WE KNOW HAS SINCE BEEN REMOVED.

THERE ARE OTHER UNDERGROUND STORAGE TANKS RELATED TO
FUEL. I MEAN, THAT -- WE DON'T BELIEVE THOSE TANKS ARE ASSOCIATED
WITH THIS PROBLEM.

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BUT WE DID LOOK AT SOIL AND FOUND VERY LITTLE OF THE
SOLVENTS IN THE SOIL IN THE HIGHEST AREA THAT WE KNOW OF
GROUNDWATER CONTAMINATION WE PULLED SOIL SAMPLES AND FOUND VERY
LOW LEVELS WHICH GOES BACK TO SOMETHING WHERE I SAID -- WHAT I WAS
TALKING ABOUT LAST NIGHT. I THOUGHT I MAYBE SAID IT HERE AT THIS
MEETING WHERE OVER TIME, YOU KNOW, KNOWING THAT THESE SPILLS
HAPPENED MANY YEARS AGO THROUGH TIME WITH PRECIPITATION AND
EVERYTHING IT SORT OF -- THE SOLVENTS WILL MOVE OUT OF THIS
FRONTAL ZONE. AND THAT MIGHT BE THE CASE HERE WHERE WE HAVE VERY
LOW LEVELS IN SOIL AND VERY FEW SAMPLES HAVE SOLVENTS IN THEM.

SO, THE TANK HAS -- AS FAR AS WE KNOW HAS BEEN PULLED
THAT HAD SPENT SOLVENTS. AND EVEN THAT INFORMATION TO BE QUITE
HONEST WITH YOU IS SKETCHY. IF WASN'T CONCRETE THAT THE TANK THAT
THEY PULLED WAS USED FOR SPENT SOLVENTS; ONE REPORT SAID THAT IT
DID AND ANOTHER REPORT DID NOT SAY THAT. BUT WE HAVE TO THAT FOR
WHAT -

MRS. WOOD: YEAH, WE'VE GOT THE MATERIAL
THERE.

MR. WATTRAS: WE AGREE, YOU KNOW, WE SUSPECT
THAT THERE WAS A TANK THAT WAS USED TO COLLECT SPENT SOLVENTS.
I'LL TALK A LITTLE BIT ABOUT THE PAST INVESTIGATIONS.
I JUST MENTIONED -- YOU KNOW, WE -- THERE HAVE BEEN A LOT OF
INVESTIGATIONS ESPECIALLY AT HADN'T POINT SINCE THE MID-80S. NOW,
THIS INTERIM REMEDIAL ACTION OF THE SHALLOW AQUIFER, THIS IS WHAT
I WAS JUST TALKING ABOUT THE CONTAINMENT WALLS AND WE MADE THE

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DECISION BACK IN 1992 -- WHEN I SAY "WE" I SOMETIMES TALK AS A
GROUP HERE -- THE DEPARTMENT OF THE NAVY AND THE MARINE CORPS
MAKES THE DECISION.

MRS. WOOD: MARINE CORPS.

MR. WATTRAS: THEY MADE THE DECISION TO GO
WITH THE CONTAINMENT ALTERNATIVE WHICH WAS ACCEPTED BY THE EPA AND
THE STATE OF NORTH CAROLINA.

WHAT WE'RE DOING NOW WE STARTED IN 1993/1994. WE'RE NOW
LOOKING AT THE ENTIRE HADNOT POINT AREA. SEE, THE DIFFERENCE
INTERIM STUDY WE WERE JUST FOCUSING ON "LET'S DO SOMETHING ABOUT
THIS PROBLEM NOW. LET'S CONTAIN IT." AND THAT WAS THE
ALTERNATIVE CHOSEN. BUT IT JUST FOCUSED ON SHALLOW GROUNDWATER.
The study of 1993 and 1994 looked at other portions of the
aquifer, looked at surface water and sediment and looked at soil.
That's the difference between these two investigation.

MRS. WOOD: WHAT ABOUT THE DEEP AQUIFER,
YOU DIDN'T FIND ANY --

MR. WATTRAS: ABOUT THE?

MRS. WOOD: THE DEEP AQUIFER.

MR. WATTRAS: WE'LL TALK ABOUT THAT IN A
MINUTE HERE.

BASICALLY, TO THROW OUT THE TERM REMEDIAL INVESTIGATION,
THIS IS DONE UNDER CERCLA. THE OBJECTIVE OF REMEDIAL
INVESTIGATION IS TO FIND OUT WHAT IS THE PROBLEM AT THE SITE. HOW

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BAD IS THE PROBLEM, WHAT KIND OF CONTAMINANTS ARE THERE, AT WHAT CONCENTRATIONS. AND ONCE WE COLLECT ALL THAT DATA THE MAIN PART OF REMEDIAL INVESTIGATION IS TO DETERMINE WHAT IS THE IMPACT TO HUMAN HEALTH AND THE ENVIRONMENT.

SO, IN A NUTSHELL THE REMEDIAL INVESTIGATION LOOKS AT WHAT'S AT THE SITE, TRIES TO FIGURE OUT WHERE IS IT GOING, HOW DEEP HAS IT MIGRATED, HOW FAR OFF-SITE HAS IT MIGRATED VERTICALLY -- OR HORIZONTALLY AND WHAT DOES THIS MEAN TO THE PEOPLE WORKING THERE OR THE ENVIRONMENT.

NOW, HERE'S WHAT WE FOUND AND THIS IS WHERE I'LL GET INTO THESE DIFFERENT AQUIFERS. WE CONFIRMED -- WE KNEW RIGHT THEN WE HAD TWO MAIN PLUMES TO LOOK AT. WE PUT IN A FEW MORE WELLS TO MAKE SURE WE KNEW THE EXTENT -- THE HORIZONTAL EXTENT OF THESE PLUMES. WE DEFINED THE HORIZONTAL EXTENT OF THE PLUMES. WE FEEL VERY COMFORTABLE THAT WE HAVE A GOOD IDEA OF HOW FAR THE CONTAMINATION HAS MIGRATED HORIZONTALLY. AND AS I MENTIONED BEFORE THE TWO PLUMES ARE AT THE 900 BUILDING AREA AND THE 1600 BUILDING AREA.

WE ALSO RECOGNIZED THE BTEX PLUME AT SITE 22 WHICH NEAL TALKED ABOUT EARLIER. WE HAD TOTAL METALS -- WE HAD SOME METALS THROUGHOUT HAD NOT POINT AND AT NO SPECIFIC PATTERN. PRETTY MUCH RANDOM HITS OF LEAD, CHROMIUM, MANGANESE, IRON, BUT NO PARTICULAR PATTERN THAT YOU CAN ASSOCIATE IT WITH A PLUME. WE FOUND THIS AT OTHER SITES TOO. WE'RE NOT SO SURE THESE METALS ARE NECESSARILY DUE TO DISPOSAL ACTIVITIES. THEY COULD BE DUE TO A LOT OF OTHER

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THINGS SUCH AS THE GEOLOGIC CONDITIONS OF THE SHALLOW AQUIFER AND POSSIBLY --

MRS. WOOD: WOULD YOU EXPAND ON THAT A LITTLE BIT BECAUSE I DON'T UNDERSTAND THAT.

MR. WATTRAS: OKAY.

MRS. WOOD: YOU KNOW, THE CHROMIUM I DON'T UNDERSTAND.

MR. WATTRAS: THAT'S FINE.

MRS. WOOD: WHERE WOULD THEY COME FROM IN YOUR --

MR. WATTRAS: FROM THE SOIL ITSELF. THE SOIL SAMPLES WILL HAVE CHROMIUM AND LEAD.

MRS. WOOD: YEAH, I MEAN --

MR. WATTRAS: AND THAT'S NATURALLY OCCURRING.

I MEAN --

MRS. WOOD: MANGANESE, I --

MR. WATTRAS: MANGANESE -- EVEN LEAD -- YOU HAVE SOME LEAD IN SOILS, AND SOME LEAD FROM PARTICULATES AND SO FORTH.

WHEN WE PUT IN A SHALLOW WELL THE SHALLOW AQUIFER IS IMPounded ABOUT FIVE TO TEN FEET BELOW GROUND SURFACE HERE AT HADNOT POINT DEPENDING UPON WHERE YOU'RE AT.

THE CHARACTERISTICS OF THE AQUIFER, IT'S VERY LOOSELY COMPACTED, VERY SANDY; IT'S NOT TIGHTLY COMPACTED. WE PUT IN A WELL, WE HAVE A SCREEN IN THE WELL THAT TRIES TO GET OUT THESE

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SILTS AND SANDS FROM THE SAMPLE, BUT YOU STILL HAVE SOME THAT GO
THROUGH THE SLOTS OF THE SCREEN.

WHEN WE SAMPLE WE TRY TO TAKE PRECAUTIONS WHEN WE PULL
A SAMPLE NOT TO HAVE ANY SUSPENDED SOLIDS IN THAT WATER SAMPLE.
IT'S VERY HARD TO DO THAT IN THIS GEOLOGIC FRAMEWORK BECAUSE OF
THE LOOSELY COMPACTED SILTS AND SANDS.

NOW, OUR DEEP WELLS, AND HERE'S THE ONLY PATTERNING THAT
WE'RE SEEING, WE'RE SEEING THESE TOTAL METALS AND TOTAL METALS
MEANS JUST THAT; IT'S A SAMPLE OF THE WATER IT'S TAKEN STRAIGHT TO
THE LABORATORY, IT'S NOT FILTERED.

SO, WITH THE -- THE ANALYSIS MIGHT BE BIASED HIGH A
LITTLE BIT BECAUSE OF THE FINDS OR PARTICULATES IN THE SAMPLE. I
CAN TELL YOU THIS THAT WE ALSO LOOK AT DISSOLVED METALS. AND WHEN
WE LOOK AT DISSOLVED METALS THAT WATER SAMPLE IS PUT THROUGH A
FILTER FIRST, AND ALL THE FINDS ARE TAKEN OUT OR ANY MATTER, YOU
KNOW, IT COULD BE SOME BACTERIA OR WHATEVER THAT COLLECTS IN THE
WELL, THAT'S SCREENED AWAY AND THEN THAT SAMPLE IS SENT TO THE
LABORATORY.

NOW, WHEN WE LOOK AT DISSOLVED WATER SAMPLES WE REALLY
DON'T FIND A METALS PROBLEM. ANOTHER PLACE WERE WE REALLY DON'T
FIND A METALS PROBLEM IS IN DEEP GROUNDWATER AND WE BELIEVE THE
REASON IS -- WE USE THE SAME SAMPLING TECHNIQUES, BUT IN THE DEEP
GROUNDWATER THE WAY THE GEOLOGY IS YOU HAVE VERY TIGHTLY COMPACTED
SILTS AND SANDS. THEY'RE VERY TIGHT AS OPPOSED TO THE SHALLOW
WHERE THEY'RE LOOSE. AND IN THE DEEP AQUIFER WE DON'T REALLY HAVE

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MUCH OF A METALS PROBLEMS. WE HAVE THE MANGANESE. WE HAVE FOUND THIS MANGANESE IN SOME OF THE DEEP WELLS AND I BELIEVE OUT OF ALL OF OUR DEEP WELLS, I THINK, WE HAD ONE HIT OF LEAD THAT WAS JUST ABOVE THE DRINKING WATER STANDARDS AND IT -- THE DRINKING WATER STANDARDS FOR LEAD -- IT'S 15.

MRS. WOOD: 15, YEAH.

MR. WATTRAS: WE FOUND ONE HIT OF LEAD AT 16 IN ONE DEEP WELL. SO, FOR THE MOST PART THE PATTERN THAT WE'RE SEEING IS THE SHALLOW HAS CONSISTENTLY SHOWN US HIGH TOTAL METALS, NOT JUST AT HADNOT POINT, EVEN IN SOME OF OUR BACKGROUND WELLS THAT WE HAVE THROUGHOUT THE BASE, AND EVEN AT SOME OFF-BASE WELLS. WE'VE LOOKED AT SOME STUDIES THAT WERE DONE -- I'M NOT SURE IF IT WAS MENTIONED HERE LAST NIGHT ABOUT CAMP LEJEUNE ACQUIRING 40,000 ACRES OF LAND.

MRS. WOOD: OH, YEAH. YEAH. RIGHT.

MR. WATTRAS: SO THERE'S BEEN A COUPLE OF STUDIES DONE THERE WHERE THE SAME PATTERN HAS OCCURRED WHERE THE SHALLOW AQUIFER EVERY TIME WE LOOK AT TOTAL METALS IT SHOWS US SOME ELEVATED LEVELS WHICH WOULD BE ABOVE DRINKING WATER STANDARDS.

MRS. WOOD: WELL, THEY HAVE NOT DONE A SOIL STUDY ON THIS AREA THAT WOULD HAVE DEFINED WHAT TO EXPECT IN YOUR TOTAL METALS. I MEAN, BEFORE YOU STARTED THIS PROGRAM THERE ISN'T SOME --

MR. WATTRAS: WELL, WE LOOKED AT THE SOIL

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RESULTS. WE COMPARED THE SOIL RESULTS, IF I'M UNDERSTANDING YOUR
QUESTION --

MRS. WOOD: NO, I'M JUST SAYING --

MR. PAUL: DIDN'T THE STATE STUDY THIS AREA?

MRS. WOOD: -- JUST A GENERAL STUDY.

MR. WATTRAS: NO, NOT BEFORE THIS. WE JUST LOOKED AT THIS, WE DID A PRELIMINARY STUDY PROBABLY ABOUT TWO MONTHS AGO AND BAKER LOOKED AT 21 SITES AT CAMP LEJEUNE AND THESE WERE -- THE 21 SITES MAKE UP DIFFERENT INVESTIGATIONS THAT WE'RE LOOKING AT, DIFFERENT PHASES AND SO FORTH. AND AT ALL 21 SITES WE HAD HIGH TOTAL METALS AND WE HAD A NUMBER OF WHAT WE CALL BACKGROUND WELLS. THESE ARE WELLS THAT ARE INSTALLED OFF-SITE, UPGRADEINT, WITH RESPECT TO FLOW THAT WE WOULDN'T EXPECT THAT WELL TO BE CONTAMINATED FROM THIS SITE. FOR EXAMPLE, IF THIS SITE IS SITTING HERE AND THERE'S A HILL COMING UP THIS WAY, WE MIGHT PUT A WELL UP HERE, WHICH WE HOPE IS GOING TO TELL US WHAT IS OUR BACKGROUND CONCENTRATIONS.

WELL, I THINK WE LOOKED AT 14 BACKGROUND WELLS, AND I BELIEVE -- I'M GOING TO SAY EITHER SIX OR NINE OF THE BACKGROUND WELLS ALSO HAD THIS SAME TOTAL METALS PATTERN IN THE SHALLOW AQUIFER.

SO, THE OTHER THING WE DID TOO TO LOOK AT THIS TOTAL METALS PROBLEM IS WE LOOKED AT THE SOIL RESULTS TO SEE IF THERE WAS A CORRELATION BETWEEN WHAT WE SEE IN THE SOIL AND HIGH LEVELS.

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IN THE SHALLOW GROUNDWATER. AND WE LOOKED AT SOIL RESULTS FROM
I'LL SAY A CLEAN WELL, A WELL THAT SHOWED NO REAL ELEVATED LEVELS
OF METALS AND THE SOIL RESULTS WE LOOKED AT THAT, AND WE COMPARED
THOSE SOIL RESULTS WITH SOIL RESULTS TAKEN FROM ANOTHER AREA THAT
EXHIBITED HIGH TOTAL METALS AND THERE WAS NO DIFFERENCE. SO, WE
SAID THERE'S NO SOURCE.

I MEAN, WHEN YOU HAVE A GROUNDWATER PROBLEM YOU HAVE TO
ASSOCIATE IT WITH A SOURCE. WE COULD NOT CORRELATE THESE TOTAL
METALS IN SHALLOW GROUNDWATER WITH A SOURCE IN SOIL. SO, WE
PRETTY MUCH PRELIMINARILY -- WE'VE ONLY CONDUCTED ONE STUDY AND
THIS IS SOMETHING THAT WE'RE GOING TO LOOK AT ON AND ON BECAUSE
WE'RE FACING THIS PROBLEM WITH EVERY SITE OF TOTAL METALS. AND WE
HAVE TO -- OBVIOUSLY THE STATE OF NORTH CAROLINA AND EPA STANDARDS
ARE BASED ON TOTAL METALS AND THAT'S A PROBLEM BBecause WE'RE NOT
SO SURE WHETHER THESE TOTAL METALS ARE NECESSARILY RELATED TO
DISPOSAL ACTIVITIES OR WHETHER THEY'RE RELATED TO A COMBINATION OF
THE GEOLOGIC FRAMEWORK AND SAMPLING TECHNIQUES.

MRS. WOOD: NOW, AS A CORPORATION ARE YOU
RESPONSIBLE FOR MAKING -- I MEAN, YOU ALL ARE DOING THIS WORK AND
GETTING PAID FOR IT, BUT I THINK THE STATE WOULD HAVE TO COME IN
AND DO COMPLEMENTARY STUDIES. I DON'T SEE WHY YOU WOULD HAVE TO
BE RESPONSIBLE IF IT IS A GEOLOGICAL CONDITION OR A NATURAL
CONDITION TO FIND THAT.

MR. WATTRAS: WE ARE -- WE'RE --

MR. WATTERS: NOT -- NOT --

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MR. WATTRAS: SORRY GO AHEAD, PATRICK.

MR. WATTERS: NOT NECESSARILY. THE STATE
WOULDN'T HAVE TO COME IN AND DEAL WITH THAT. IT'S JUST THAT IN
THIS PARTICULAR CASE THE STATE WILL TELL WHOEVER IS WORKING ON THE
PROBLEM TO SHOW US WHETHER OR NOT THIS IS REAL OR WHETHER OR NOT
THIS IS --

MRS. WOOD: SO, IN OTHER WORDS THEY'RE THE
ONES THAT COME IN --

MR. WATTERS: IT'S UP TO WHOEVER OWNS THE
PROPERTY.

MRS. WOOD: THEY HAVE TO REVEAL THOSE
STANDARDS. I MEAN, THEY COULD COME IN AND SAY THIS IS A NATURAL
CONDITION THAT THEY ARE FINDING AND YOU WOULD HAVE TO MAKE THAT
DETERMINATION. SO, IF THIS CAME UP SOMEWHERE DOWN THE LINE IF
THEY ARE FINDING, YOU KNOW, IT AS A NATURAL PHENOMENON.

MR. WATTERS: IF THERE'S SOMETHING TO PAY
WELL I GUESS IT GOES BACK TO THE GENERAL ASSEMBLY AND WE NEED TO
DEAL WITH THE STANDARD, BUT IN THE MEAN TIME WE HAVE TO DEAL WITH
THE INITIAL --

MRS. WOOD: COULDN'T YOU DO A WAIVER?

MR. WATTERS: WE COULD DO THE WAIVER SYSTEM

BUT --

COURT REPORTER: WAIT I CAN'T HEAR HER.

MR. WATTRAS: CAN YOU SPEAR UP?

MS. TOWNSEND: WE MET WITH THE GROUNDWATER

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SECTION UP IN WILMINGTON AND THIS ISSUE CAME UP AND RAY AND HIS GROUP HELPED PRESENT THE FACTS OF WHAT WE WERE FINDING AND THE CONCLUSION WAS LIKE IN THIS EVENT. AND WE'RE TRYING TO SEE WHAT'S ACTUALLY GOING ON, WHAT WE THINK IS GOING ON. YOU KNOW, WE PROVED IT ON PAPER, BUT WE NEED TO SEE WHAT'S ACTUALLY IN THE ACTUAL SAMPLE AND WE HAVEN'T DONE THAT IN THE PAST. THAT'S WHERE WE'RE HEADING.

MR. WATTRAS: ANOTHER THING THAT WE'RE DOING -- TOM BIXIE HERE WORKS FOR BAKER AND HE'S INVOLVED WITH A PROJECT FOR AN INDUSTRIAL CLIENT WHERE THEY HAD THE SAME SITUATION WHERE THEIR TOTAL METALS WERE VERY HIGH AND THEY WEREN'T REALLY CONVINCED THAT THESE METALS WERE DUE TO WHAT WAS DISPOSED OF AT THIS SITE HE WAS WORKING AT AND THERE'S NOW DIFFERENT SAMPLING TECHNIQUES THAT WE'RE GOING TO TRY IN THE FUTURE TO ELIMINATE THE SUSPENDED PARTICLES, YOU KNOW, TRY TO REDUCE THAT DOWN. SO, WE'RE GOING TO TRY THAT IN OUR NEXT INVESTIGATION, A LITTLE BIT DIFFERENT SAMPLING TECHNIQUES. SO, THERE'S SOME THINGS THAT WE'RE LOOKING AT BECAUSE, YOU KNOW, IT COULD BE PARTLY DUE TO THE SAMPLING TECENIQUE.

MRS. WOOD: YEAH.

MR. WATTRAS: I MEAN, THERE'S NO DOUBT ABOUT IT.

MRS. WOOD: YEAH.

MR. WATTRAS: NOW, THE GEOLOGIC FRAMEWORK IS ONE THING, BUT WE'VE GOT TO TRY TO DEAL WITH THAT AND THAT'S WHAT

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WE'RE GOING TO TRY TO.

CORRECT ME IF I'M WRONG GINA, BUT I WAS TALKING TO N.U.S., YOU KNOW, AT THE MEETING THE OTHER DAY AND THEY'RE WORKING AT CHERRY POINT, WHICH IS ABOUT AN HOUR AWAY, AND THEY -- THEY'RE RUNNING INTO SIMILAR PROBLEMS ALSO AND IT'S BECAUSE OF THIS LOOSELY COMPACTED SANDS AND SILTS OF THE SHALLON AQUIFER AND THEY'RE ALSO GOING TO BE TRYING THIS LOW FLOW TECHNIQUE --

MRS. WOOD:

TO SEE --

MR. WATTRAS:

-- TO SEE.

MRS. WOOD:

-- WHAT CHANGES.

MR. WATTRAS: NOW, THE INTERMEDIATE GROUNDWATER AND THE DEEP GROUNDWATER WERE ALSO STUDIED. WE SAW A DRASTIC CHANGE IN CONCENTRATION COMPARED TO THE SHALLOW, WHICH IS GOOD. THE INTERMEDIATE I'M TALKING ABOUT DEPTHS OF ABOUT 75 FEET; ROUGHLY 75 FEET. THE DEEP, I'M REFERRING TO DEPTHS OF ABOUT 150 TO 175.

NOW, THE SUPPLY WELLS IN THE HADNOT POINT AREA, AND THERE ARE QUITE A FEW. THERE ARE ABOUT -- AT LEAST SIX SUPPLY WELLS SURROUNDING THE HADNOT POINT AREA. THEY ARE SCREENED IN SEVERAL INTERVALS. THESE SUPPLY WELLS AND THEY'RE ALL -- THEY ARE SHUT DOWN. THEY'VE BEEN SHUT DOWN FOR A NUMBER OF YEARS, BUT THEY ARE SCREENED AT ABOUT 75 FEET AND THEN DOWN BELOW FURTHER AT ABOUT 150 UP TO 200 FEET AND THAT'S WHY THE INTERMEDIATE WELLS WERE INSTALLED, AND THESE WERE INSTALLED BY ANOTHER FIRM, BUT THEY INSTALLED THEM, I BELIEVE, TO MATCH THE SCREENING INTERVALS OF THE

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SUPPLY WELLS.

AGAIN, WHAT WE SAW WAS A DRASTIC CHANGE IN CONCENTRATION BETWEEN WHAT WE ARE SEEING IN THE SHALLOW AND THEN WHAT WE'RE SEEING IN THE INTERMEDIATE AND EVEN LOWER IN THE DEEP. AND IN THE DEEP I WOULD ALMOST SAY WE HAVE NOT MUCH OF A PROBLEM AT ALL.

THERE WAS JUST BENZENE AND, IN FACT, IT WAS AT A WELL NEAR HADNOT POINT FUEL FARM. THAT WAS AT ABOUT FIVE PARTS PER BILLION, WHICH IS JUST AT THE M.C.L., MAYBE FIVE, MAYBE SIX; IT WAS RIGHT AROUND THE M.C.L. EVERYTHING ELSE IN THE DEEP WAS PRETTY -- WHAT WE WOULD CALL CLEAN; MEANING, BELOW THE DRINKING WATER STANDARDS.

MRS. WOOD: NOW, THESE WERE THE FIGURES YOU GOT AND YOU'RE NOT RELYING ON THE ONES THAT WERE TAKEN FROM THE PREVIOUS STUDIES?

MR. WATTRAS: YEAH. OH, YEAH. WE RE-SAMPLED THESE WELLS. THESE WELLS HAVE BEEN SAMPLED SEVERAL TIMES. WE ARE SEEING SOME PATTERN OVER TIME THAT THE CONCENTRATIONS IN THE INTERMEDIATE AND DEEP HAVE BEEN DECREASING.

WE DID TAKE ONE MORE SAMPLE -- OR ANOTHER ROUND OF SAMPLES LATE IN THE INVESTIGATION AND THEY SLIGHTLY INCREASED.

SO, OVERALL THERE HAS BEEN A TREND OF DECREASE IN CONCENTRATIONS WITH THE EXCEPTION OF THE LAST ROUND; THEY INCREASED SLIGHTLY.

NOT -- I MEAN, I'M NOT TALKING A MAJOR INCREASE, BUT I CAN'T SAY THAT EVERY SAMPLING ROUND THEY WENT DOWN, DOWN, DOWN, DOWN IN CONCENTRATION, BUT THE LAST ONE WAS SLIGHTLY HIGHER THAN THE PREVIOUS ONE.

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WE'LL TALK A LITTLE BIT ABOUT THE SOIL. AS EXPECTED WITHIN SITE 21 WE HAD SOME HIGH LEVELS OF PESTICIDES IN THAT MIXING AREA AND ALSO IN THE PCB DISPOSAL PIT. WE FOUND PCB'S AT 4.6 PARTS PER MILLION. THAT IS A LITTLE BIT ELEVATED. I WOULDN'T -- YOU HAVE A -- WHAT'S CALLED A TSCA WASTE WHEN YOU HIT 50 PARTS PER MILLION AND THAT'S WHEN YOU REALLY HAVE A PROBLEM. SO, WE'RE -- WE DO HAVE SOME ELEVATED LEVELS. THEY'RE AT FOUR -- ROUGHLY FOUR AND A HALF PARTS PER MILLION AND THAT WAS THE MAXIMUM CONCENTRATION. IN FACT, THAT WAS RIGHT FROM THE CENTER CORE OF THE PIT.

AT SITE 24 WE HAD SOME METALS THAT WERE ABOVE WHAT WE CALL BACKGROUND CONCENTRATIONS IN THE SOIL. AGAIN, AS WE INVESTIGATE EACH SITE WE ALWAYS TAKE BACKGROUND SAMPLES OF EACH SITE AND WE'VE BEEN -- WE HAVE A DATABASE THAT HAS BEEN ACCUMULATING OVER TIME. THE METALS IN -- AT SITE 24 WERE SLIGHTLY ABOVE THOSE BACKGROUND CONCENTRATIONS, BUT I WILL SAY WHEN WE COMPARED THE SOIL RESULTS AT SITE 24 WITH SITE 21 AND 78 THEY WERE PRETTY COMPARABLE. AND SEE, AT SITE 24 THAT'S A FLY ASH DUMP, WE THOUGHT WE WOULD SEE SOME ELEVATED LEVELS OF METALS.

SO, IN ONE SENSE, I'LL SAY THAT YES, THEY WERE ELEVATED BECAUSE THEY WERE ABOVE BACKGROUND, BUT WHEN WE COMPARED THEM TO SITES 21 AND 24 THEY WERE COMPARABLE. SO, WE DIDN'T SEE MUCH OF A PATTERN BETWEEN THE THREE SITES IS WHAT I WOULD SAY.

MRS. WOOD: YOU'VE GOT A PROBLEM GENERALLY.

MR. WATTRAS: WE DON'T BELIEVE IT WAS MUCH OF

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A problem there. We had a pesticide that was detected in one soil sample, this heptachlor epoxide it was at a low concentration down at Site 24. It was also -- and I'm kind of jumping ahead of myself, but the reason we put it up on the slide that pesticide was also found in groundwater in the shallow aquifer at Site 24.

Here's a case where, again, we found it at low levels in the groundwater, but in our soil we really didn't see much of it. We can't -- we're really not too clear on what happened there. You know, did we miss the source or is the source depleted from the soil, or -- I mean, another possibility would be the same situation with the metals, did we get a groundwater sample that had some finds in it of some pesticides that was really more or less related to the sediment as opposed to being in groundwater.

Because one thing about pesticides they're not -- number one, they're not that mobile in the environment. They don't migrate like a solvent will. If you have a gasoline spill or a solvent spill and it would rain over time that would pretty much go to the groundwater pretty quick. Pesticides stay with the soils. They don't migrate that readily. So, we were a little bit surprised to see it in the groundwater especially when we saw that our highest level in soil was very, very low. That's five parts per billion. That's extremely low to see it -- thinking that it might be part of the groundwater problem.

So, I'm going to jump ahead of myself a little bit right here. We are going to monitor that. We're going to look at those

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Wells some more to try to figure out, is there really a groundwater problem associated with pesticides. Again, it was at very low levels or was that a sample that might have been biased high due to some particulates that may have accumulated in the sample itself.

Site 78 -- at Site 78 we found some high levels of pesticides around Building 1502 and the history of that building as far as we know and what we can tell was never used for pesticide mixing and handling. So, although the history doesn't tell us anything we do know we have some high levels of pesticides that will be taken care of.

Now, VOC's, these are the volatiles, we did find them at several building areas and we also found PAH's, which are another group of contaminants, mainly in the 900 building area as I mentioned. They were at low levels though. So, we should of maybe added that to the slide, that they were detected, but at pretty low levels. Nothing where we would say there is a continuing source of a groundwater problem. I mean, we're talking in the parts per billion range.

Colonel Wood: What side of the main road is 1502 on as you go in?

Mr. Wattras: Pardon me?

Colonel Wood: What side of the road is it on? The right side or the left side?

Mr. Wattras: Of building --

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COLONEL WOOD: IN THE INDUSTRIAL AREA?

MR. WATTRAS: I DON'T RECALL.

MR. HAVEN: IT'S IN THE INDUSTRIAL AREA.

COLONEL WOOD: IT'S IN THE INDUSTRIAL AREA?

MR. HAVEN: YES, SIR. YES, SIR. IT WOULD BE MORE IN THE SOUTHWESTERLY END.

MS. BERRY: IT'S RIGHT HERE. YOU CAN SEE IT HERE.

COLONEL WOOD: I'M SORRY, I THOUGHT IT WAS -- MIGHT BE ASSOCIATED WITH THE WASH TOWER AND THE HARDSTAND WHERE THEY USED TO WASH DOWN VEHICLES AND THINGS LIKE THAT. AND --

MR. HAVEN: NO, SIR; IT'S --

MS. BERRY: IT'S RIGHT OFF GIBB STREET,

RIGHT HERE.

COLONEL WOOD: I'M WITH YOU. OKAY, THANK YOU.

THANK YOU. I'M SORRY.

MR. WATTRAS: FROM A STANDPOINT OF HUMAN HEALTH RISK WE COLLECT ALL THIS INFORMATION. LOOKING AT THE ACTIVITIES AT HADNOT POINT WE LOOK AT, YOU KNOW, THE PEOPLE WORKING THERE AND HOW THEY WOULD BE EXPOSED TO THIS. THE RISK ASSESSMENT RESULTS SHOWED THAT THERE IS -- THAT THE NUMBERS -- THE INCREMENTAL CANCER RISKS OR THE CHANCE OF ACQUIRING CANCER DUE TO EXPOSURE ARE WITHIN ACCEPTABLE RANGE AS DEFINED BY EPA. CAN I SAY THAT?

MS. TOWNSEND: (NODS HEAD.)

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MR. WATTRAS: OKAY. WHICH IS THE RANGE OF
ONE IN 10,000 TO ONE IN ONE MILLION. WE ALSO LOOK AT OTHER THINGS
SUCH AS WHAT'S CALLED THE HAZARD INDEX, AND THAT'S AN INDEX OF
ONE. THAT HAZARD INDEX TAKES INTO ACCOUNT THINGS LIKE LIVER
damage, things that are obviously not cancer related, but impacts
the body; such as the kidney or the liver or other things. And it
was acceptable for soil, but not for groundwater which we expected
at those high levels somebody -- you know, we don't want somebody
drinking that shallow aquifer. That would give them an
unacceptable risk.

Now, you have to remember too about the groundwater when
we do a risk assessment currently there's really no exposure.
People obtain their water from supply wells -- from clean supply
wells. So, under current situations there's no risk to human
health with the groundwater.

Now, if had not point or Camp Lejeune would shut down one
day and someone decided to turn it into a complex and they
installed their wells in the shallow aquifer they would have an
unacceptable risk.

So, when we do a risk assessment you look at the current
situation and you always have to project out, and we call that the
future potential risk. It's a conservative way of looking at
things, but you know, things over time change. It could be
realistic in a lot of cases. And at Camp Lejeune we think right
now that would be pretty unrealistic.

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I'LL HAVE TOM BIXIE TALK A LITTLE BIT ABOUT ECOLOGICAL
RISKS BECAUSE THAT'S THE OTHER PART OF THE RISK ASSESSMENT WHICH
PLAYS A GREAT IMPORTANCE IS LOOKING AT, YOU KNOW, DO THESE
CONTAMINANTS IMPACT THE TERRESTRIAL HABITAT OR THE AQUATIC
HABITAT.

MR. BIXIE: AT THE SITE WE DID LOOK AT WHAT
WOULD BE THE IMPACTS FROM -- FROM THE SITE AND THE CONTAMINANTS ON
BOTH THE AQUATIC, ENVIRONMENT AND THE TERRESTRIAL. WE TOOK SOME
SURFACE WATER AND SEDIMENT SAMPLES AND COMPARED THESE TO STANDARDS
THAT HAVE ESTABLISHED FOR SCREENING VALUES TO SEE IF -- IF THERE
WERE ANY EXCEEDANTS OF THESE VALUES, AND NOT ONLY IF THERE WERE
ANY EXCEEDANTS; WHERE WERE THEY, WERE THEY UP STREAM OR WERE THEY
DOWN STREAM, WAS THERE ANY PATTERN TO THEM.

IN TERMS OF THE SURFACE SOILS WHAT WE HAVE BEEN DOING IS
GOING THROUGH A SCENARIO WHERE WE MODEL THE UPTAKE OF THE
CONTAMINANTS ENTERING PLANTS THAT SOME TYPE OF TERRESTRIAL
WILDLIFE WOULD BE FOR EXAMPLE, A RABBIT; WE USED A RABBIT, AND WE
USED A BIRD AND WE USED A DEER.

SO, WE GO THROUGH A SCENARIO JUST AS YOU GO THROUGH THE
HUMAN HEALTH SCENARIO AS A SMALL CHILD USES DRINKING WATER. WE GO
THROUGH AND WE HAVE THE DEER EATING SOME SOIL WHILE HE'S GRAZING
ON THE PLANTS; HE'S EATING THE PLANTS AND DRINKING THE WATER FROM
THE AREAS. SO, WE GO THROUGH THOSE TYPE OF SCENARIOS. IN LOOKING
AT THIS PARTICULAR SITE IT LOOKS LIKE THE PESTICIDES SEEM TO
REPRESENT THE MOST POTENTIAL FOR ANY TYPE OF ADVERSE IMPACT TO THE

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ECOLOGICAL ENVIRONMENT. AND --

MRS. WOOD: OKAY, NOW, I'M THINKING GREAT

VAST AREAS OF CEMENT THAT YOU HAVE AROUND BURGER KING. YOU 'VE GOT

THAT FIELD UP THERE AND YOU'RE GOT THE STEAM PLANT. WHERE IS THIS

WATER GOING TO BE?

MR. BIXIE: IT'S -- IT'S IN THE TWO CREEKS

THAT ARE LOCATED ON EITHER SIDE.

MRS. WOOD: I'M TRYING TO VIEW THIS.

MR. BIXIE: IT'S COGDELS CREEK AND BEAVER

DAM.

MR. WATTRAS: YES, BEAVER DAM AND COGDELS

CREEK.

MR. BIXIE: BEAVER DAM IS SOUTHEAST --

MR. WATTRAS: TO THE WEST OF HOLCOMB

BOULEVARD. COGDELS CREEK IS TO THE EAST OF THE HADNOT POINT

INDUSTRIAL AREA. MAYBE BRING THAT --

MRS. WOOD: NO, I'LL GET OVER THERE.

THAT'S FINE.

(MR. WATTRAS AND MR. BIXIE SHOW MRS. WOOD A MAP

OF THE LOCATION IN QUESTION.)

(PAUSE.)

MR. BIXIE: LOOKING AT THE IMPACTS OF

TERRESTRIAL WILDLIFE IS NOT AS ADVANCED AS IT IS -- AS WHAT WE'RE

LOOKING AT WITH IMPACTS TO FISH AND THINGS THAT LIVE IN THE WATER

JUST BECAUSE WATER IMPACTS HAVE BEEN A LOT MORE WELL STUDIED OVER

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THE YEARS.

WE'VE DEVELOPED THIS MODEL THAT LOOKS AT WHAT TYPE OF DOSAGE THIS PARTICULAR WILDLIFE COULD GET. JUST AS YOU COMPARE FOR HUMANS WHAT THE ALLOWABLE INTAKE EPA HAS ESTABLISHED FOR LEAD AND MERCURY OR WHATEVER THERE'S ALSO LEVELS THAT EPA HAS ESTABLISHED IN THE LITERATURE FOR DEER AND FOR RABBIT THAT MAY BE EXPOSED TO ZINC OR -- SO WE GO THROUGH THAT TYPE OF ANALYSIS AND BASED ON THAT WE CAME UP WITH PESTICIDES ARE -- SEEM LIKE THEY HAVE THE MOST IMPACT.

MRS. WOOD: THAT'S INTERESTING. THANK YOU.

MR. WATTRAS: ONCE ALL THESE THINGS ARE TAKEN INTO ACCOUNT AND WE KNOW WHAT THE POTENTIAL RISKS ARE TO BOTH HUMANS AND WILDLIFE WE WILL LOOK AT WHAT ARE THE PROBLEMS OUT THERE THAT ARE CAUSING A HIGH RISK SUCH AS THE GROUNDWATER, SUCH AS PESTICIDES OF THE SOIL OR WHATEVER. AND WE LOOK AT WHAT ARE THE BEST CLEANUP METHODS OR ALTERNATIVES IN DEALING WITH THESE PROBLEMS.

FOR THE GROUNDWATER, THERE ARE TWO PRIMARY PLUMES WHICH WE'RE LOOKING AT. AND FOR SOIL THERE ARE FOUR AREAS OF CONCERN. THREE OF THE AREAS OF CONCERN ARE WITHIN SITE 21 AND THE FOURTH ONE IS AT THIS BUILDING 1502.

I CAN TELL YOU -- NOW, THOSE AREAS OF CONCERN ARE MEASURED THERE IN SQUARE FEET. IT WOULD HAVE BEEN MAYBE A LITTLE BIT BETTER TO SHOW IT IN CUBIC YARDS. IT'S A LOT EASIER, I THINK, TO PICTURE THINGS IN CUBIC YARDS THAN SQUARE FEET, BUT I'LL TELL

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YOU THAT THE PESTICIDES AND PCB'S ARE PRIMARILY UP IN THE TOP TWO
FEET OF SOIL. BELOW THAT OUR SOIL SAMPLES REALLY DIDN'T FIND ANY
SIGNIFICANT CONTAMINATION.

SO, DURING REMEDIATION IT WOULD PRETTY MUCH INVOLVE
TAKING OUT ABOUT TWO FEET OF SOIL OVER THAT AREA. THEY ARE SMALL
AREAS. NONE OF THESE AREAS ARE WHAT I WOULD CALL A HUGE AREA OF
CONTAMINATION. THEY'RE PRETTY -- YOU KNOW, YOU'RE TALKING ABOUT
800 SQUARE FEET, THAT'S NOT VERY BIG. SAME THING WHERE THE
HIGHEST ONE IS AT SITE 21 IS ABOUT 8,100 SQUARE FEET. THAT'S NOT
THAT LARGE OF AN AREA.

THE GROUNDWATER ALTERNATIVES THAT WE LOOKED AT WOULD BE
THE NO ACTION ALTERNATIVE, WHICH EVERYBODY KNOWS WE LOOK AT.
INSTITUTIONAL CONTROLS WHICH WOULD BE SHUTTING WELLS DOWN, NOT
ALLOWING NEW WELLS TO BE PUT IN. THE THIRD ALTERNATIVE IS
REFERRED TO AS SOURCE CONTROL. AS I MENTIONED BEFORE THE ACTION
THAT'S GOING ON RIGHT NOW IS ContAINMENT ALTERNATIVE. WE'RE
CONTAINING MIGRATION.

ALTERNATIVE THREE FOCUSES ON GOING TO THE HOT SPOT AND
DEALING WITH THAT HOT SPOT; PUMPING FROM THAT AREA. AND IN
ALTERNATIVE THREE IT WOULD SIMPLY BE ADDING ADDITIONAL WELLS IN
THE HOTTEST, THE MOST CONTAMINATED PORTION OF THAT PLUME, TYING IT
INTO THE EXISTING TREATMENT SYSTEM THAT IS BEING CONSTRUCTED. THE
FOURTH ALTERNATIVE WOULD ALSO BE SOURCE CONTROL, BUT IT WOULD USE
A DIFFERENT TECHNIQUE OF AIR SPARGING.

AIR SPARGING IS SIMPLY PULLING AIR -- PULLING AIR OUT OF

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THE GROUND. BY DOING THIS IT'S ALMOST LIKE A VACUUM WHERE YOU'RE PULLING THE VOLATILES, AND VOLATILES READILY MOVE AND IT WOULD GO THROUGH AN AIR PATHWAY AND IT WOULD BE COLLECTED. THE AIR WOULD BE -- EMISSIONS WOULD BE COLLECTED.

IN THAT ALTERNATIVE THE ADVANTAGES -- YOU DON'T REALLY TREAT ANY -- YOU DON'T HAVE TO PULL ANY GROUND WATER OUT. YOU DO EVERYTHING -- WHAT WOULD BE IN SITU. YOU'RE NOT PULLING OUT ANYTHING. EVERYTHING STAYS THE SAME, IT'S JUST THAT YOU'RE SUCKING AIR OUT AND THE VOLATILES WOULD FOLLOW THAT AIR PATHWAY.

THE FIFTH ALTERNATIVE ADDRESSES THE DEEPER GROUNDWATER.

THE FIRST FOUR -- OF COURSE, ONE AND TWO DON'T DO ANYTHING WITH THE GROUNDWATER, BUT THE THIRD AND FOURTH ALTERNATIVE FOCUSES JUST ON THE SHALLOW GROUNDWATER.

THE FIFTH ONE CONSIDERS WHAT WOULD HAPPEN IF -- OR WHAT WOULD BE THE COST AND OUTCOME IF WE PUT IN SOME DEEP EXTRACTION WELLS AND WENT AFTER THE CONTAMINATION IN THE INTERMEDIATE AQUIFER AND IN THE DEEP AQUIFER.

LET ME MOVE AHEAD A LITTLE BIT HERE AND I'LL GO BACK TO THAT. LET'S LOOK AT THE COST OF THESE ALTERNATIVES TOO. THE COST OF --

COLONEL WOOD: COULD YOU FOCUS THAT JUST A LITTLE BIT?

MR. WATTRAS: I'LL TELL YOU THE COST. I'M SORRY IF YOU CAN'T TELL WHAT THEY ARE. THEY ARE A LITTLE BIT HARD TO SEE.

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THE ALTERNATIVES FOR GROUNDWATER RANGE ANYWHERE FROM

ZERO, IF WE DID NOTHING ELSE OUT THERE, UP TO 690,000 AND THAT WAS
FOR THE AIR SPARGING. THE OTHER COSTS IF WE JUST IMPLEMENTED MORE
INSTITUTIONAL CONTROLS AND DID MORE MONITORING IT WOULD COST
ROUGHLY $260,000.

THE THIRD ALTERNATIVE IS TO ADDRESS THE SHALLOW
GROUNDWATER IN THE MOST CONTAMINATED AREA TIE THAT INTO THE
EXISTING TREATMENT SYSTEM AND IT'S AT $460,000. THE OTHER
TREATMENT ALTERNATIVE INVOLVING SOME REMEDIATION OF THE
INTERMEDIATE AND DEEP AQUIFER IS $615,000.

I'LL TALK ABOUT SOIL LATER. I FIGURE IT'S BEST MAYBE TO
GO THROUGH THE GROUNDWATER THEN WE'LL MOVE BACK AND TALK ABOUT
SOIL.

THE ALTERNATIVE THAT THE DEPARTMENT OF NAVY AND MARINE
CORPS IS PROPOSING WOULD BE ALTERNATIVE THREE, AND THAT'S JUST TO
ADDRESS MORE CLEANUP OF THE SHALLOW GROUNDWATER IN THE HOTTEST
AREA OF CONTAMINATION. AGAIN, THAT'S WHERE WE WOULD JUST ADD ON
TO THE EXISTING TREATMENT SYSTEM. THE REASON ALTERNATIVE SIX WAS
NOT SELECTED WAS BECAUSE WHAT WE'RE AFRAID OF IS INSTALLING SOME
EXTRACTION WELLS IN THE INTERMEDIATE PORTION OF THE AQUIFER AS
WELL AS THE DEEP PORTION COULD POTENTIALLY MAKE THINGS WORSE
DEEPER.

MRS. WOOD: I WAS WONDERING ABOUT THAT. IF
IT WOULDN'T CREATE A PULL.

MR. WATTRAS: WE'RE WORRIED ABOUT THAT

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BECAUSE THERE IS NO CONFINING LAYER. YOU KNOW LAST NIGHT WE TALKED ABOUT A SEMI-CONFINING LAYER OUT AT SITE 35. AT HADNOT POINT THE GEOLOGY IS TOTALLY DIFFERENT. IT’S ON THE OTHER SIDE OF THE NEW RIVER. THERE IS NO CONFINING LAYER AT HADNOT POINT UNTIL ABOUT 220 FEET.

WHAT WOULD PROBABLY -- WHAT COULD POSSIBLY HAPPEN WOULD BE IF WE WOULD ADDRESS THE INTERMEDIATE AND DEEP IS YOU WOULD START PUMPING OVER TIME AND YOU COULD ACTUALLY DRAW CONTAMINATES DOWNWARD.

GIVEN THAT THE CONTAMINATION LEVELS IN THE INTERMEDIATE AND DEEP ARE PRETTY LOW TO BEGIN WITH WE FELT THAT WOULD NOT BE -- THAT WE'D ACTUALLY END UP WITH A WORSE RESULT. SO, THAT'S WHY THAT ALTERNATIVE WASN'T SELECTED. IT'S NOT, YOU KNOW, BECAUSE THEY DON'T FEEL LIKE CLEANING UP THE DEEP AQUIFER. WE FEEL IT'S BEST TO JUST ADDRESS THE SHALLOW, WHICH IS THE HOT SPOT AND THAT'S THE SOURCE OF THE DEEP. I MEAN, THE SHALLOW IS THE SOURCE OF OBVIOUSLY THE DEEP. WE FEEL LET'S CLEAN THAT UP SEE WHAT HAPPENS TO THE LEVELS DOWN BELOW. WHILE WE'RE CLEANING UP THAT SHALLOW AQUIFER OVER TIME AND AT CERTAIN INTERVALS, USUALLY IT'S QUARTERLY AND THEN SOMETIMES THEY,LL BACK IT OFF TO MAYBE TWICE A YEAR, WE WILL TAKE SAMPLES FROM OUR MONITORING WELLS TO SEE HOW EFFECTIVE THE SOLUTION IS. WE WILL ALSO TAKE SAMPLES FROM THE DEEP. WE WANT TO SEE IF OVER TIME THE DEEP AQUIFER IS SLOWLY DECREASING IN CONCENTRATION AS WELL AS THE INTERMEDIATE. WE THINK THAT WILL HAPPEN OVER TIME IF WE ADDRESS THE SOURCE AREA.

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MRS. WOOD: WHERE WOULD THAT WATER IN THE DEEP BE MIGRATING TO?

MR. WATTRAS: IN THE DEEP?

MRS. WOOD: YEAH.

MR. WATTRAS: IT'S HEADING TOWARDS THE NEW RIVER. THE DEEP AQUIFER --

MRS. WOOD: WELL, AT THAT RATE WOULD IT INTERSECT -- ACTUALLY INTERSECT OR IS IT GOING RIGHT OUT INTO THE OCEAN?

MR. WATTRAS: SOME OF IT -- YOU KNOW, AGAIN, THIS CASTLE HAYNE AQUIFER GOES DOWN TO 220 FEET. YOU KNOW, AT A HUNDRED FEET SOME OF THAT GROUNDWATER AS IT HEADS TOWARDS THE NEW RIVER IS GOING TO START GOING UPWARDS TOWARDS THE RIVER. THE WATER AT 220 FEET IS PROBABLY GOING TO GO RIGHT UNDERNEATH THE NEW RIVER.

BY THE WAY, WE HAVE SAMPLED THE NEW RIVER JUST TO SEE IF THERE IS ANY IMPACT. THERE WAS NO VOLATILE CONTAMINATION OF THAT SURFACE WATER. CHANCES ARE AT LEVELS -- AND I MENTIONED BEFORE WE HAD A LITTLE BIT OF BENZENE IN THE DEEP AQUIFER AT ABOUT FIVE PARTS PER BILLION. MY BEST JUDGEMENT WOULD BE THAT ONCE THAT WOULD REACH THE NEW RIVER AND ENTER THE NEW RIVER YOU WOULD NOT EVEN BE ABLE TO MEASURE IT BECAUSE OF DELUSIONAL EFFECTS. THAT WOULD BE -- YOU'D HAVE TO HAVE A PRETTY GOOD SLUG OF GROUNDWATER FOR IT TO ACTUALLY SHOW UP IN THE NEW RIVER; YOU WOULD HAVE A PRETTY GOOD PROBLEM.

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COLONEL WOOD: IN YOUR TESTING OF THE NEW
RIVER DID YOU FIND ANY METALS THERE?

MR. WATTRAS: WE DO FIND METALS.

COLONEL WOOD: DID YOU FIND MERCURY?

MR. WATTRAS: OH, MERCURY? I DON'T ACTUALLY
RECALL. CAN YOU -- I DON'T -- IT DOESN'T RING A BELL.

MR. BIXIE: IT WASN'T ANYTHING THAT WAS
ABOVE ANY STANDARDS. I MEAN, YOU ALWAYS FIND VERY, VERY LOW
LEVELS OF METALS, BUT NOTHING THAT WAS ABOVE STANDARD.

MR. PAUL: DO YOU ASK THAT FOR ANY
SPECIFIC REASON?

COLONEL WOOD: WHAT IT DOES TO THE FISH.

MR. PAUL: WHAT'S THAT?

COLONEL WOOD: WHAT IT DOES TO THE FISH.

MR. PAUL: BUT NO KNOWN PRACTICE THAT YOU
KNOW ABOUT?

COLONEL WOOD: NO, NO, NO, NO.

MR. PAUL: THAT WAS THE SITE OF THE AIR
STATION THAT WE EXPECTED TO FIND MERCURY, BUT WE DIDN'T FIND IT.

MR. WATTRAS: YEAH, SAMPLED -- DID YOU ASK
ABOUT THE FISH?

COLONEL WOOD: YEAH.

MR. WATTRAS: OKAY. I'M SORRY, I COULDN'T
HEAR YOU. YEAH, WE DID --

MR. PAUL: NO, HE JUST SAID WHAT IT DOES

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TO THE FISH.

MR. WATTRAS: OH.

MR. PAUL: WHAT IT DOES TO THE FISH.

MR. WATTRAS: OH, I SEE.

MR. PAUL: I DIDN'T KNOW IF THERE WAS SOME HISTORY THERE THAT HE COULD SHED SOME LIGHT ON?

COLONEL WOOD: NO, NOT AT ALL.

MR. WATTRAS: SO, THAT'S THE PROPOSED ALTERNATIVE TO GROUNDWATER. TO SIMPLY -- WE ARE CONTAINING IT AT PRESENT. NOW, WE'RE GOING TO GO OUT TO THE HOT SPOT AND TIE IN WITH THE EXISTING SYSTEM.

I'M GOING TO BACK UP AND GO OVER THE SOIL ALTERNATIVES. WE CAME UP WITH FOUR ALTERNATIVES. OBVIOUSLY, THE NO ACTION ALTERNATIVE IS ALWAYS CONSIDERED. THE SECOND ALTERNATIVE WOULD BE TO LEAVE THE SOIL IN PLACE AND POSSIBLY CAP IT. YOU CAN CAP IT WITH ASPHALT. YOU CAN CAP IT WITH CLAY. YOU CAN CAP IT WITH SOIL, PUT TWO FEET OF SOIL ON IT AND PLANT GRASS. THAT WOULD BE CONSIDERED CAPPING.

THE THIRD ALTERNATIVE IS ON-SITE TREATMENT. THAT WOULD BE EXCAVATION OF THE SOIL, POSSIBLY BRINGING ON -- YOU CAN BRING ON AN INCINERATOR OR ANOTHER TYPE OF TREATMENT TECHNIQUE THAT WOULD BE APPLICABLE TO PESTICIDES AND PCB'S.

THE FOURTH ALTERNATIVE WOULD BE JUST TO EXCAVATE IT AND TO TAKE IT OFF-SITE TO A PERMITTED FACILITY FOR DISPOSAL.

I'LL GO OVER THE COSTS AGAIN; YOU PROBABLY CAN'T SEE

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THEM VERY WELL. THE COSTS RANGE ANYWHERE, OBVIOUSLY, FROM ZERO ALL THE WAY UP TO 1.4 MILLION.

1.4 MILLION WOULD BE THE COST OF BRINGING AN ON-SITE INCINERATOR ACTUALLY TO THE BASE. THE REASON IT'S SO HIGH -- I MENTIONED BEFORE ABOUT THE QUANTITIES OF SOIL. WE DON'T REALLY HAVE A -- YOU KNOW, THESE ARE SMALL AREAS. AND HERE'S WHERE YOU RUN INTO THE COST OF, BECAUSE YOU'RE DEALING WITH SUCH A SMALL AMOUNT OF SOIL, IT REALLY DOES NOT MAKE IT COST-EFFECTIVE TO BRING A TREATMENT SYSTEM ON-SITE, BECAUSE OF ALL THE CAPITAL COSTS ASSOCIATED WITH JUST A SMALL AMOUNT OF SOIL. THAT'S WHY THE COST IS SO HIGH; IT'S REALLY NOT THAT COST-EFFECTIVE TO DO ON-SITE TREATMENT FOR SUCH A SMALL COST OF SOIL.

HOW, MAYBE IF YOU HAD A PROBLEM WHERE YOU HAD A VERY LARGE AREA OF SOIL CONTAMINATION, THAT MIGHT BE FEASIBLE, INSTEAD OF EXCAVATING AND TRUCKING EVERYTHING OFF-SITE FOR TREATMENT OR FOR OFF-SITE DISPOSAL, THAT MIGHT BE A CASE WHERE IT'S MORE FEASIBLE TO SAY LET'S BRING THE TREATMENT SYSTEM ON-SITE, BECAUSE WE HAVE PLENTY OF SOIL AND IT'S GOING TO BE COST-EFFECTIVE.

SO, THERE'S A LITTLE BIT OF -- THE LESS CONTAMINATION YOU HAVE, IT SEEMS LIKE THE MORE EXPENSIVE IT IS TO BRING THE TREATMENT ON-SITE. THAT MIGHT NOT -- NOW, FOR PETROLEUM -- AGAIN, WE'RE TALKING PESTICIDES AND PCB'S. LAST NIGHT WE TALKED ABOUT THE PETROLEUM PRODUCT. THAT'S A LITTLE BIT DIFFERENT. IT'S A LOT EASIER TO TREAT, TOO.

PESTICIDES AND PCB'S, THERE AREN'T THAT MANY TREATMENT

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TECHNOLOGIES IN DEALING WITH THEM. YOU'RE ALMOST LIMITED TO --

INCINERATION IS PROBABLY THE MOST NOTED AND THE LEAST AMOUNT OF

RISK WE KNOW THAT IT'S GOING TO GET RID OF IT. THERE ARE SOME

OTHER TECHNOLOGIES THAT ARE WHAT THEY CALL INNOVATIVE, AND THEY

HAVE MORE RISKS. YOU WON'T BE -- THERE IS --

MRS. WOOD: DEFINE "INNOVATIVE"?

MR. WATTRAS: FOR EXAMPLE --

MRS. WOOD: DEFINE IT.

MR. BIXIE: SOIL WASHING.

MR. WATTRAS: SOIL WASHING. THEY CAN ADD

SOME -- I WANT TO -- ACTUALLY LIKE A SOLVENT TO THE SOIL TO

EXTRACT THE PCB'S OR PESTICIDES. THEN, ALL THOSE PCB'S AND

PESTICIDES ARE --

MRS. WOOD: YOU STILL HAVE THEM.

MR. WATTRAS: -- IN THE SOLVENT, AND THEN

THEM WOULD JUST GET RID OF THE SOLVENT, AND THE SOIL WOULD BE USED

AS BACK FILL.

SO, THE COST RANGE, AGAIN, THIS IS -- THAT ONE ON-SITE

TREATMENT -- THIS IS A TYPOGRAPHICAL ERROR. THE COSTS RANGE FROM

$650,000 TO 1.4 MILLION.

FOR THE OFF-SITE DISPOSAL, THE COSTS WOULD RANGE FROM

$480,000 UP TO 1.3 MILLION. THE REASON IS $480,000 REPRESENTS

TAKING IT OFF-SITE AND TAKING IT TO A PERMITTED LANDFILL. THE 1.3

MILLION DOLLAR RANGE REPRESENTS TAKING IT OFF-SITE, TREATING IT

VIA INCINERATION.

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NOW, THE SOIL -- THERE'S OUR TREATMENT SYSTEM, BY THE WAY. WE CAN TALK ABOUT THAT LATER ON.

THE PROPOSED ALTERNATIVE FOR SOIL IS TO CHOOSE ALTERNATIVE FOUR AND SIMPLY EXCAVATE THE SOIL AND TAKE IT TO AN OFF-SITE LANDFILL. IN THIS CASE -- IT HAS A LOT TO DO WITH THE QUANTITY OF SOIL. WE'RE NOT TALKING HIGH QUANTITIES OF SOIL. IN THIS CASE, IT'S MOST FEASIBLE TO JUST TAKE IT TO AN OFF-SITE LANDFILL. THE PESTICIDE AND PCB CONTAMINATED SOIL IS NOT CONSIDERED A HAZARDOUS WASTE. IT'S CONSIDERED -- IT HAS HAZARDOUS SUBSTANCES IN IT, BUT IT DOES NOT FALL UNDER THE CATEGORY OF HAZARDOUS WASTE.

ONCE A SOIL OR A LIQUID FAILS UNDER THE CATEGORY OF A HAZARDOUS WASTE, IT HAS TO GO TO A VERY SPECIAL TYPE OF LANDFILL, AND THAT DOES RUN INTO A LOT OF MONEY. IN THIS CASE, BECAUSE IT'S NOT HAZARDOUS, IT COULD BE TAKEN TO A PERMITTED, WHAT THEY CALL A TITLE C LANDFILL, IF I'M NOT MISTAKEN. BUT IT COULD BE TAKEN TO A LANDFILL THAT DOES NOT -- IT HAS A LOT OF PRECAUTIONS, YOU KNOW, IT'S NOT JUST A DUMP.

MS. WOOD: IT'S LINED.

MR. WATTRAS: BUT IT'S DIFFERENT THAN A HAZARDOUS WASTE LANDFILL AND IT BECOMES MORE COST-EFFECTIVE JUST TO TAKE THIS PESTICIDE AND PCB SOIL TO AN OFF-SITE LANDFILL. THAT'S THE CONCLUSION OF THE HADNOT POINT PROPOSED ALTERNATIVES.

WE'RE GOING TO TALK ABOUT ANOTHER OPERABLE UNIT. BUT

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BEFORE WE GET INTO THAT, ARE THERE ANY OTHER QUESTIONS THAT YOU
MIGHT HAVE THAT YOU WANT TO TALK ABOUT NOW OR -- WE COULD -- WE
CAN ADDRESS THEM.

MRS. WOOD: JUST, IN OTHER WORDS, YOU'RE
CONCENTRATING ON THE WATER AND THE SOILS THAT ARE CONTAMINATED
WITH THE PESTICIDES.

MR. WATTRAS: RIGHT, PESTICIDES AND PCB'S.

MRS. WOOD: THERE'S NO PROBLEMS WITH
PETROLEUM PRODUCTS --

MR. WATTRAS: NO, THAT --

MRS. WOOD: -- OR SOLVENTS?

MR. WATTRAS: THAT WAS NOT INCLUDED AS PART
OF THIS STUDY. YOU'RE TALKING ABOUT SITE 22 OR?

MRS. WOOD: WELL, I MEAN -- YEAH, OR UP
THERE BY BUILDING 900, THERE'S NO GROUND PROBLEM?

MR. WATTRAS: OH, NO. NO, NO, NO. AGAIN, WE
LOOKED AT THOSE SOIL RESULTS. THAT'S WHAT I WAS SAYING BEFORE,
WHERE WE REALLY DIDN'T SEE VERY HIGH LEVELS OF SOLVENTS THAT WE
COULD ASSOCIATE WITH A CONTINUING SOURCE.

IF WOULD HAVE, AND THAT WOULD HAVE, YOU KNOW -- THAT
WOULD HAVE BEEN A GREAT THING TO SAY THAT THERE'S STILL A SOURCE
THERE AND WE'RE GOING TO DO SOMETHING WITH IT. BUT IF WE WOULD
HAVE FOUND SOME VERY HIGH LEVELS OF SOLVENTS IN SOILS THAT ARE
ASSOCIATED WITH THAT PLUME, THEY WOULD HAVE BEEN TAREN CARE OF.
I MEAN, WE WOULD -- I DON'T BELIEVE --

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SO, IT'S JUST THE PLUME.

Mr. Wattras: -- a source would have been left there. I don't believe EPA or the state would have ever permitted a source of contamination to the soil to remain there. It certainly would have been addressed. But it appears that the source has been depleted from that soil matrix at this time and is pretty much sitting in the shallow groundwater.

Okay. Operable Unit Number Five is a very small operable unit. It consists of one site: Site Two. Site Two is called the former nursery day care center. It involves two areas; one is -- we call the building 712 area. That was the building that used to house the pesticides and stored them. And we have another area called the former storage area. This is across a set of railroad tracks that was once opened -- that's an open field that was once used to store bulk materials.

This is a picture of building 712, and behind it that's a parking lot area. It's currently used as an administrative office. And I can show you on another slide, but over in this area, there are two concrete pads, cement pads or concrete pads, which we believe they used to store drums of pesticides. We looked at some aerial photographs where we could see these drums of pesticides sitting on these pads. And they probably, you know -- they were 55-gallon drums that were turned on their side. They probably had the spigot there and would pour out the pesticides as they need them and fill up their sprayers and apply them.
COLONEL WOOD: DID THEY OPERATE THOSE
PADS COINCIDENTALLY WITH THE -- OR AT THE SAME TIME THAT THE PLACE
WAS OPERATING AS A DAY CARE CENTER?

MR. WATTRAS: AS FAR AS I KNOW, NO.
MR. HAVEN: NO, SIR.
MR. PAUL: NO, SIR.
MR. HAVEN: AS A MATTER OF FACT, SITE TWO,
IF I'M NOT MISTAKEN, WAS OPERATING FROM 1945 TO 1958 AS A
PESTICIDE MIXING AREA. AND THE DAY CARE CENTER WAS PROBABLY A
COUPLE OF DECADES LATER.

MRS. WOOD: OH, NO. NO.
MR. HAVEN: IT CAME ABOUT THE '60S.
MRS. WOOD: NO, THAT CAME ABOUT -- YEAH, IT
WAS THERE FOR YEARS BEFORE YOU WERE BORN REALLY. I HAD IT IN
HERE, BUT IT CAME IN SHORTLY AFTER '58.

MR. HAVEN: IN THE '60S.
MRS. WOOD: AND THEY CLOSED IT DOWN IN THE
'70S, '78 OR SOMETHING LIKE THAT.

MR. WATTRAS: I THINK IT'S ONE ON OF THOSE
SLIDES. LET ME SEE. FROM 1945 TO 1958 IS WHAT WE HAVE THROUGH
OUR RECORDS OR IN LOOKING AT INFORMATION, THAT'S WHEN IT OPERATED.

MRS. WOOD: THE DAY CARE CENTER WENT IN
ALMOST IMMEDIATELY AFTER THAT.

MR. PAUL: I WANT TO SAY '63 FOR THE DAY
CARE.

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MRS. WOOD: THAT SOUNDS AWFULLY CLOSE.

MR. PAUL: YEAH, IT WAS IN THE EARLY '60S, BUT I DON'T THINK IT WAS A YEAR OR TWO AFTER.

MRS. WOOD: THEY DIDN'T MOVE ONE OUT AND PUT ONE IN.

MR. WATTRAS: THESE ARE THE CONCRETE PADS. THE OBJECT IN THE BACKGROUND IS A MONITORING WELL WHICH WE INSTALLED. ON THE OTHER SIDE OF THE MONITORING WELL RIGHT UP HERE IS ANOTHER CONCRETE PAD. SO, WE HAVE A MONITORING WELL RIGHT IN THE MIDDLE OF THIS AREA.

WE TOOK A LOT OF SAMPLES THROUGHOUT HERE, A LOT OF SOIL SAMPLES. WE STARTED AT THE SURFACE AND WORKED OUR WAY DOWN TO THE WATER TABLE, WHICH IS PROBABLY ABOUT SIX OR SEVEN FEET UP HERE. AND WE ALSO LOOKED AT THE OTHER AREA AROUND THE BUILDING, JUST TO MAKE SURE, YOU KNOW, THERE WEREN'T HIGH LEVELS OF PESTICIDES BACK THERE.

THIS IS THE SECOND PAD THAT I WAS SHOWING YOU IN THAT PREVIOUS FIGURE. THIS PAD’S PRETTY --

MRS. WOOD: NOW, IS THAT A DITCH OVER THERE TO THE RIGHT?

MR. WATTRAS: YES, THERE IS A DRAINAGE DITCH, AND THERE’S A SET OF -- THERE'S RAILROAD TRACKS THAT RUN IN THIS DIRECTION. AND THAT DRAINAGE DITCH RECEIVES SURFACE RUN-OFF. RARELY IS THERE WATER IN THAT DITCH EXCEPT AFTER A RAINFALL. SO, IT'S NOT AN INTERMITTENT STREAM; IT'S SIMPLY A DITCH.

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THIS IS THE OPEN AREA, THE STORAGE AREA, I WAS TALKING ABOUT. NOW, TYPICALLY IT'S JUST AN OPEN FIELD. THE EQUIPMENT YOU SEE HERE WAS ASSOCIATED WITH OUR INVESTIGATION. BUT TYPICALLY, THERE'S NOTHING THERE. IT'S JUST AN OPEN FIELD. LOOKING AT HISTORICAL PHOTOGRAPHS -- IN FACT, I BELIEVE THERE'S ONE OVER THERE -- YOU CAN SEE THAT THERE USED TO BE, COMING OFF THAT TRAIN TRACK -- NOW, THE TRAIN TRACKS ARE RUNNING RIGHT OVER HERE, OKAY? BUILDING 712 IS ON ONE SIDE. THIS OPEN FIELD'S ON THE OTHER. THERE USED TO BE A RAILROAD SPUR THAT CAME OFF OF THE MAIN LINE, AND YOU CAN SEE THINGS THAT WERE STORED OVER HERE AT ONE TIME. NOW, THAT RAILROAD SPUR IS GONE AND, AGAIN, NOTHING'S STORED THERE.

TO BE QUITE HONEST WITH YOU, THERE'S NO INFORMATION TELLING US WHAT WAS STORED THERE. YOU CAN SEE OBJECTS IN THE HISTORICAL PHOTOGRAPHS, BUT WE LOOKED THROUGH DIFFERENT RECORDS TO SEE IF -- WHAT MIGHT HAVE BEEN STORED THERE. THERE IS A WATER TREATMENT FACILITY ON THE OTHER SIDE OF THIS ROAD, RIGHT OVER HERE. IT COULD HAVE BEEN -- THE STUFF THAT WAS STORED OVER THERE COULD HAVE BEEN ASSOCIATED WITH THAT TREATMENT FACILITY FOR ALL WE KNOW. BUT WE DON'T HAVE ANY INFORMATION ON EXACTLY WHAT WAS STORED THERE.

STUDIES HAVE BEEN CONDUCTED OUT HERE BEFORE WE DID OUR REMEDIAL INVESTIGATION. I BELIEVE THERE WERE FIVE MONITORING WELLS ALREADY IN PLACE. FOUR OF THE MONITORING WELLS WERE LOCATED AROUND THE BUILDING 712 AREA. AND THE FIFTH MONITORING WELL WAS

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1 IN THIS OPEN FIELD AREA.
2 WHAT WE FOUND -- OBVIOUSLY WE FOUND A LOT OF PESTICIDES
3 IN THE SURFACE SOIL AND THE SEDIMENT NEAR THE CEMENT PADS, VERY
4 HIGH LEVELS. THE HIGHEST LEVEL WAS ABOUT ONE MILLION PARTS PER
5 BILLION. WE'RE TALKING PERCENTAGE, SO VERY HIGHLY CONCENTRATED
6 SOIL -- OR PESTICIDE LEVELS IN THE SOIL; AS WELL AS THE SEDIMENT
7 IN THE DRAINAGE DITCH, WHICH MAKES SENSE BECAUSE IT'S A PRETTY
8 STEEP DITCH, AND I'M SURE THROUGH RUNOFF A LOT OF STUFF FLOWS
9 RIGHT INTO THAT DITCH.
10
11 WITH RESPECT TO GROUNDWATER, WE REALLY DIDN'T FIND MUCH
12 OF A PESTICIDE PROBLEM. WE DID HAVE SOME LOW LEVELS. THE WELL IN
13 BETWEEN THE PADS HAD SOME VERY, VERY LOW LEVELS. I LIKE TO CALL
14 THEM TRACE LEVELS; WE'RE TALKING VERY LOW PARTS PER BILLION. BUT
15 THE MAJOR PROBLEM, WITH RESPECT TO GROUNDWATER, HAPPENED TO BE
16 SOME LEVELS OF ETHYLBENZENE AND XYLENE IN THE FORMER STORAGE AREA.
17 I MENTIONED JUST A BIT AGO WE HAD ONE WELL OVER IN THE
18 FORMER STORAGE AREA. AND HISTORICALLY, BACK IN THE MID-80S WHEN
19 THAT WELL WAS FIRST INSTALLED, IT HAD SOME LOW LEVELS OF
20 ETHYLBENZENE AND XYLENE, AND THAT WELL'S BEEN SAMPLED ABOUT THREE
21 OR FOUR TIMES, AND THE CONTAMINANTS KEEP SHOWING UP AT SLIGHTLY
22 LOWER LEVELS.
23 WE LOOKED FOR THE SOURCE OF ETHYLBENZENE AND XYLENE; WE
24 KNOW THOSE ARE ASSOCIATED WITH PETROLEUM PRODUCTS, GASOLINE OR
25 WHATEVER, DIESEL FUEL. WE THOUGHT MAYBE THERE WAS AN UNDERGROUND
26 STORAGE TANK OVER THERE THAT NOBODY KNEW ABOUT. SO, WE LOOKED AT

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THAT, WE DID SOME GEOPHYSICAL WORK TO SEE IF WE COULD SEE A TANK; NOTHING CAME UP.

WE DID SOME EXTENSIVE SAMPLING IN THE FORMER STORAGE AREA THINKING THAT WE'RE GOING TO HIT SOME KIND OF SPILL AREA THAT WOULD HAVE, YOU KNOW, ETHYLBENZENE AND ALL THESE OTHER PRODUCTS, BUT WE REALLY DIDN'T FIND THE SOURCE OF THIS ETHYL BENZENE AND XYLENE.

LET ME TELL YOU ABOUT THE LEVELS JUST A LITTLE BIT MORE. WE ARE TALKING ABOUT LOW LEVELS OF ETHYLBENZENE AND XYLENE. THEY ARE BELOW WHAT'S THE FEDERAL DRINKING WATER STANDARDS. BUT THEY ARE ABOVE THE STATE'S DRINKING WATER STANDARDS. THE STATE'S STANDARDS ARE A LITTLE BIT MORE STRICTER THAN THE FEDERAL STANDARDS (SIC).

THE EXTENT OF THAT CONTAMINATION IS DEFINED. IT'S A VERY SMALL PLUME. WE HAVE WELLS -- WE HAVE A LOT OF WELLS. AT ONE TIME I MENTIONED THERE WERE FIVE WELLS WHEN WE STARTED. I THINK WE'RE UP TO ABOUT 13 WELLS OR 12 WELLS. WE HAVE A PRETTY GOOD IDEA. WE LOOKED AT THE DEEP GROUNDWATER RIGHT BELOW THAT ETHYLBENZENE PLUME, AND WE DIDN'T FIND ANY ETHYLBENZENE OR XYLENE IN THE DEEP GROUNDWATER. SO, WE KNOW IT'S A SMALL LOCALIZED GROUNDWATER PROBLEM.

TALKING ABOUT THE FINDINGS A LITTLE BIT, I PROBABLY WENT OVER MOST OF THIS, JUMPING AHEAD OF MYSELF. I WILL SAY ANOTHER THING, BY THE CEMENT PAD AREA, WE ALSO FOUND SOME SEMI-VOLATILE ORGANICS LIKE NAPHTHALENE. AGAIN, AT ONE TIME THESE PESTICIDES

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WERE APPLIED WITH A PETROLEUM-BASED SOLVENT, SO SEEING THINGS LIKE NAPHTHALENE, NAPHTHALENE IS A CONTAMINANT THAT'S ASSOCIATED WITH PETROLEUM. IF THEY USED PETROLEUM-BASED SOLVENTS TO MIX WITH THE PESTICIDES TO APPLY IT, IT MAKES SENSE THAT WE WOULD FIND SOME OF THESE COMPOUNDS IN THAT SEDIMENT OR IN THE SOIL AND SEDIMENT.

THAT'S PRETTY MUCH JUST WHAT I JUST MENTIONED. LOW LEVELS OF XYLENE AND ETHYLBENZENE ABOVE THE STATE STANDARDS, BUT BELOW FEDERAL STANDARDS. I MENTIONED SOME PESTICIDES IN GROUNDWATER, EVEN OUR UPGRADIENT WELL, FOR WHATEVER REASON, HAD SOME LOW LEVELS OF PESTICIDES. AGAIN, THESE LOW LEVELS COULD HAVE BEEN DUE, PRETTY MUCH THE SAME SITUATION WHERE I TALKED BEFORE ABOUT SITE 24 WHERE YOU START GETTING SOME PARTICULATES INTO THE SAMPLE, ESPECIALLY IN OUR BACKGROUND WELL. WE WERE A LITTLE BIT SURPRISED.

WE HAD THE SAME PROBLEM WITH LEAD AND -- METALS SUCH AS LEAD, CADMIUM AND CHROMIUM IN OUR GROUNDWATER. AND THIS GOES BACK TO THE WHOLE DISCUSSION WE HAD PREVIOUSLY, AND WE EVEN INCLUDED ON THERE INCLUDING OUR UPGRADIENT WELL. AGAIN, WE'RE NOT SO SURE WHETHER THESE METALS WERE REALLY ASSOCIATED WITH THE SITE OR NOT.

WE REALLY BELIEVE THEY ARE NOT.

WITH RESPECT TO DISSOLVED METALS, MANGANESE WAS THE ONLY CONTAMINANT WHICH EXCEEDED WATER STANDARDS. IT EVEN EXCEEDED IT IN OUR UPGRADIENT WELL, AND AS WE KNOW, I THINK THROUGHOUT THIS REGION, MANGANESE SEEMS TO BE EVERYWHERE, REGARDLESS IF IT'S ON SITE OR OFF-SITE.

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DEEP GROUND WATER; SURPRISINGLY, OUR DEEP WELL, WE WERE LOOKING FOR ETHYLBENZENE, BECAUSE WE WERE INTERESTED IN -- WE HAVE A SHALLOW GROUNDWATER PROBLEM. WE WERE INTERESTED TO SEE HOW FAR DOWN THESE CONTAMINANTS MIGRATE. WE ACTUALLY PICKED UP VERY LOW LEVELS OF TCE IN THE WELL, WHICH WAS SURPRISING BECAUSE THIS SITE, ALL THE SOIL SAMPLES THAT WE'VE TAKEN, ALL THE OTHER MONITORING WELLS HAD NO TCE IN IT. WE FOUND VERY LOW LEVELS OF TCE. SO, WE RE-SAMPLED THE WELL; THE SECOND ROUND WE DIDN'T HAVE IT. NOW, THAT'S NOT UNCOMMON WHEN YOU GET TO LOW LEVELS. IT IS UNCOMMON IF, FOR EXAMPLE, THE FIRST ROUND YOU HAVE 1,000 MICROGRAMS PER LITER, AND THEN THE SECOND TIME YOU SAMPLED IT YOU DIDN'T FIND IT. THAT'S UNUSUAL; SOMETHING'S WRONG THERE. WHEN YOU'RE AT SUCH A LOW LEVEL, FIVE PARTS PER MILLION, THAT'S VERY, VERY LOW TO BEGIN WITH. SO, CAN'T SAY THERE ISN'T ANYTHING THERE, BUT WE'RE SAYING IT'S A PRETTY SMALL PROBLEM. AND AGAIN, WE DON'T BELIEVE IT'S ATTRIBUTABLE TO SITE TWO BASED ON THE DATA THAT WE HAVE OF THIS SITE AND BASED ON THE HISTORY OF THIS SITE, KNOWING IT WAS USED FOR A PESTICIDE STORAGE AREA.

MRS. WOOD: THERE ARE NO WELLS -- WATER WELLS IN THE AREA?

MR. WATTRAS: THERE ARE WATER WELLS, NOT IN THE INMEDIATE AREA OF SITE TWO. THERE ARE WELLS WITHIN A MILE OF SITE TWO THAT ARE OPERATING AND ARE CLEAN, BUT NOT WITHIN THE IMMEDIATE SITE TWO AREA.

WHILE WE WERE DOING THIS STUDY, WE WERE GETTING THE

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RESULTS IN FROM THE LABORATORY. WE WERE SEEING THESE VERY HIGH
LEVELS OF PESTICIDES. WE TalkED TO THE DEPARTMENT OF THE NAVY AND
MARINE CORPS, AND WE ALERTED THEM THAT, LOOK, WE HAVE SOME
-- WE HAVE A MAJOR PROBLEM WITH THE SOIL.

THE NAVY AND MARINE CORPS DECIDED TO "LET'S GET RID OF
THE SOILS NOW. LET'S NOT WAIT UNTIL THE STUDY IS OVER. LET'S DO
SOMETHING NOW."

SO, THEY DID WHAT'S CALLED A TIME CRITICAL REMOVAL
ACTION. THEY WENT IN AND THIS IS BEING DOWN RIGHT NOW IN FACT.
THEY'RE EXCAVATING AS WE SPEAK. THERE'S A HOLE IN THE GROUND OUT
AT SITE TWO.

THEY DECIDED, "LET'S NOT WAIT FOR THE CLEANUP. WE KNOW
WE HAVE A PROBLEM THAT WE'RE GOING TO HAVE TO DEAL WITH. WHY WAIT
TO THE END OF THE STUDY TO DEAL WITH IT? LET'S GET RID OF IT
NOW." ESPECIALLY IN LIGHT OF THE FACT THAT THE BUILDING IS BEING
USED AS AN ADMINISTRATIVE OFFICE.

SO, THAT'S GOING ON RIGHT NOW. AND THAT HAPPENS -- I
MEAN, THAT HAPPENS A LOT. IT'S NOT A BAD THING TO DO. IF YOU
KNOW YOU HAVE A PROBLEM, WHY WAIT ANOTHER YEAR OR TWO TO COMPLETE
A STUDY, WHEN AT THE END OF THE STUDY YOU KNOW YOU'RE GOING TO
HAVE TO ADDRESS THAT PROBLEM. IT REALLY MAKES SENSE TO DEAL WITH
THE PROBLEM NOW.

THAT'S BEEN THE WAVE OF THINGS, NOT ONLY IN THE
DEPARTMENT OF DEFENSE, BUT PRETTY MUCH THROUGHOUT THE INDUSTRY, IS
"LET'S NOT WAIT FOR THE END OF THESE STUDIES. WE'LL DEAL WITH THE

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OBVIOUS PROBLEM FIRST, THEN WE'LL WRAP UP ANYTHING IN THE FINAL
STUDY, AND WE'LL DEAL WITH THE RESIDUAL PROBLEM." SAY, IF IT WAS
A GROUNDWATER PROBLEM. YOU KNOW, THERE'S NO RISK TO THE
GROUNDWATER, BUT WE'LL DEAL WITH THAT AT THE END OF THE STUDY.
LET'S DEAL WITH THE PART THAT MIGHT ACTUALLY HAVE A RISK AS WE
SPEAK.

THAT'S JUST THE PAD. CLEANUP IS CURRENTLY UNDERWAY, AS
I SAID. IT'S INVOLVING APPROXIMATELY 500 CUBIC YARDS OF PESTICIDE
CONTAMINATED SOIL. I BELIEVE THEY ARE TAKING THAT SOIL OFF-SITE
TO AN INCINERATOR. IS THAT CORRECT, NEAL?

MR. PAUL: RIGHT.

MRS. WOOD: WHERE IS THE INCINERATOR?

MR. PAUL: IN KENTUCKY.

MRS. WOOD: IN KENTUCKY?

MR. PAUL: ACTUALLY, WE ARE EXCAVATING ALL
THE SOIL AND ARE WAITING FOR CONFIRMATION OF THE SAMPLES BACK TO
MAKE SURE WE HAVE EXCAVATED ALL WE NEED TO DO. HOPEFULLY WE WILL
BE CLOSING THAT JOB OUT. I ANTICIPATE HOPEFULLY NEXT WEEK WE CAN
GO IN AND PUT CLEAN BACK FILL BACK INTO IT.

MRS. WOOD: IS BASE EQUIPMENT DOING THIS?

MR. PAUL: NO, OHM IS DOING IT.

MRS. WOOD: OHM.

MR. PAUL: INTERESTINGLY ENOUGH, I'VE HAD
QUITE A FEW CALLS FROM OTHER CONTRACTORS ON THIS JOB, WANTING TO
KNOW HOW THEY COULD GET INVOLVED IN CONSTRUCTING, AND WE'RE TRYING

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TO GET SOME OF THAT BUSINESS BACK IN NORTH CAROLINA. I'VE GIVEN
THEM THE PROJECT FOR OHM -- I'VE GIVEN THEM THEIR PHONE NUMBER TO
CONTACT THEM BECAUSE THEY DID NOT USE A NORTH CAROLINA
CONSTRUCTION COMPANY. SO, HOPEFULLY WE CAN BRING SOME OF THAT
BUSINESS BACK INTO ONSLOW COUNTY AND THE STATE OF NORTH CAROLINA.

MRS. WOOD: I MEAN, THEY HAD TO HAVE THE
SPECIFIC SITE, ANYTHING THAT'S RUN AROUND THIS --

MR. PAUL: TRIPLE ACTION ALSO WANTS IT
BECAUSE THEY'RE CAPABLE OF CARRYING MAYBE 20 CUBIC YARDS.

MR. WATTRAS: I'M SURE THEY SAVE A WEIGHT
RESTRICTION, YOU KNOW?

MR. PAUL: WHAT'S THAT?

MR. WATTRAS: I WAS GOING TO SAY ABOUT 15
CUBIC YARDS.

MR. PAUL: YEAH. YOUR BASIC DUMP TRUCK
CAN CARRY NINE.

MRS. WOOD: NOW, THAT WOULD HAVE TO BE
COVERED, WOULDN'T IT?

MR. PAUL: OH, YEAH.

MR. WATTRAS: OH, YEAH. I'M SURE THEY ARE.

MR. PAUL: AND WE WEIGH THEM ON BASE TO
INSURE THAT --

MRS. WOOD: AND THEN THEY WEIGH IT OUT.

MR. PAUL: THEN THEY WEIGH IT OUT TO MAKE
SURE WE'RE NOT PAYING FOR ANYMORE THAN WHAT WE'RE ACTUALLY

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MRS. WOOD: SO THEY DON'T STOP OFF AND DUMP IT TO SAVE GAS.

MR. PAUL: EVEN THOUGH IT'S NON-HAZARDOUS, YOU STILL MANIFEST IT TO INSURE THAT IT DOES GET SOME DISPOSABILITY.

MR. WATTRAS: NOW, WITH RESPECT TO THE RISK ASSESSMENT, WE LOOKED AT TWO SCENARIOS. SINCE WE KNEW THERE WAS REMOVAL ACTION TAKING PLACE, WE SAID WHAT WOULD BE THE RISK FOLLOWING THE REMOVAL OF THE SOIL, BECAUSE AS I MENTIONED, WE WERE GOING AFTER THE OBVIOUSLY PROBLEM, BUT WE HAVE TO FIGURE OUT IN THE TOTAL SCHEME OF THINGS, IS THERE GOING TO BE SOME RISK EVEN AFTER REMOVING THE SOIL, BECAUSE WE'RE ONLY ADDRESSING THE HOT SPOT, AND IT'S PRETTY WELL DEFINED.

WE ALSO LOOKED AT WHAT WOULD BE THE RISK WITHOUT REMOVING THE SOIL. ALTHOUGH WE KNEW THEY WERE REMOVING IT, WE WANTED TO MAKE A COMPARISON OF WHAT IS THE REAL IMPACT OF DOING THIS.

SO, HUMAN HEALTH LOOKED AT, BEFORE THIS REMOVAL ACTION, AND IT WAS PRETTY OBVIOUS THAT IF THE SOIL SEDIMENTS WEREN'T REMOVED, THERE WOULD BE WHAT WE WOULD CONSIDER AN UNACCEPTABLE RISK FOR THOSE PEOPLE THAT WOULD, YOU KNOW, BE WORKING IN THE AREA OR WEATEVER. THERE WAS A HIGH RISK.

BUT AFTER THE SOIL IS REMOVED -- NOW, WHEN WE DO THIS STUDY, WE KNOW A CERTAIN AREA IS GOING TO BE REMOVED AND WE THROW

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OUT THOSE RESULTS. OKAY. NOW, WE LOOK AT WHAT'S THE OTHER
CONCENTRATIONS OF THE CONTAMINANTS IN THE AREA. WE HAD, WITHIN
THE OTHER PARTS OF THE LAWN, WE HAD SOME PESTICIDES AT WHAT I
WOULD CALL TYPICAL LEVELS THAT YOU FIND THROUGHOUT LEJEUNE. I
KNOW YOU'VE HEARD ME TALK ABOUT OUR PESTICIDES THROUGHOUT CAMP
LEJEUNE THAT I SAID IF I SEE SOMETHING WITH 10 OR 50 PARTS PER
BILLION, I REALLY DON'T RAISE AN EYEBROW, BECAUSE I SEE THAT
EVERYWHERE. YOU KNOW, THAT DOESN'T TELL ME THAT THERE'S A SOURCE.
SO, THROUGHOUT THE LAWN AREA, AND EVEN IN SOME OF THE
BACKGROUND SAMPLES, WE HAVE SOME LOW LEVELS OF PESTICIDES. WELL,
WHEN WE USE THAT DATA IN THE RISK ASSESSMENT AFTER REMOVING THIS
HOT SPOT; THERE IS NO UNACCEPTABLE HEALTH RISK. EVERYTHING, YOU
KNOW, PUTTING CLEAN SOIL BACK IN THE HOLE, REGRADING IT, THERE IS
NO UNACCEPTABLE HEALTH RISK AFTER THIS HOT SPOT IS REMOVED
COLONEL WOOD: WHO ASSUMES RESPONSIBILITY FOR
LOOKING INTO THE WELFARE OF THE PEOPLE WHO MAY HAVE BEEN EXPOSED
OVER THE YEARS WHILE THEY WERE OUT THERE?
MR. HAVEN: A LOT OF WHAT WENT ON THERE
WAS THERE WERE DIFFERENT RISK ASSESSMENTS DONE LIKE HEALTH RISK
ASSESSMENT TO HUMAN RECEPTORS IS --
MR. BIXIE: AS I HAD MENTIONED BEFORE AN
AGENCY FOR TOXIC SUBSTANCES HAS ALSO TAKEN THAT INTO ACCOUNT AND
THEY'RE CONDUCTING A PROGRAM.
COLONEL WOOD: DO THEY HAVE ACCESS?
MR. HAVEN: EVERYTHING -- ALL THE

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INFORMATION THEY HAVE REQUESTED THEY FORWARD TO US AND WE'RE WORKING WITH MANPOWER, FOR EXAMPLE, BASE HOUSING TO GET THEM ALL THE INFORMATION THAT THEY WANT. THEY HAVE ALSO GONE THROUGH, I BELIEVE, SOME MEDICAL RECORDS AND THINGS LIKE THAT TO GET MORE INFORMATION, AND THEY ARE ESSENTIALLY LOOKING AT THAT POSSIBILITY.

COLONEL WOOD: DO YOU KEEP THAT --
MR. HAVEN: NO, SIR.

COLONEL WOOD: WILL THEY USE THE FACILITY?
MR. HAVEN: HERE AGAIN, THE ATSTR MANAGER -- BASICALLY BEFORE WE PUT IN MANPOWER, BASE HOUSING --

COLONEL WOOD: DOES ATSTR SAY THEY HAVE THE RESPONSIBILITY FOR IT?
MR. HAVEN: YES, SIR. THEY'D HAVE RESPONSIBILITY FOR IT.

MR. WATTRAS: SEE, THAT'S THE MAIN DIFFERENCE. I BELIEVE LAST NIGHT YOU ASKED A QUESTION ABOUT ATSTR AND THE RISK ASSESSMENT THAT THEY DO. AS I SEE IT, HERE'S THE DIFFERENCE: WHEN WE DO A RISK ASSESSMENT UNDER CERCLA, WE LOOK AT WHAT'S THE CURRENT RISK AND WHAT'S THE FUTURE RISK.

ATSTR, THEY GET INTO THE MORE OF THE -- THOSE STUDIES, WHAT ARE THEY CALLED? WHATEVER THEY 'RE CALLED. THEY WILL DO THAT. THAT'S THE MAIN DIFFERENCE. THEY LOOK AT LOOKING AT BIRTH DEFECTS OR WHATEVER. WE DON'T DO THAT UNDER OUR RISK ASSESSMENT. THAT'S -- WE LOOK AT CURRENT SITUATION. WE DON'T LOOK AT THE PAST. THAT IS PART OF THEIR MISSION. THEY WILL AT

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WHAT HAS HAPPENED IN THE PAST AND LOOKING FOR TRENDS IN CANCER IN
THE AREA, OR BIRTH DEFECTS OR THINGS LIKE THAT. THAT'S THE MAIN
DIFFERENCE IN OUR RISK ASSESSMENT AND THEIR PUBLIC HEALTH
ASSESSMENT. IT'S EITHER CALLED -- IT'S CALLED A PUBLIC HEALTH
ASSESSMENT, WHEREAS OURS IS CALLED A RISK ASSESSMENT, A HUMAN
HEALTH RISK ASSESSMENT.

THEY'RE NOT GOING TO TELL YOU NUMBERS THAT THERE IS --
YOU KNOW, WE COME UP WITH THESE INCREMENTAL CANCER RISKS, YOU
KNOW, WHAT'S THE CHANCES OF ACQUIRING CANCER. THEY DON'T DO THAT
PART OF IT; THEY LOOK AT MORE OF A TREND-TYPE THING. THAT'S THE
MAIN DIFFERENCE. SO, THAT'S THEIR MISSION, AND I BELIEVE THEY'RE
PROBABLY LOOKING AT THAT ASPECT.

WITH RESPECT TO ECOLOGICAL RISKS, I'LL LET TOM BIXIE
TALK ABOUT THIS AGAIN, HIS SPECIALTY HERE.

MR. BIXIE: AGAIN, WHEN WE WENT THROUGH OUR
ANALYSIS, WE DID FIND THAT PESTICIDES, AND THAT WAS NO SURPRISE,
WAS THE MAIN PROBLEM OR THE MAIN CONTAMINANT BEFORE THE TIME
CRITICAL REMOVAL ACTION.

NOW, THE DRAINAGE DITCH GOES TO OVERS CREEK, THAT'S
WHERE THE DRAINAGE DITCH GOES. THAT'S PARALLEL TO THE SITE.
BASED ON OUR SAMPLING, WE DIDN'T SEE CONTAMINANTS REALLY MIGRATING
DOWN TO THERE. AGAIN, RAY WENT OVER THE PESTICIDES, WHAT THEY DO,
THEM ADHERE TO THE SEDIMENTS OR PARTICLES; THEY DON'T TRANSFER
DOWNSTREAM READILY.

AND SO, THE AREA OF CONCERN WAS LIMITED TO RIGHT NEXT TO

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THE SITE AND ON-SITE. WE WENT THROUGH AND LOOKED AT CERTAIN
SEDIMENT, COMPARED IT TO STANDARDS AND VALUES THAT WOULD EVALUATE
THE HEALTH OF AQUATIC ORGANISMS EXPOSED, AND ALSO WE WENT THROUGH
THE TERRESTRIAL SCENARIO I MENTIONED BEFORE, ASSUMING THAT A DEER
OR RABBIT WAS ON-SITE EATING PLANTS AND BEING EXPOSED TO THAT.

MRS. WOOD: WHAT ABOUT THE BURROWERS, OUR
EVER-PRESENT MOLES AND THINGS LIKE THAT?

MR. DIXIE: TYPICALLY WE LOOK AT BURROWING
WILDLIFE WHEN THERE'S A VERY HIGH RISK OF VOLATILES IN THE SOIL.

MRS. WOOD: BUT THEY WOULD NOT BE AFFECTED
BY PESTICIDES?

MR. BIXIE: THEY WOULD. IN FACT, THEY
WOULD BE IN CONTACT WITH THEM THE SAME WAY A RABBIT WOULD AND THE
SAME WAY A BIRD WOULD. THEIR EXPOSURE WOULD BE GREATER BECAUSE
THEM THEY WOULD BE BURROWING INTO THEM. BUT THE DATABASE AND THE
LITERATURE, REALLY, I DON'T THINK HAS ADVANCED FAR ENOUGH TO
ASSUME THAT IF A GROUND SQUIRREL OR A MOLE WAS IN CONTACT WITH THE
SOIL, HOW MUCH OF IT IT ABSORBS. TYPICALLY, THE EXPOSURE IS
EVALUATED BASED ON THEM EATING WORMS THAT EAT THE DIRT, THEN
EATING DIRT JUST BY GOING THROUGH THE SYSTEM, EATING PLANTS AND
THINGS LIKE THAT. SO, IT'S PRIMARILY THAT EXPOSURE.

MRS. WOOD: BUT THEY ARE IN THE MODEL?

MR. DIXIE: EXCUSE ME?

MRS. WOOD: I MEAN, THE MOLES, ARE THEY THE
BURROWING ANIMAL THAT'S IN YOUR MODEL?

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MR. DIXIE:                NO, IN OUR MODEL, WE HAVE
RABBITS, DEER AND BIRDS.

MRS. WOOD:               I WOULD THINK IF THAT STUFF IS
GOING DOWN IT SEEMS APPROPRIATE TO --

MR. DIXIE:               WELL, IN THIS PARTICULAR AREA,
BASED ON, YOU KNOW, HOW THE PAD WAS AND LOOKING AT THE TYPES OF
HABITATS, WE FELT THOSE WERE THE CRITICAL WILDLIFE SPECIES.

MR. WATTRAS:             PLUS YOU HAVE TO REMEMBER THIS
IS AN AREA, IT'S NOT IN THE MIDDLE OF THE WOODS. IT'S A MOWED
LAWN.

MRS. WOOD:               RIGHT. YEAH.

MR. WATTRAS:             I MEAN, THAT HAS TO BE
CONSIDERED, TOO. SO, NOT TO SAY THERE COULDN'T BE A MOUSE OR A
MOLE.

COLONEL WOOD:            WE'VE GOT MOLES IN OUR LAWN AT
HOME.

MR. WATTRAS:             OH, I KNOW. I'M NOT SAYING
IT'S NOT --

MRS. WOOD:               I WAS THINKING OF A MOLE, TOO.

MR. WATTRAS:             -- YOUR TYPICAL ENVIRONMENT.
WE HAVE THEM, TOO. I KNOW WHAT YOU'RE SAYING.

MR. BIXIE:               I GUESS, ON THE OTHER SIDE,
TOO, IS WHENEVER WE PICK WILDLIFE THAT WE'RE GOING TO EXAMINE,
IT'S TYPICALLY WILDLIFE THAT HAS A LARGE HISTORY OF BEING STUDIED.
FOR INSTANCE, THERE'S BEEN A LOT OF HISTORY ON THE EFFECTS OF

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CHEMICALS ON RABBITS, ON CHICKENS, ON DEER.

MRS. WOOD: SO, YOU HAVE YOUR --

MR. BIXIE: AND WE KNOW PRETTY MUCH HOW MUCH A RABBIT EATS, HOW MUCH WATER A RABBIT NEEDS, WHAT THE AREA THAT A RABBIT WOULD -- ITS HOME RANGE, BECAUSE THAT HAS TO BE TAKEN INTO CONSIDERATION. WHEN WE LOOK AT A DEER THAT HAS A VERY BIG HOME RANGE. SO, YOU ASSUME THAT THE ACTUAL FOOTPRINT THAT IS CONTAMINATED, MAYBE IT'S 100 FEET BY 100 FEET, MAY ONLY BE ONE PERCENT OF ITS HOME RANGE. THE OTHER 99 PERCENT OF ITS TIME, YOU ASSUME THAT IT'S IN DIFFERENT AREAS THAT ARE NOT CONTAMINATED.

SO, THAT HAS TO BE FACTORED INTO THE MODEL.

THAT COMES INTO PLAY, FOR INSTANCE, WHEN WE -- WE DON'T TYPICALLY LOOK AT, LIKE, TURTLES OR SNAKES BECAUSE THERE'S NOT A LOT OF -- ALTHOUGH THEY ARE IMPORTANT, AS WILDLIFE, THERE'S NOT A LOT OF INFORMATION IN TERMS OF HOW MUCH WATER DOES A SNAKE DRINK.

MRS. WOOD: YEAH.

MR. DIXIE: SO, YOU REALLY HAVE TO BASE A LOT OF, WHEN YOU SELECT YOUR WILDLIFE, ON WHAT TYPE OF INFORMATION YOU HAVE ON HOW MUCH IT EATS. SO, THAT COMES INTO PLAY, TOO.

WHEN WE WENT THROUGH THIS MODEL AND BEFORE THE TIME CRITICAL ACTION, WE AGAIN DETERMINED IF PESTICIDES WOULD PRESENT A PROBLEM TO THESE WILDLIFE BEING EXPOSED, AND DO PRESENT A PROBLEM TO ANY TYPE OF AQUATIC ORGANISMS BEING EXPOSED IN THAT DITCH.

NOW, WE DID REALIZE THAT THE DITCH WAS A DRAINAGE DITCH

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AND THERE WASN'T OBVIOUSLY A VIABLE POPULATION OF FISH. THERE MAY
BE SOME FROGS, MAYBE A TADPOLE OR SOMETHING LIKE THAT, BUT TO BE
CONSERVATIVE, WE TREATED IT AS A SERVICE WATER BODY AND COMPARED
IT TO THOSE STANDARDS. I THINK THE NEXT SLIDE --

MR. WATTRAS: WELL, THIS ONE BASICALLY SAYS
BEFORE -- IF YOU DIDN'T REMOVE THE SOIL, WE FOUND THAT THERE WOULD
BE A DECREASE IN VIABILITY, WHICH IS PRETTY OBVIOUS WITH THOSE
LEVEL OF PESTICIDES. THEN WE LOOKED AT IT FROM A STANDPOINT,
OKAY, AFTER THE SOIL IS REMOVED, AND IT HAS BEEN REMOVED, TOM AND
HIS GROUP LOOKED AT WHAT WOULD BE THE IMPACTS AFTER THAT.

MR. BIXIE: AND AFTER WE SAW THAT THERE
-- BASED ON THE TERRESTRIAL RECEPTORS IN OUR MODEL, THERE WOULD BE
NO DECREASE IN THE VIABILITY OF THE TERRESTRIAL RECEPTORS. THERE
WOULD STILL BE A VERY SLIGHT DECREASE IN TERMS OF THE AQUATIC
RECEPTORS, BUT WHAT WE SEE THIS IS, AND RAY MENTIONED THIS, IS TO
THE LEVELS OF PESTICIDES THAT WE SEE THROUGHOUT THE BASE FROM A
NORMAL SPRAYING. THE AREAS THAT HAVE VERY HIGH LEVELS THAT REALLY
WOULD PRESENT A SIGNIFICANT RISK TO AQUATIC ORGANISMS IN THIS
DRAINAGE DITCH, WERE BEING REMOVED BASED ON SOME OF THE REMOVAL
ACTIONS. SO, WE FELT LIKE IT ADDRESSED THE SIGNIFICANT RISKS.

MRS. WOOD: WE'VE GOT A DECREASE. IT'S NOT
NEUTRALIZED, BUT IT'S --

MR. BIXIE: AND THEN, THAT LOW LEVEL,
AGAIN, WOULD EXIST THROUGHOUT ANY AREA, A GOLF COURSE, WOULD HAVE
THOSE PESTICIDES, BUT IT WASN'T AT THAT HIGH LEVEL.

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MR. WATTRAS: THE FEASIBILITY STUDY, BECAUSE

NOW, AFTER REMOVING THE SOIL, AND WE DID AN EVALUATION OF THE

RISKS AND WE DETERMINED THERE WAS NO MORE UNACCEPTABLE RISKS TO

HUMAN HEALTH AND THE ENVIRONMENT, WE THEN LOOKED AT OUR ONLY

PROBLEM REMAINING, WHICH HAPPENED TO BE THIS SMALL PLUME OF

ETHYLBENZENE AND XYLENE IN GROUNDWATER.

WE LOOKED AT SIX ALTERNATIVES THAT WE COULD DO WITH THIS

CONTAMINATION PROBLEM. ALTERNATIVE ONE BEING NO ACTION;

ALTERNATIVE TWO BEING INSTITUTIONAL CONTROL WHERE WE WOULD JUST

KEEP MONITORING THE PROBLEM. AGAIN, IN THIS CASE EVEN -- ALTHOUGH

WE HAVE SOME SUPPLY WELLS WHICH ARE QUITE FAR FROM THE SITE, IT

WOULD INCLUDE SAMPLING OF THOSE WELLS TO MAKE SURE NOTHING IS

WRONG WITH THEM. IT WOULD INCLUDE, OBVIOUSLY, NOT LETTING ANYBODY

PUT ANY WELLS ON THE SITE.

THE THIRD ALTERNATIVE WOULD BE TO EXTRACT THE

GROUNDWATER WITH THE WELL, OR WELLS, TREAT IT ON-SITE, AND THEN

DISCHARGE IT THROUGH A SANITARY SEWER LINE TO THE SEWAGE TREATMENT

PLANT.

THE FOURTH ALTERNATIVE WOULD BE SIMPLY TO COLLECT IT,

DISCHARGE IT TO THE SEWAGE TREATMENT PLANT WITHOUT TREATMENT. THE

REASON THAT WAS SELECTED IS BECAUSE, NUMBER ONE, WE'RE TALKING

ABOUT SOME PRETTY LOW LEVELS TO BEGIN WITH. LEVELS THAT, AS I

MENTIONED BEFORE, ARE BELOW STATE STANDARDS FOR GROUNDWATER, BUT

ARE JUST SLIGHTLY ABOVE -- I'M SORRY, THAT ARE BELOW THE FEDERAL

STANDARDS FOR GROUNDWATER BUT ARE SLIGHTLY ABOVE STATE STANDARDS.

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AND AT THOSE LEVELS, PUTTING IN A SANITARY SEWER LINE AND SENDING
IT TO THE SEWAGE TREATMENT PLANT WOULD PROBABLY BE FEASIBLE FOR
TREATING IT DOWN TO A FURTHER LEVEL.

MRS. WOOD: OKAY, NOW, THIS IS GOING TO BE
ONE THAT A PIPE SWINGS IN? IT'S GOING TO THE FRENCH CREEK PLANT?
OR ARE YOU --

MR. WATTRAS: WE WOULD SEND IT TO THE NEAREST
SANITARY SEWER LINE. AND I KNOW YOU'RE TALKING ABOUT THE FUTURE
TREATMENT PLANT.

MRS. WOOD: YEAH, THEY WERE TALKING
ABOUT --

MR. WATTRAS: YEAH, IT WOULD GO TO, PROBABLY
BY THE TIME, IT WOULD PROBABLY GO TO THAT TREATMENT PLANT.

MRS. WOOD: SO, I MEAN, THIS IS NOT GOING
TO BE DONE INSTANTLY?

MR. WATTRAS: BUT THAT'S NOT GOING TO BE THE
SELECTED ALTERNATIVE ANYWAY. BUT IT REALLY WOULDN'T MATTER --
HADNOT POINT, EVEN IF HADNOT POINT IS OPERATING, WHICH IT STILL
IS, SENDING IT INTO A SANITARY SEWER LINE AND TAKING IT ALL THE
WAY DOWN TO HADNOT POINT WOULD STILL BE ACCEPTABLE. THEY HAVE A
BIOLOGICAL TRICKLING FILTER, AND THEY HAVE AN AERATION POND, THAT
WOULD PROBABLY BE ABLE TO REMOVE THESE LEVELS OF ETHYLBENZENE AND
XYLENE. WE'RE TALKING ABOUT SOME VERY LOW LEVELS.

COLONEL WOOD: BUT YOU'RE ALSO TALKING ABOUT
PLANTS THAT ARE BEYOND THE -- USABILITY.

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MRS. WOOD: THEY'RE UNDER WAIVER, LET'S PUT IT THAT WAY.

COLONEL WOOD: THEY'RE DISCHARGING LOTS OF WATER INTO THE RIVER THAT THEY SHOULD NOT BE. IN OTHER WORDS, THEY'RE OVER THE STATE STANDARDS.

MR. PAUL: THAT'S CORRECT.

MRS. WOOD: LET'S NOT GET OFF ON THAT.

MR. WATTRAS: YES, I KNOW WHAT YOU'RE TALKING ABOUT.

MR. PAUL: YEAH. YEAH, LET'S DON'T GET -- THE BOTTOM LINE HERE IS WE'RE NOT GOING TO -- IT'S NOT ECONOMICALLY FEASIBLE TO CHASE THESE TRACE AMOUNTS OF CONTAMINATION.

MR. WATTRAS: THE FIFTH ALTERNATIVE WOULD BE TO COLLECT IT AND DISCHARGE IT AND PIPE IT OUT TO SITE 82. NOW, SITE 82 IS LOCATED ABOUT TWO MILES DOWN THE ROAD, AND WE'RE BUILDING A TREATMENT PLANT TO DEAL WITH A MAJOR GROUNDWATER PROBLEM OUT THERE. AND WE SAID, WELL, LET'S JUST COLLECT IT AND SEND IT TO SITE 82.

AND THE SIXTH ALTERNATIVE WOULD INVOLVE IN SITU TREATMENT. AND IT'S PRETTY MUCH WHAT I TALKED ABOUT BEFORE WHERE WE WOULD TRY SOMETHING LIKE VAPOR EXTRACTION TO PULL OUT THESE VOLATILES.

THE COST OF THESE ALTERNATIVES GO FROM ZERO; THE MOST EXPENSIVE ALTERNATIVE WOULD BE TO BUILD AN ON-SITE TREATMENT

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PLANT, WHICH IS PRETTY OBVIOUS BECAUSE OF THE CAPITAL COSTS, WE'RE LOOKING AT ALMOST TWO MILLION DOLLARS TO DO THAT.

TO JUST MONITOR IT AND TO SEE WHAT'S HAPPENING OVER TIME WOULD COST THE DEPARTMENT OF THE NAVY ABOUT $350,000. THAT'S MAINLY AN ANALYTICAL COST. WE'RE TALKING ABOUT USING ABOUT FIVE OR SIX MONITORING WELLS, TAKING SAMPLES QUARTERLY, MAYBE OVER TIME TAKING THEM BI-ANNUALLY, AND ANALYZING THEM FOR CONTAMINANTS OF CONCERN HERE.

MRS. WOOD: WELL, NOW, THAT 350,000 IS PROJECTED OVER WHAT PERIOD OF YEARS?

MR. WATTRAS: THAT'S PROJECTED OVER 30 YEARS.

MRS. WOOD: 30 YEARS, OKAY.

MR. WATTRAS: THAT'S A STANDARD TIME FRAME THAT WE LOOK AT THINGS --

MRS. WOOD: OKAY. RIGHT, I REMEMBER THAT CAME UP EARLIER.

MR. WATTRAS: -- WHEN WE DO COST ANALYSES, AND THESE ARE PRESENT WORTH COSTS.

MRS. WOOD: OKAY.

MR. WATTRAS: THAT WOULD BE THE MONEY YOU'D HAVE TO SET ASIDE TODAY AND DRAW FROM.

ALTERNATIVE NUMBER FOUR IS SENDING IT DOWN TO -- THROUGH A SANITARY SEWER LINE DOWN TO HADNOT POINT WOULD BE ABOUT 1.3 MILLION. ALTERNATIVE FIVE -- THAT'S STILL BACKWARDS. I'M SORRY.

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MRS. WOOD: YEAH, IT'S GOING TO 82.

MR. WATTRAS: OH, ALTERNATIVE FIVE IS TO COLLECT IT AND SEND IT DOWN TO SITE 82. THAT ONE IS ABOUT 1.4 MILLION. AND ALTERNATIVE SIX IS TO DO THE IN SITU STUDY, OR THE IN SITU REMEDIATION; THAT WOULD BE ABOUT 1.3 MILLION. NOW --

MR. PAUL: EXCUSE ME, RAY, IS THERE A MINIMUM AMOUNT OF ALTERNATIVES YOU HAVE TO COME UP WITH? I DON'T KNOW IF YOU PROBABLY KNOW THIS ANSWER, BUT I KNOW YOU HAVE TO USE ALTERNATIVES IN YOUR FEASIBILITY STUDIES.

MR. WATTRAS: I MISSED YOUR QUESTION. I COULDN'T HEAR YOU.

MR. PAUL: IS THERE A MINIMUM --

MR. WATTRAS: AMOUNT OF ALTERNATIVES?

MR. PAUL: RIGHT. I KNOW YOU HAVE TO USE NOTHING AS ONE.

MR. WATTRAS: YOU ALWAYS HAVE TO USE NO ACTION. YOU ALWAYS SHOULD CONSIDER A TREATMENT, TOTAL TREATMENT ALTERNATIVE.

MR. PAUL: RIGHT.

MR. WATTRAS: YOU SHOULD ALWAYS CONSIDER A CONTAINMENT ALTERNATIVE. I BELIEVE THOSE ARE AT LEAST THREE ALTERNATIVES THAT YOU ALWAYS HAVE TO CONSIDER. CONTAINMENT, TOTAL REMEDIATION AND NO ACTION. AND INNOVATIVE -- WELL, TREATMENT IS PREFERRED.

MS. TOWNSEND: YOU START LOOKING AT -- AT --

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OF THOSE THREE OPTIONS, THEN YOU LOOK AT LANDFILL ON-SITE,

LANDFILL OFF-SITE. YOU GET INTO THOSE BREAK-UPS WHERE IT'S REALLY

THREE CATEGORIES.

MR. PAUL: I KNOW YOU GUYS ALWAYS DO A

REAL GOOD JOB OF PROPOSING QUITE A FEW ALTERNATIVES FOR US.

MR. WATTRAS: YEAH, THERE ARE CERTAIN ONES

THAT YOU ALWAYS HAVE TO CONSIDER, UNLESS THERE'S A SITUATION WHERE

YOU FIND OUT THAT YOU SAMPLE A SITE AND SOMETIMES YOU MIGHT -- YOU

DON'T EVEN NEED A FEASIBILITY STUDY IF YOU DETERMINE THAT, AFTER

SAMPLING, YOU DON'T HAVE A PROBLEM, THEN IT DOESN'T MAKE SENSE TO

DO A FEASIBILITY STUDY, BUT THAT'S KIND OF RARE.

AS I MENTIONED BEFORE, SOIL -- WE'RE NOT GOING TO DO

ANYTHING MORE TO THE SOIL. WE'RE DEALING WITH IT NOW, AND WHAT'S

REMAINING IS ACCEPTABLE. IT'S NOT AT HIGH LEVELS THAT'S GOING TO

CAUSE A PROBLEM.

GROUNDWATER, THE PROPOSED ALTERNATIVE HERE IS TO NOT

TREAT IT, BUT TO JUST PERFORM INSTITUTIONAL CONTROLS, AND I'LL

EXPLAIN A LITTLE BIT ABOUT THIS APPROACH.

THE INSTITUTIONAL CONTROLS WOULD INCLUDE AN ORDINANCE

RESTRICTION FOR PUTTING ANY SUPPLY WELLS IN THIS AREA. IT WOULD

INVOLVE LONG TERM GROUNDWATER MONITORING OF THE SHALLOW AND OF THE

DEEP AND OF A FEW OF THE SUPPLY WELLS.

COLONEL WOOD: WHAT IS LONG TERM?

MRS. WOOD: 30 YEARS.

MR. WATTRAS: IT WOULD BE 30 YEARS, BUT I'LL

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QUALIFY THAT. EVERY FIVE YEARS -- WHEN YOU SELECT AN ALTERNATIVE THAT IS NOT A FINAL REMEDY, IN OTHER WORDS, A CONTAINMENT ALTERNATIVE, FOR EXAMPLE, OUT AT HADNOT POINT WHERE WE'RE CONTAINING THAT PLUME, THAT'S NOT A FINAL REMEDY. EVERY FIVE YEARS, UNDER CERCLA, IT'S A REQUIREMENT THAT YOU LOOK AT THE PROBLEM AGAIN TO SEE IF THE ALTERNATIVE IS, NUMBER ONE, EFFECTIVE; WHETHER IT'S EFFECTIVE FROM THE STANDPOINT THAT YOU ARE REDUCING CONTAMINATION OR YOU'RE PREVENTING MIGRATION; OR IN SOME CASES, YOU KNOW, I GUESS IT'S POSSIBLE THAT THINGS COULD GET WORSE IN FIVE YEARS, THAT THE ALTERNATIVE THAT YOU SELECTED WASN'T THE BEST ALTERNATIVE. BUT WHEN I SAY 30 YEARS, SAY IN FIVE OR TEN YEARS, AND YOU HAVE TO DO THIS EVERY FIVE YEARS, IN TEN YEARS, WE MONITOR THIS PROBLEM AND WE SEE THAT, OVER TIME, THESE ETHYLBENZENE AND THE XYLENE HAS DECREASED IN CONCENTRATION TO THE POINT THAT THEY'RE NOT A PROBLEM ANYMORE, IT WOULD BE DONE. SO, THEORETICALLY 30 YEARS. POSSIBLY AS LITTLE AS FIVE YEARS, SOMEWHERE IN BETWEEN THERE.

MRS. WOODS: SO, WHEN THEY GET DOWN TO BELOW STATE REQUIREMENTS --

MR. WATTRAS: BELOW STATE STANDARDS.

MRS. WOODS: -- THAT'S IT.

MR. WATTRAS: THE REASON WE SELECTED THIS ALTERNATIVE AS OPPOSED TO TREATMENT IS, NUMBER ONE, THERE IS NO RISK. WE'RE TALKING ABOUT A VERY SMALL POCKET OF GROUNDWATER. WE'VE DISCUSSED BEFORE ABOUT THE FACT THAT THERE IS NO EXPOSURE.

July 27, 1994
BECAUSE EVERYBODY'S GETTING THEIR WATER FROM THE SUPPLY WELL.

THE OTHER ASPECT HAS TO DO WITH THE CONTAMINANTS THEMSELVES, XYLENES AND ETHYLBENZENES, THEY'RE RELATED TO PETROLEUM PRODUCTS. OVER TIME, I MENTIONED THAT SAMPLES WERE FIRST BEING TAKEN IN THE MID-80S, CONCENTRATIONS HAVE BEEN DECREASING. WE HAVE A HANDLE ON THE LIMITED AREA OF CONTAMINATION. THESE ARE CONTAMINANTS THAT CAN, THROUGH NATURAL PROCESSES, BIODEGRADATION IN THE AQUIFER. THEY ARE SEEING THAT AT A LOT OF SITES NOW WITH PETROLEUM. IF I'M NOT MISTAKEN, THE STATE – MAYBE, PATRICK, I DON'T KNOW IF YOU CAN ADD ANYTHING TO THIS, THE STATE OF NORTH CAROLINA IS LOOKING AT A LOT OF PETROLEUM GROUNDWATER PROBLEMS WHERE THEY'RE LOOKING AT POSSIBLY JUST MONITORING THAT PROBLEM. IF IT'S A LOW LEVEL PROBLEM. I MEAN, OBVIOUSLY, WE'RE NOT TALKING ABOUT A MAJOR PROBLEM HERE WHERE THE STATE WOULD JUST SAY, "OH, LET'S JUST MONITOR IT."

BUT IN A SITUATION LIKE THIS WHERE YOU'RE JUST AT THE LEVELS, WE'RE LOOKING AT IT FROM THE STANDPOINT IT BECOMES REALLY NOT A FEASIBLE IDEA TO GO AHEAD IN THERE, INVEST ALL THAT CAPITAL TO START TREATING WHEN IT'S COST-EFFECTIVE TO JUST MONITOR THIS PROBLEM, WE THEN -- THEORETICALLY, WE'VE BEEN MONITORING IT SINCE THE MID-80S AND HAVE FOUND THAT THE LEVELS HAVE BEEN SLOWLY DECREASING, AND, DUE TO THE NATURE OF THESE CONTAMINANTS, WE BELIEVE, JUST THROUGH NATURAL ATTENUATION, THAT IT WILL CLEAN ITSELF UP THROUGH TIME.

MRS. WOOD: AND IT'S AN AREA WHERE YOU'VE

July 27, 1994
GOT TIME.

COLONEL WOOD: DO YOU HAVE AN APPROXIMATE DATE TO EXPECT IT MAY BE CLEAN?

MR. WATTRAS: NO, WE DO NOT. WE DON'T HAVE AN APPROXIMATE DATE. WE WILL BE MONITORING THIS, LIKE I SAID, OVER TIME, AND IN FIVE YEARS, WE'LL DO A PRETTY GO ANALYSIS OF WHAT HAS CHANGED WITHIN THE LAST FIVE YEARS.

THERE ARE MODELS, COMPUTER MODELS, THAT WE COULD THEORETICALLY COME UP WITH A DATE, BUT YOU KNOW WHAT, THAT'S A THEORETICALLY MODEL, SO NOTHING'S GUARANTEED. MODELING IS VERY -- THERE'S A LOT OF GOOD ASPECTS ABOUT USING COMPUTER MODELS. YOU COULD USE IT IN THIS CASE, AND IT WILL POP OUT A NUMBER, BUT IT'S JUST GOING TO BE A BEST GUESS OF A NUMBER OF YEARS.

BUT AT THESE LEVELS, I WOULD BE, YOU KNOW, KIND OF SURPRISED IF A MODEL CAME OUT AND SAID IT'S GOING TO TAKE A HUNDRED YEARS, YOU KNOW. I THINK AT THESE LEVELS, BY JUST LEAVING THE PROBLEM GO AND SEEING THE DECREASE OVER TIME, THAT WE HAVE SEEN, THAT WE WOULD BE IN PRETTY GOOD SHAPE.

THAT CONCLUDES THIS OPERABLE UNIT, AND DO YOU HAVE ANY QUESTIONS?

MRS. WOOD: NO, I JUST ENJOYED THIS VERY MUCH. WE APPRECIATE THIS.

(WHEREUPON, THESE PROCEEDINGS CONCLUDED AT 8:58 P.M.)

July 27, 1994
I CERTIFY THAT THE FOREGOING IS A CORRECT TRANSCRIPT FROM THE RECORD OF PROCEEDINGS IN THE ABOVE-ENTITLED MATTER.

8-9-94

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STACY TONE, CCR                        DATE

July 27, 1994
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC
EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL (SITE 5)
USMC/CHEM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/22/1995
Operable Unit: 10
ROD ID: EPA/ROD/R04-95/240

Media: groundwater, soil, sediment

Contaminant: Benzene, trichloroethene, cis-1,2-dichloroethene, trans-1,2-dichlor
USMC Camp Lejeune (Camp Lejeune) is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Activity, as the base is referred to, covers approximately 236 square miles and includes 14 miles of coastline. Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina, is located north of the Activity.

Camp Geiger is located at the extreme northwest corner of Camp Lejeune. The main entrance to Camp Geiger is off U.S. Route 17, approximately three and a half miles southwest of the city of Jacksonville, North Carolina. Site 35, the decommissioned Camp Geiger Area Fuel Farm, refers primarily to five 15,000-gallon above-ground storage tanks (ASTs), a pump house, and a fuel unloading pad formerly situated within Camp Geiger just north of the intersection of Fourth and G Streets.

The Interim Feasibility Study (FS) study area consists of a portion of Operable Unit (OU) 10 measuring approximately 18 acres. More specifically, the study are consists of contaminated groundwater in the portion of the surficial aquifer that is located between the Fuel Farm and Brinson Creek.

Construction of Camp Geiger was completed in 1945, four years after construction of MCB, Camp Lejeune was initiated. Originally, the ASTs were used for the storage of No. 6 fuel oil, but were later converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. The date of their conversion is not known. The ASTs at the site are reported to be the original tanks. Demolition of the Fuel Farm ASTs, which began in the spring of 1995, is completed.

Routinely, the ASTs at Site 35 supplied fuel to an adjacent dispensing pump. A leak in the underground line from the ASTs to the dispensing island was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period. The leaking line was subsequently sealed and replaced.

The ASTs at Site 35 were used to dispense gasoline, diesel, and kerosene to government vehicles and to supply underground storage
tanks (USTs) in use at Camp Geiger and the nearby New River Marine Corps Air Station until the spring of 1995. The ASTs were supplied by commercial carrier trucks which delivered product to fill ports located on the fuel unloading pad at the southern end of the facility. Six short-run (120 feet minimum), underground fuel lines were used to distribute the product from the unloading pad to the ASTs.

Reports of a release from an underground distribution line near one of the ASTs date back to 1957. Apparently, the leak occurred as the result of damage to a dispensing pump. At that time, the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released, although records of the incident cannot be located. The fuel reportedly migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and buried.

Another abandoned underground distribution line extended from the ASTs to the former Mess Hall Heating Plant, located adjacent to D Street, between Third and Fourth Streets. The underground line dispensed No. 6 fuel oil to a UST which fueled the Mess Hall boiler. The Mess Hall, located across D Street to the west is believed to have been demolished along with its Heating Plant in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp Geiger personnel along the unnamed drainage channels north of the Fuel Farm. Apparently, the source of the fuel, believed to be diesel or jet fuel, was an unauthorized discharge from a tanker truck that was never identified. The Activity reportedly initiated an emergency clean-up action that included the removal of approximately 20 cubic yards of soil.

Decommissioning of the Fuel Farm began in the spring of 1995 and was completed in July 1995. The ASTs were cleaned, dismantled and removed along with associated concrete foundations, slabs on grade, berms, and underground piping. The Fuel Farm was removed to make way for a six-lane, divided highway proposed by the North Carolina Department of Transportation (NC DOT). In addition, soil remediation activities began in August 1995 along the highway right-of-way according to an Interim Record of Decision executed on September 15, 1994.

Soil, groundwater, surface water, and sediment samples were obtained and analyzed for lead, oil and grease. Groundwater was also analyzed for volatile organics. Oil and grease results indicated that soils northeast of the Fuel Farm were affected by site activities.
**Remedy:** The major components of the selected remedy (RAA 5) include:

- Six aeration wells spaced at approximately 180 feet (center to center). These wells would be installed in a line between the proposed highway and Brinson Creek.

- A submersible pump incorporated into each well. These pumps are placed near the bottom of the wells. They draw in contaminated groundwater and pump it to the stripping zone of the aeration system.

- An aeration system in each well. As water is pumped in from the bottom of the wells; air is injected into the water allowing the VOCs to move from the dissolved phase to the vapor phase. As the water is aerated, it is forced back out into the formation.

- A header system that delivers pressurized air from the compressor/blowers at each well to the well heads.

- An air extraction header system that runs from the well heads to a carbon adsorption unit adjacent to the well. This system is equipped with vacuum pumps that draw VOC laden air from the wellheads to carbon adsorption units.

- Carbon adsorption units that adsorb vapor phase VOCs from the contaminated air prior to discharge to the atmosphere. These units, along with the blowers, vacuum pumps, and controls will be housed in individual treatment buildings, which will also house the in well aeration well heads.

- Each well head has an upper observation well (slightly above groundwater table) and a lower observation well below the groundwater table.

- Implementation of aquifer use restrictions.

- Long-term groundwater monitoring.

**Text:** Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 10
ONSLOW COUNTY, NC
09/22/1995
FINAL
INTERIM RECORD OF DECISION
FOR SURFICIAL GROUNDWATER
FOR A PORTION OF OPERABLE UNIT NO. 10
SITE 35 - CAMP GEIGER AREA FUEL FARM
MARINE CORPS BASE,
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0232
SEPTEMBER 5, 1995

Prepared For:
DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia
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LIST OF ACRONYMS AND ABBREVIATIONS

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<tr>
<td>ARAR/TBC</td>
<td>applicable or relevant and appropriate requirements/to be considered (criteria)</td>
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<tr>
<td>AST</td>
<td>aboveground storage tank</td>
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<tr>
<td>Baker</td>
<td>Baker Environmental, Inc.</td>
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<tr>
<td>bgs</td>
<td>below ground surface</td>
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<td>BRA</td>
<td>Baseline Human Health Risk Assessment</td>
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<tr>
<td>BTEX</td>
<td>benzene, toluene, ethylbenzene, and total xylenes</td>
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<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
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<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>COPC</td>
<td>contaminant of potential concern</td>
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<td>CS</td>
<td>Confirmation Study</td>
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<td>CSA</td>
<td>Comprehensive Site Assessment</td>
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<td>DON</td>
<td>Department of the Navy</td>
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<tr>
<td>ERA</td>
<td>Ecological Risk Assessment</td>
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<td>Environmental Science and Engineering, Inc.</td>
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<tr>
<td>FFA</td>
<td>Federal Facilities Agreement</td>
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<td>Focused Feasibility Study</td>
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<td>FS</td>
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<td>IAS</td>
<td>in situ air sparging</td>
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<td>Incremental Cancer Risk</td>
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<td>Installation Restoration Program</td>
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<td>Law</td>
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<td>MCB</td>
<td>Marine Corps Base</td>
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<td>MTBE</td>
<td>methyl tertiary butyl ether</td>
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<td>NC DEHNR</td>
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T-1,2-DCE    trans-1,2-dichloroethene
TAL    Target Analyte List
TCE    trichloroethylene
TCL    Target Compound List
TPH    total petroleum hydrocarbons
USEPA    United States Environmental Protection Agency
UST    underground storage tank
VOC    Volatile Organic Compound
WAR    Water and Air Research, Inc.
DECLARATION

Site Name and Location

Operable Unit No. 10 (Site 35)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for surficial groundwater for a portion of Operable Unit (OU) No. 10 (Site 35), Marine Corps Base (MCB), Camp Lejeune, North Carolina, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This particular interim action focuses on contaminated surficial groundwater in the vicinity of the former Camp Geiger Fuel Farm extending downslope to Brinson Creek. This decision is based on the Administrative Record for Operable Unit No. 10. The Department of the Navy (DON) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA), Region IV, on the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this operable unit, if not addressed by implementing the response action selected in this Interim Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

Description of Selected Remedy

Five Remedial Action Alternatives (RAAs) were evaluated as part of an interim remedial investigation/feasibility study for surficial groundwater at OU No. 10 (Site 35). These RAAs included RAA 1 (No Action), RAA 2 (No Action With Institutional Controls), RAA 3 (Groundwater Collection and On-site Treatment), RAA 4 (In Situ Air Sparging and Off-Gas Carbon Adsorption) and RAA 5 (In Well Aeration and Off-Gas Adsorption). After all five RAAs were compared to established criteria, RAA 5 was selected as the preferred alternative.

RAAs 1, 2, 3 and 4 were not selected as the preferred alternative. Neither RAA 1 nor RAA 2 were selected primarily because of the potential environmental impacts associated with a no action alternative. RAA 3 was not selected primarily because of its high cost and implementation difficulties. RAA 4 was not selected primarily because of potential difficulties controlling releases of toxic vapors associated with vapor extraction. Thus, RAA 5, which was determined to be the most cost effective alternative, was selected as the preferred alternative because it best met the various selection criteria.

The selected remedy focuses on positively impacting contaminated surficial groundwater in the vicinity of the Fuel Farm as it moves downslope towards Brinson Creek. The physical location of this remedial action will be just beyond the northern right-of-way boundary of the proposed U.S. Route 17 bypass (i.e., six-lane divided highway) in the direction of Brinson Creek, and will extend the entire width of the contaminant plume. RAA 5 is an Interim Remedial Action representing only one phase of a comprehensive investigation and remediation program at Site 35. The selected remedy addressed in this Interim ROD provides for reduction of organic contaminants in the surficial groundwater to levels below North Carolina Water Quality Standards (NCWQS) and mitigates potential risks to human health and the environment.

The major components of the selected remedy (RAA 5) include:

- Six aeration wells spaced at approximately 180 feet (center to center). These wells would be installed in a line between the proposed highway and Brinson Creek.

- A submersible pump incorporated into each well. These pumps are placed near the bottom of the wells. They draw in contaminated groundwater and pump it to the
stripping zone of the aeration system.

- An aeration system in each well. As water is pumped in from the bottom of the wells; air is injected into the water allowing the VOCs to move from the dissolved phase to the vapor phase. As the water is aerated, it is forced back out into the formation.

- A header system that delivers pressurized air from the compressor/blowers at each well to the well heads.

- An air extraction header system that runs from the well heads to a carbon adsorption unit adjacent to the well. This system is equipped with vacuum pumps that draw VOC laden air from the wellheads to carbon adsorption units.

- Carbon adsorption units that adsorb vapor phase VOCs from the contaminated air prior to discharge to the atmosphere. These units, along with the blowers, vacuum pumps, and controls will be housed in individual treatment buildings, which will also house the in well aeration well heads.

- Each well head has an upper observation well (slightly above groundwater table) and a lower observation well below the groundwater table.

- Implementation of aquifer use restrictions.

- Long-term groundwater monitoring.

The viability of in well aeration technology at Camp Lejeune needs to be determined by means of a field pilot test. Such a test is scheduled to be initiated in October 1995 at Camp Lejeune. A Draft Report of results will be available in May 1996. Additionally, the field pilot test will provide important design support data. If it is determined, based on the results of the field pilot test, that in well aeration cannot perform as required, RAA 3 (Groundwater Collection and On-Site Treatment) will be selected as the Interim Preferred Remedial Action.

The major components of RAA 3 include:

- A vertical interceptor trench (specifically, a biopolymer slurry drainage trench) approximately two feet wide, by 30 feet deep, by 1,080 feet long. This trench will be constructed from the ground surface to the semiconfining layer.

- A groundwater collection system consisting of submersible pumps and above and below ground piping. Water that is intercepted by the trench is conveyed to an on-site groundwater treatment plant.

- A groundwater treatment plant located on-site. This plant will include a treatment building which will house the following major process units: a filtration system, a settling tank, a sludge holding tank, an air stripper, an off-gas carbon adsorption unit, and a liquid phase carbon adsorption unit.

- Implementation of aquifer use restrictions.

- Long-term groundwater monitoring.
Declaration

This interim action is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs) and criteria to be considered (TBCs) directly associated with this action, and is cost-effective. This action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, given the limited scope of the action. Because this action does not constitute the final remedy for Site 35, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element for other media, including groundwater south and southwest of the above ground storage tank (AST) area, surface water, and sediment will be addressed at the time of the final response action. Subsequent actions are planned to address fully the principal threats posed by this site.

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Signature (Commanding General, MCB Camp Lejeune) Date
1.0 SITE LOCATION AND DESCRIPTION

Marine Corps Base (MCB), Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Activity, as the base is referred to, covers approximately 236 square miles and includes 14 miles of coastline. MCB, Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina, is located north of the Activity (see Figure 1).

Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune. The main entrance to Camp Geiger is off U.S. Route 17, approximately 3.5 miles southwest of the city of Jacksonville, North Carolina. Site 35, the decommissioned Camp Geiger Area Fuel Farm, refers primarily to five, 15,000-gallon aboveground storage tanks (ASTs), a pump house, and a fuel unloading pad formerly situated within Camp Geiger just north of the intersection of Fourth and G Streets (see Figure 2).

Site 35 is contained within Operable Unit (OU) No. 10, one of 14 operable units at MCB, Camp Lejeune. An "operable unit," as defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is a discrete action that comprises an incremental step toward comprehensively addressing site problems.

The Interim Feasibility Study (FS) study area consists of a portion of OU No. 10 measuring approximately 18 acres. More specifically, the study area consists of contaminated groundwater in the portion of the surficial aquifer that is located roughly between the Fuel Farm and Brinson Creek (see Figure 2).

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Construction of Camp Geiger was completed in 1945, four years after construction of MCB, Camp Lejeune was initiated. Originally, the ASTs were used for the storage of No. 6 fuel oil, but were later converted for storage of other petroleum products including unleaded gasoline, diesel fuel, and kerosene. The date of their conversion is not known. The ASTs at the site are reported to be the original tanks. Demolition of the Fuel Farm ASTs is completed, having begun in the spring of 1995.

Product was dispensed from the ASTs via trucks and underground piping. Routinely, the ASTs at Site 35 supplied fuel to an adjacent dispensing pump. A leak in the underground line from the ASTs to the dispensing island was reportedly responsible for the loss of roughly 30 gallons per day of gasoline over an unspecified period (Law, 1992). The leaking line was subsequently sealed and replaced.

The ASTs at Site 35 were used to dispense gasoline, diesel, and kerosene to government vehicles and to supply underground storage tanks (USTs) in use at Camp Geiger and the nearby New River Marine Corps Air Station until the spring of 1995. The ASTs were supplied by commercial carrier trucks which delivered product to fill ports located on the fuel unloading pad at the southern end of the facility. Six short-run (120 feet maximum), underground fuel lines were utilized to distribute the product from the unloading pad to the ASTs.

Reports of a release from an underground distribution line near one of the ASTs date back to 1957-58 (ESE, 1990). Apparently, the leak occurred as the result of damage to a dispensing pump. At that time, the Camp Lejeune Fire Department estimated that thousands of gallons of fuel were released, although records of the incident cannot be located. The fuel reportedly migrated to the east and northeast toward Brinson Creek. Interceptor trenches were excavated and the captured fuel was ignited and burned.

Another abandoned underground distribution line extended from the ASTs to the former Mess Hall Heating Plant, located adjacent to D Street, between Third and Fourth Streets. The underground line dispensed No. 6 fuel oil to a UST which fueled the Mess Hall boiler. The Mess Hall, located across "D" Street to the west, is believed to have been demolished along with its Heating Plant in the 1960s.

In April 1990, an undetermined amount of fuel had been discovered by Camp Geiger personnel along the unnamed drainage channels north of the Fuel Farm. Apparently, the source of the fuel,
believed to be diesel or jet fuel, was an unauthorized discharge from a tanker truck that was never identified. The Activity, reportedly initiated an emergency clean-up action that included the removal of approximately 20 cubic yards of soil.

Decommissioning of the Fuel Farm began in the spring of 1995 and was completed in July 1995. The ASTs were cleaned, dismantled and removed along with associated concrete foundations, slabs on grade, berms, and underground piping. The Fuel Farm was removed to make way for a six-lane, divided highway proposed by the North Carolina Department of Transportation (NC DOT) (see Figure 2).

In addition to the Fuel Farm dismantling, soil remediation activities began in August 1995 along the highway right-of-way as per an Interim Record of Decision executed on September 15, 1994. The soil remediation work is scheduled to be completed during the fall of 1995.

Previous Investigations and Findings

Previous investigations conducted at Site 35 include the Initial Assessment Study of Marine Corps Base, Camp Lejeune, North Carolina (WAR, 1983); Final Site Summary Report, MCB Camp Lejeune (ESE, 1990); Draft Field Investigation/Focused Feasibility Study, Camp Geiger Fuel Spill Site (NUS, 1990); Underground Fuel Investigation and Comprehensive Site Assessment (Law, 1992); Addendum Report of Underground Fuel Investigation and Comprehensive Site Assessment (Law, 1993); Interim Remedial Action Remedial Investigation/Feasibility Study for Soil (Baker, 1994); Comprehensive Remedial Investigation Report (Baker, 1994); and Interim Feasibility Study for Surficial Groundwater (Baker, 1994).

The Initial Assessment Study identified Site 35 as one of 23 sites warranting further investigation. Environmental media were not sampled as part of this study. ESE performed the Confirmation Study at the Fuel Farm between 1984 and 1987. Soil, groundwater, surface water, and sediment samples were obtained and analyzed for lead, oil and grease. Groundwater was also analyzed for volatile organics. Oil and grease results indicated that soils northeast of the Fuel Farm were potentially impacted by site activities. Additional wells were installed by NUS Corporation during the Focused Feasibility Study, which was conducted in 1990. Soil cuttings obtained from two of the four well boreholes contained hydrocarbon related contamination.

Law conducted the Comprehensive Site Assessment in 1991. A total of 18 soil borings were drilled, sampled and converted to nested wells that monitor the upper and lower portions of water table aquifer. An additional three soil borings were drilled to provide stratigraphic data. Five more soil borings were drilled to provide data regarding vadose zone contamination. Nine hand-auger samples were also obtained. A follow-up study was conducted subsequent to the Comprehensive Site Assessment. Three additional borings were drilled, sampled and converted to wells.

Law identified separate areas of impacted soil and groundwater directly beneath and apart from the Fuel Farm. The nature of the contamination included both chlorinated organic compounds (e.g., TCE, trans-1,2-DCE, and vinyl chloride) and petroleum hydrocarbons (e.g., TPH, MTBE, BTEX). The majority of the soil contamination encountered appeared to be associated with a fluctuating groundwater table. Two plumes of shallow groundwater contaminated with petroleum constituents and two plumes contaminated with chlorinated organics were identified. All four plumes were located north of Fourth Street and east of E Street except for a portion of a TCE plume extending southwest of Fourth Street. The approximate locations of these plumes are shown on Figures 3, 4, 5, and 6.

The Interim Remedial Action RI conducted by Baker in 1993 and 1994 consisted of drilling seven additional soil borings including five in those areas where groundwater contamination plumes were suspected. In general, the Interim Remedial Action RI data confirmed the findings of the CSA (Law, 1992) which indicated contaminated soil conditions at Site 35 are primarily associated with a fluctuating shallow groundwater plume.

The Interim Remedial Action RI/FS culminated with an executed Interim Record of Decision (ROD), signed on September 15, 1994, for the remediation of contaminated soil along and adjacent to the proposed highway right-of-way at Site 35. Three areas of contaminated soil have been identified (see Figure 2). The first area is located in the vicinity of the Fuel Farm and the
two other areas are located north of the Fuel Farm. The larger of these two areas is located along F Street in the vicinity of monitoring well MW-25. Baker has estimated that approximately 3,600 cubic yards (4,900 tons) of contaminated soil is present in these areas. Contaminated soil located in these areas is scheduled for removal and disposal at an off-site soil recycling facility beginning July 1995.

A fourth area of soil contamination, located immediately north of Building G480, was also identified in the Interim ROD(1994). Additional data pertaining to this fourth area became available subsequent to the execution of the Interim ROD. The data indicated that contaminated soil was encountered in this area during the removal of a UST in January 1994. The contaminated soil was excavated and reportedly disposed off site; however, no documentation is available regarding how or where the soil was disposed. An additional soil investigation will be conducted in this area to confirm that the contaminated soil was not returned to the excavation and that follow-up soil remediation in this area is not necessary.

A comprehensive RI was conducted by Baker in 1994 to evaluate the nature and extent of the threat to public health and the environment caused by the release of hazardous substances, pollutants, or contaminants, and to support a Feasibility Study evaluation of potential remedial alternatives. The RI field program was initiated on April 11, 1994. Data gathering activities were derived from a soil gas survey and groundwater screening investigation, a soil investigation, a groundwater investigation, a surface water and sediment investigation, and an ecological investigation. From the results of the comprehensive RI, an Interim Feasibility Study for surficial groundwater was completed in May 1995 and is the supporting document of this Interim ROD. An Interim Proposed Remedial Action Plan (PRAP) identified In Well Aeration and Off-Gas Carbon Adsorption as the method to remediate organic contamination in the surficial groundwater in the vicinity of the Fuel Farm.

Fuel and solvent related groundwater contamination was identified in the surficial aquifer in the area north of Fourth Street. Two additional plumes of solvent related groundwater contamination have been identified adjacent to Site 35. The extent and sources of this contamination have not been identified and additional RI activities are planned. In addition, significant levels of organic and inorganic contamination were identified in sediment samples. Two USTs located near the Fuel Farm have been the subject of previous investigations conducted under an Activity-wide UST program. The two USTs include a No. 6 fuel oil UST situated adjacent to the former Mess Hall Heating Plant, and a No. 2 fuel oil UST situated adjacent to the Explosive Ordnance and Disposal Armory, Office, and Supply Building. The former UST was abandoned in place years ago (date unknown) and has been the subject of previous environmental investigations performed by ATEC Associates, Inc. and Law. The latter UST was removed in January 1994, and is the UST associated with the fourth area of soil contamination identified in the previously mentioned Interim ROD, signed September 1994. The area from which this latter UST was removed is reported to be scheduled for an upcoming comprehensive environmental investigation.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Final Interim Proposed Remedial Action Plan (PRAP) for surficial groundwater at Site 35 was released to the public on May 9, 1995. These documents were made available to the public at the information repository maintained at the Onslow County Library and Building 67, MCB, Camp Lejeune. The notice of availability of these documents was published in The Jacksonville Daily News in the form of a display ad on April 29, 1995 and a legal ad on May 3, 1995. A public comment period was held from May 10 to June 10, 1995. In addition, a public meeting was held on May 10, 1995. At this meeting representatives from DON/Marine Corps were available to discuss the remedial action alternatives (RAAs) currently under consideration and address community concerns. However, no members of the community turned out for the meeting. Responses to the comments received during the comment period are included in the Responsiveness Summary, which is part of this ROD (Section 11.0).

This decision document presents the five RAAs which were considered. RAA 5 has been selected for the remediation of organic chemical contaminated surficial groundwater at Site 35. This RAA has been chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the NCP. The selected RAA for surficial groundwater at Site 35 is based on the Administrative Record.
The viability of in well aeration technology (RAA 5) at Camp Lejeune will be determined by means of a field pilot test scheduled to be initiated in October 1995. A Draft Report of results will be available in May 1996. Additionally, the field pilot test will provide important data to support the full design of this alternative. If it is determined, based on the results of the field pilot test, that in well aeration cannot perform as required, RAA 3 (Groundwater Collection and On-Site Treatment) will be selected as the Interim Preferred Remedial Action.

4.0 SCOPE AND GOALS OF INTERIM REMEDIAL ACTION

The response action presented in this document is interim in nature because it represents only one phase of a comprehensive investigation and remediation at Site 35 and is not intended to represent the final solution for OU No. 10. This particular interim action focuses on organic groundwater contamination in the surficial aquifer located in the vicinity of the Fuel Farm and extending downgradient towards Brinson Creek. A remediation system installed in this area would be designed to mitigate the migration of groundwater contamination from OU No. 10 prior to its discharge into Brinson Creek.

Other media of concern such as sediment, and groundwater in the upgradient portion of the surficial aquifer, will be addressed during subsequent RI/FS activities that are due to commence later in 1995. Soil contamination at Site 35 was the focus of an Interim Remedial Action document that was issued by Baker on August 31, 1994.

The scope and goals for the remediation of organic chemical contaminated groundwater were developed based on North Carolina Water Quality Standards (NCWQS). In the Interim Feasibility Study, which addressed contaminated surficial groundwater at Site 35, risk-based cleanup goals were established. These goals were then compared to Federal Maximum Contaminant Levels (MCLs) and NCWQS, and the most conservative value for each contaminant was selected as the remediation goal. In each case, the most conservative criteria was the NCWQS. The remediation goals for the organic contaminants of concern are listed below:

- Benzene 1 µg/L
- Trichloroethene 2.8 µg/L
- cis-1,2-dichloroethene 70 µg/L
- trans-1,2-dichloroethene 70 µg/L
- Ethyl benzene 29 µg/L
- Methyl Tertiary, Butyl Ether 200 µg/L
- Xylenes 530 µg/L

5.0 SITE CHARACTERISTICS

This section of the Interim ROD presents an overview of the nature and extent of surficial groundwater contamination in the vicinity of the Fuel Farm at Site 35. The nature and extent of contamination was determined based on the analytical results obtained under the RI (Baker, 1994).

Groundwater contamination was observed in the surficial aquifer along both the upper and lower monitored intervals. Fuel-related organic contaminants (e.g., BTEX), when encountered, appear more prevalent in the upper portion of the surficial aquifer. Conversely, solvent-related organic contaminants (e.g., TCE), when encountered, appear more prevalent in the lower portion of the surficial aquifer. This is likely due to the fact that the latter type of contaminants have specific gravities greater than water and tend to "sink" while fuel-related contaminants have specific gravities less than water and tend to "float".

The extent of fuel-related contamination appears to be adequately defined based on the data obtained to date. Fuel-related contaminants are present in the area north of Fourth Street in the vicinity of obvious suspected sources such as the Fuel Farm, and nearby former UST sites. The limits of fuel related contamination are depicted in Figures 3 and 4. There are four distinct plumes of groundwater contamination in the upper portion of the surficial aquifer. The most northern plume is located immediately east of F Street and north of the ASTs at Site 35. The easternmost plume is north of Building TC474 and east of the ASTs. The westernmost plume is in the vicinity of building G480 and the football field. The southernmost portion of this plume has not been adequately defined (see Figures 3 and 5).
Groundwater contamination in the lower portion of the surficial aquifer consists of two separate plumes that conglomerate into a single plume. The easternmost plume is centered roughly under Buildings TC474, TC473, and TC470. The westernmost plume is south of Fourth Street and centered directly under E Street. The southernmost boundary of this conglomerate plume has not been adequately delineated (see Figures 4, 5 and 6). Additional investigations are planned to further evaluate the extent of this contamination.

Other media of concern such as sediment and groundwater in the upgradient portion of the surficial aquifer will be addressed as part of a Supplemental Groundwater Investigation to be initiated in December 1995. Soil contamination at Site 35 was the focus of an Interim Remedial Action document that was issued by Baker on August 31, 1994.

6.0 SUMMARY OF SITE RISKS

Baseline Human Health Risk Assessment

A baseline human health risk assessment (BRA) was performed as part of this study utilizing the data obtained under the RI field investigation. Contaminants of potential concern (COPC) for the BRA were selected for each media as shown in Table 1. The BRA highlights the media of interest from the human health standpoint at OU No. 10 by identifying areas with elevated Incremental Cancer Risk (ICR) and Health Index (HI) values. Current and future potential receptors at the site include current military personnel, future residents (i.e., children and adults), and future construction workers. The total risk from each site for these receptors was estimated by logically summing the multiple exposure pathways likely to affect the receptor during a given activity. The risk to human health was derived based on the following receptors and contaminant exposure routes:

1. Current Military Personnel
   a. Incidental ingestion of COPC in surface soil + dermal contact with COPC in surface soil + inhalation of airborne COPC

2. Future Residents (Children and Adults)
   a. Incidental ingestion of COPC in surface soil + dermal contact with COPC in surface soil + inhalation airborne of COPC
   b. Ingestion of COPC in groundwater + dermal contact with COPC in groundwater + inhalation of volatile COPC

3. Future Construction Worker
   a. Incidental ingestion of COPC in on-site subsurface soil + dermal contact with COPC in subsurface soil + inhalation of airborne COPC

4. Current Residents (Children and Adults)
   a. Ingestion of COPC in surface water and sediment + dermal contact with COPC in surface water and sediment
   b. Ingestion of fish tissue (adults only)

The total site ICR and HI values associated with current and future receptors at this site are presented in Table 2. The total site ICR estimated for future residential children (2.0E-03) and adults (4.3E-03) exceeded the USEPA's upper bound risk range (1E-04). The total site ICR estimated value for the current residential child (3.0E-07) is below the USEPA's upper bound risk range, while the current residential adult (1.4E-04) is slightly above the risk range (1E-04 to 1E-06). The total site ICR estimated value for future construction workers (1E-07) was less than the USEPA's lower bound target risk (1E-06). The total site ICR estimated value for current military personnel (3.2E-06) is within the USEPA's risk range (1E-04 to 1E-06). Additionally, USEPA guidance provides for a maximum HI value of 1.0. The total site HI for future residential children (65) and adults (28) exceed unity (i.e., 1.0). The total site HI for current residential child (2.4E-02) is less than unity, while the total site HI for the current residential adult (3.5) is greater than unity. The total site HI estimated for the future construction worker (1.7E-02) did not exceed unity. Finally, the total site HI for the current military personnel (1.0E-01) did not exceed unity. The total site risk was driven by future potential exposure to groundwater contaminated with cis-1,2-dichloroethene, trichloroethane, benzene, antimony, arsenic, barium, beryllium, chromium, cadmium, manganese, and vanadium; and current potential exposure to fish due to mercury.
As part of this study an ecological risk assessment (ERA) was conducted to assess the potential impacts to ecological receptors from contaminants detected at Site 35. Additional data obtained along Brinson Creek from Site 36, located downstream of Site 35, was also used in the ERA. Similar to the BRA, COPCs were selected for the media considered in the ERA. These media include sediment, surface water, surface soil, and biota.

Overall, metals and pesticides appear to be the most significant site related COPCs that have the potential to affect the integrity of the aquatic and terrestrial receptors at OU No. 10. Although the American alligator and red-cockade woodpecker have been observed at OU No. 10, potential adverse impacts to these threatened or endangered species are low due to the low levels of contaminants in their critical habitats.

Aquatic Ecosystem

Surface water quality showed exceedances of aquatic reference values for lead, mercury, and zinc. For sediments, concentrations of lead and the organics dieldrin, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, endrin, alpha-chlordane, and gamma-chlordane exceeded the aquatic reference values. In the surface water, mercury exceeded aquatic reference values in the upstream stations. Although these levels were indicative of a high potential for risk (QI > 100), mercury is not believed to be site related. Zinc exceeded unity slightly and was only found at a single station. Lead has a single exceedance of the aquatic reference value by slightly greater than 10 indicating a moderate potential for risk to aquatic receptors.

In the sediments, lead exceeded the lower sediment aquatic reference value throughout Brinson Creek. The only exceedances of the higher sediment aquatic reference value occurred downstream of Site 35 with the highest QI of 137 representing a high potential for risk to aquatic receptors. The lead detected in sediments is likely site related, the result of past reported surface spills/runoff and past and ongoing groundwater discharges to surface water. Pesticides exceeded the sediment aquatic reference values throughout Brinson Creek. The highest QI, 2,600 for dieldrin, represents a high potential for risk to aquatic receptors. There is no documented pesticide disposal or storage/preparation activities at Site 35. The pesticide levels detected in the sediments probably are a result of routine application (i.e., pest control) in the general vicinity of Site 35.

Although the pesticides in the sediments were found at levels indicating contamination throughout the watershed, the highest levels were observed in the lower reaches of Brinson Creek. This deposition trend may be related to the higher organics in the sediments in the lower reach, which would accumulate more of these types of contaminants.

The fish community sampled in Brinson Creek was representative of an estuarine ecosystem with both freshwater and marine species present. In addition, the presence of blue crabs, grass shrimp, and crayfish support the active use of Brinson Creek by aquatic species.

The absence of pathologies observed in the fish collected from Brinson Creek indicates that the surface water and sediment quality does not adversely impact the fish community.

The benthic macroinvertebrate community demonstrated the typical tidal/freshwater species trend of primarily chironmids and oligochaetes in the upper reaches and polychaetes and amphipods in the lower reaches. Species representative of both tolerant and intolerant taxa were present. Species richness and densities were representative of an estuarine ecosystem.

In summary, the aquatic community in Brinson Creek was representative of an estuarine community and does not appear to be adversely impacted by surface water and sediment quality.

Terrestrial Ecosystem

Surface soil quality indicated an infrequent potential for adversely impacting the terrestrial receptors that have indirect contact with the surface soils. This adverse impact is primarily due to arsenic and chromium concentrations in the surface soils. For the larger receptors (rabbit, raccoon, and quail) the terrestrial reference values exceeded unity only slightly. Therefore, there is no significant adverse impact to terrestrial receptors from site-related...
contaminants.

7.0 DESCRIPTION OF ALTERNATIVES

Numerous technologies and process options were screened and evaluated under the Interim FS. Based upon screening criteria, many of the technologies and process options were eliminated. Ultimately, five RAAs were developed with the following titles:

- RAA 1 - No action
- RAA 2 - No Action with Institutional Controls
- RAA 3 - Groundwater Collection and On-Site Treatment
- RAA 4 - In Situ Air Sparging and Off-Gas Carbon Adsorption
- RAA 5 - In Well Aeration and Off-Gas Carbon Adsorption

A brief description of each alternative, as well as the estimated cost and timeframe to implement the alternative, are as follows:

- **RAA 1 - No Action**
  
  Capital Cost: $0
  Annual Operation and Maintenance (O&M): $0
  Total Net Present Worth (30 years): $0
  Months to Implement: 0

  Under RAA 1, no remedial actions will be performed to reduce the toxicity, mobility, or volume of the contaminated surficial groundwater at Operable Unit No. 10. This method assumes that passive remediation will occur via natural attenuation processes and that the contaminant levels will be reduced over an indefinite period of time. However, the achievable reductions versus time is difficult, if not impossible, to predict.

  The No Action RAA is required by the NCP to provide a baseline for comparison with other alternatives. Since contaminants will remain at the site under this alternative, DON is required by the NCP [40 CFR 300.430(f)(4)] to review the effects of this alternative no less often than every five years after initiation of the selected remedial action.

- **RAA 2 - No Action with Institutional Controls**
  
  Capital Cost: $6,200
  Annual Operation and Maintenance (O&M) Costs: $19,100
  Total Net Present Worth (30 years): $299,800
  Months to Implement: 1

  Under RAA No. 2, no remedial actions will be performed to reduce the toxicity, mobility, or volume of the contaminated surficial groundwater at Operable Unit No. 10. This RAA assumes that the Base Master Plan will be modified to include restrictions on the use of the surficial aquifer in the vicinity of the Fuel Farm. These institutional controls will reduce the risk to human health and the environment posed by eliminating potential exposure to shallow groundwater; however, without additional remediation the contaminated surficial groundwater will remain a future source of contamination for Brinson Creek via groundwater discharge.

  In addition to aquifer-use restrictions, long-term groundwater monitoring is included under this RAA to provide data regarding the impact of natural attenuation and the progress of contaminant migration. Long-term groundwater monitoring will include: the semi-annual collection and analysis (TCL VOCs) of groundwater samples from 11 monitoring wells; the development of a semi-annual monitoring report; and the replacement of one monitoring well every five years. Since contaminants will remain at the site under this alternative, the DON is required by the NCP [40 CFR 300.430(f)(4)] to review the effects of this alternative no less often than every five years after initiation of the selected remedial action.

- **RAA 3 - Groundwater Collection and On-Site Treatment**
  
  Capital Cost: $2,122,700
  Annual Operation and Maintenance (O&M) Costs: $57,100
  Total Net Present Worth (30 years): $3,000,500
RAA 3 is a source collection and treatment alternative; the source being the contaminated surficial groundwater in the vicinity of the Fuel Farm at Operable Unit No. 10. Under this alternative a vertical interceptor trench will be installed at the downgradient edge of the contaminated plume in the area between the proposed highway and Brinson Creek (see Figure 7). The interceptor trench will extend from the ground surface to the semi-confining layer at the base of the surficial aquifer (see Figure 8). The purpose of the interceptor trench is to collect contaminated surficial groundwater for transfer to an on-site treatment facility prior to it being discharged to Brinson Creek.

The type of interceptor trench proposed under RAA 3 is termed a "biopolymer slurry drainage trench." This type of trench can be installed without dewatering or structural bracing. Through the use of a natural, biodegradable slurry, the walls of a trench excavation can be supported and the trench can be installed without personnel entering an excavation. Compared to other trenching methods, this technique is safer and more cost-effective in areas with a high groundwater and unstable soil because dewatering and shoring are not required.

The interceptor trench will be designed to collect groundwater at a rate roughly equal to the rate of groundwater flow (5 to 10 gpm) across the upgradient face of the trench (31,900 square feet). Flow across the downgradient face of the trench will be restricted by an impermeable geomembrane barrier. Drawdown of the groundwater surface will be minimized so as to mitigate the potential of excessive ground settlement beneath the highway. The collected groundwater will be conveyed to an on-site treatment system located just east of the proposed highway right-of-way, creek-side, where it appears that adequate space and firm ground is available. Baker, LANTDIV, and MCB, Camp Lejeune will negotiate with NC DOT regarding the specifics of site access to the creek side of the new highway. EPA and NC DEHNR will be kept abreast of developments regarding this subject. In this interim ROD, Baker proposes an access road running parallel to the east side of the highway from the south.

The collected groundwater will be treated sufficiently to allow for its discharge to Brinson Creek at a point downstream of OU No. 10. It is anticipated that the groundwater treatment system will include filtration for the removal of suspended solids, precipitation for the removal of inorganics, sludge collection and disposal, volatilization (air stripping) for the removal of volatile organic contaminants (VOCs), and secondary treatment of VOC emissions from the air stripper and of the treated groundwater (i.e., via carbon adsorption). Figure 9 is a process flow diagram of this treatment train. The treatment plant effluent will be sampled once a month to insure that water discharged to Brinson Creek meets all applicable water quality standards.

RAA 3 assumes that the Base Master Plan will be modified to include restrictions on the use of the surficial aquifer in the vicinity of the Fuel Farm. This institutional control will reduce the risk to human health and the environment posed by this media by eliminating potential exposure to shallow groundwater. In addition to aquifer-use restrictions, long-term groundwater monitoring is to be included under this RAA to provide data regarding the impact of natural attenuation and the progress of contaminant migration. Long-term groundwater monitoring will include: the semi-annual collection and analysis (TCL VOCs) of groundwater samples from 11 monitoring wells; the development of a semi-annual monitoring report; and the replacement of one monitoring well every five years.

Since contaminants will remain at the site under this alternative, the DON is required by the NCP [40 CFR 300.430(f)(4)] to review the effects of this alternative no less often than every five years after initiation of the selected remedial action.

• RAA 4 - In Situ Air Sparging And Off-Gas Carbon Adsorption
  Capital Cost: $1,068,400
  Annual Operation and Maintenance (O&M) Costs: $90,100
  Total Net Present Worth (30 years): $2,459,600
  Months to Implement: 3

In situ air sparging (IAS) is a technique in which air is injected into water saturated zones for the purpose of removing organic contaminants primarily via volatilization and secondarily via aerobic biodegradation. IAS systems introduce contaminant-free air into an impacted aquifer
near the base of the zone of contamination, forcing contaminants to transfer from the groundwater into sparged air bubbles. The air bubbles are then transported into soil pore spaces in the unsaturated zone where they are typically collected via soil vapor extraction (SVE) and conveyed to an above-ground off-gas treatment system.

An IAS system typically is comprised of the following components: 1) air injection wells; 2) an air compressor; 3) air extraction wells; 4) a vacuum pump; 5) associated piping and valving for air conveyance; and 6) an off-gas treatment system (e.g., activated carbon, combustion, or oxidation). Under RAA 4, a line of air sparging wells will be installed between the proposed highway and Brinson Creek in order to treat and contain the contaminant plume near its downgradient extreme. Based on empirical data from similar sites, the radius of influence of an air sparging well ranges from five to almost 200 feet, but is typically on the order of 25 feet (EPA, 1992). The proposed off-gas treatment system, consisting primarily of activated carbon units, will be located just east of the proposed highway right-of-way, creek-side, where it appears that there is adequate space and firm foundation material available. The air emissions from the off-gas treatment system will be sampled monthly to insure that all applicable air emissions standards are being met.

Air sparging systems are most effective in sandy soils, but can be adversely impacted by high levels of inorganic compounds in the groundwater which oxidize and precipitate when contacted by the sparged air. These inorganics can form a heavy scale on well screens and clog the well space of the sand pack surrounding the well screen resulting in a reduction in permeability. A field pilot test is recommended to determine the loss of efficiency over time as a result of inorganics precipitation and oxidation, the radius of influence of the wells under various heads of injection air pressure, and the rate of off-gas organic contaminant removal via carbon adsorption and carbon breakthrough.

Baker, LANTDIV, and MCB, Camp Lejeune will negotiate with NC DOT regarding the specifics of site access to the creek side of the new highway. EPA and NC DEHNR will be kept abreast of developments regarding this subject. In this Interim ROD, Baker proposes an access road running parallel to the east side of the highway from the south.

RAA 4 assumes that the Base Master Plan will be modified to include restrictions on the use of the surficial aquifer in the vicinity of the Fuel Farm. This institutional control will reduce the risk to human health and the environment posed by this media by eliminating potential exposure to contaminated shallow groundwater. In addition to aquifer-use restrictions, long-term groundwater monitoring is to be included under this RAA to provide data regarding the impact of natural attenuation and the progress of contaminant migration. Long-term groundwater monitoring will include: the semi-annual collection and analysis (TCL VOCs) of groundwater samples from 11 monitoring wells; the development of a semi-annual monitoring report; and the replacement of one monitoring well every five years.

Since contaminants will remain at the site under this alternative, the DON is required by the NCP [40 CFR 300.430(f)(4)] to review the effects of this alternative no less often than every five years after initiation of the selected remedial action.

- **RAA 5 - In Well Aeration and Off-Gas Carbon Adsorption**
  - Capital Cost: $1,248,300
  - Annual Operation and Maintenance (O&M): $82,320
  - Total Net Present Worth (30 years): $2,519,700
  - Months of Implementation: 3

In well aeration is a new technology that utilizes circulating air flow within a groundwater well that, in effect, turns the well into an air stripper. In well aeration differs from air sparging in that volatilization occurs outside the well via air sparging and within the well via aeration. Similar to air sparging, this technique removes organic contaminants from groundwater primarily via volatilization and secondarily via aerobic biodegradation. Under RAA 5, a line of in well aeration wells will be installed between the proposed highway and Brinson Creek in order to treat and contain the contaminated plume near its downgradient extreme (see Figure 10).

The radius of influence of an in well aeration well is reportedly much greater than a typical air sparging well system. At Site 35, the radius of the influence has been calculated by the technology's developers to be over 100 feet. The radius of influence is based upon site-specific
geological and hydrogeological parameters.

Volatilized organic contaminants collected by the in well aeration system, unlike air sparging, will be conveyed to independent carbon adsorption units placed adjacent to each well system (see Figure 11). The air emissions from the off-gas treatment system will be sampled monthly to insure that all applicable air standards are met. Each well and above-ground off-gas treatment system will be housed in a small prefabricated building.

In well aeration systems, like IAS systems, are most effective in sandy soils, but can be adversely impacted by high levels of inorganic compounds in the groundwater which oxidize and precipitate when contacted by air. These inorganics can form a heavy scale on well screens and clog the well space of the sand pack surrounding the well screen resulting in a reduction in permeability. The results of a field pilot test will help determine the loss of efficiency over time as a result of inorganics precipitation and oxidation, the radius of influence of the wells under various heads of injection air pressure, and the rate of off-gas organic contaminant removal via carbon adsorption and carbon breakthrough.

Baker, LANTDIV, and MCB, Camp Lejeune will negotiate with NC DOT regarding the specifics of site access to the creek side of the new highway. EPA and NC DEHNR will be kept abreast of developments regarding this subject. In this Interim ROD, Baker proposes an access road running parallel to the east side of the highway from the south.

RAA 5 assumes that the Base Master Plan will be modified to include restrictions on the use of the surficial aquifer in the vicinity of the Fuel Farm. This institutional control will reduce the risk to human health and the environment posed by this media by eliminating future potential exposure to shallow groundwater.

In addition to aquifer-use restrictions, long-term groundwater monitoring is included under this RAA to provide data regarding the impact of natural attenuation and the progress of contaminant migration. Long-term groundwater monitoring will include: the semi-annual collection and analysis (TCL VOCs) of groundwater samples from 11 monitoring wells; the development of a semi-annual monitoring report; and the replacement of one monitoring well every five years.

Since contaminants will remain at the site under this alternative, the DON is required by the NCP (40 CFR 300.430(f)(4)) to review the effects of this alternative no less often than every five years after initiation of the selected remedial action.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the RAAs using the nine evaluation criteria in order to select a site remedy. A brief summary of each alternative's strengths and weaknesses with respect to the evaluation criteria follows. (Table 3 presents a complete summary of the alternatives evaluation; Table 4 provides a glossary of the evaluation criteria.)
that will not comply with ARARs. RAA 3 (Groundwater Collection and On-Site Treatment), RAA 4 (In Situ Air Sparging And Off-Gas Carbon Adsorption), and RAA 5 (In Well Aeration And Off-Gas Carbon Adsorption) are primarily source control measures that will reduce contaminant levels over a limited area defined as the particular zone of influence of each system.

Wetlands disturbance will be an issue with RAA 3, 4, and 5, but, most significantly with RAA 3 which includes the excavation of an approximately two-foot wide, by 30-foot deep, by 1,080-foot interceptor trench. The disturbance associated with RAA 4 and 5 is limited primarily to drilling and well installations, although of the two, RAA 4 will have the greater impact due to the large number of wells to be installed.

Treated air and groundwater discharge are provisions of RAA 3, whereas, only air emissions are a part of RAA 4 and 5. These discharges will need to comply with applicable ARARs.

Long-Term Effectiveness and Permanence

In the case of all five RAAs, contamination will remain at the site and require the DON to review the effectiveness of the alternative on a five-year basis. RAA 1 (No Action) and RAA 2 (No Action With Institutional Controls) provide for no active means of contaminant reduction although, under RAA 2, aquifer-use restrictions will provide a permanent means for protection against direct human exposure to the contaminated surficial groundwater.

The effectiveness of RAA 3 (Groundwater Collection and On-Site Treatment), RAA 4 (In Situ Air Sparging And Off-Gas Carbon Adsorption), and RAA 5 (In Well Aeration And Off-Gas Carbon Adsorption) can be assumed to be roughly equivalent without the benefit of the results of field pilot-scale testing. RAA 3 may be the most difficult of the three to install, however, once installed it will likely be the most reliable and easiest to control. RAA 4 and 5 may encounter clogging problems if dissolved metals precipitate out of solution when placed in contact with forced air. At a minimum the metals problem will prompt increased maintenance which could lead to complete well replacement. RAA 4 has the additional problem of releasing toxic vapors to the atmosphere during operation because it is difficult to apply sufficient vacuum to the vadose zone where the groundwater surface is within a few feet of the ground surface.

Reduction of Toxicity, Mobility, or Volume Through Treatment

No reduction of contaminants will occur under RAA 1 (No Action) and RAA 2 (No Action With Institutional Controls) as the result of active treatment because active treatment is not provided for under these RAAs.

RAA 3 (Groundwater Collection and On-Site Treatment) provides for on-site treatment of the collected contaminated groundwater (organics and inorganics) using standard wastewater treatment technology. Conversely, RAA 4 (In Situ Air Sparging And Off-Gas Carbon Adsorption) and RAA 5 (In Well Aeration And Off-Gas Carbon Adsorption) provide for treatment of the organic phase of contaminated groundwater in-situ. Both RAA 4 and 5 primarily utilize volatilization technology and biodegradation technology secondarily. The principle difference between the two is that under RAA 4, both volatilization and biodegradation occur outside the well and within the soil column. Under RAA 5, volatilization occurs within the well while biodegradation occurs outside the well within the soil column. Under RAA 4, it may be difficult to efficiently collect all of the volatilized organic contaminants via conventional soil vapor extraction because of the proximity of the groundwater surface to the ground surface at this site. Without an efficient means of collecting the volatilized organics under RAA 4, toxic vapors may be released to the atmosphere. The zone of influence of an air sparging system may also be significantly reduced due to vapor extraction wells only four to five feet deep, the depth of groundwater. Vapor extraction wells this close to the ground surface may short circuit and actually draw in air from the atmosphere. Under RAA 5 these are not of concern because the volatilization is conducted within the well and vapors are conveyed to activated carbon via piping which means the system is essentially a closed loop.

RAA 3 will produce the highest volume of residual waste during operation because it is the only alternative involving groundwater treatment. However, the volume of air treatment under RAA 3 will be less than that under RAAs 4 and 5 because the latter are specifically designed as air volatilization systems. Under RAAs 4 and 5 a small volume of contaminated water will be generated because extracted air contains water which condenses and collects in a knock-out tank.
at the treatment facilities.

Short-Term Effectiveness

Worker protection against exposure will not be a significant issue for any of the RAAs. Each system provided for under RAA 3 (Groundwater Collection and On-Site Treatment), RAA 4 (In Situ Air Sparging and Off-Gas Carbon Adsorption), and RAA 5 (In Well Aeration and Off-Gas Carbon Adsorption) will require approximately 30 to 60 days to install with the total time in the field for construction being a little longer. It has also been assumed that system start-up and testing operations will require an additional 90 days.

Under RAA 1 (No Action) and RAA 2 (No Action With Institutional Controls) there will be no increase in the risks to the community resulting from implementation of the RAA. RAAs 3 and 5 will likely present minimal risk of community exposure during implementation and operation because they are, in essence, closed loop systems. RAA 4 has the potential for releases of toxic vapors to the atmosphere because of close proximity of the groundwater surface to the ground surface will make efficient soil vapor extraction difficult.

Some disturbance of the wetlands is expected under RAAs 3, 4, and 5. The greatest disturbance will be associated with RAA 3.

Implementability

Aside from RAAs 1 and 2, which are essentially no action alternatives, RAA 3 (Groundwater Collection And On-Site Treatment) will present greater technical challenges during construction than RAA 4 (In Situ Air Sparging and Off-Gas Carbon Adsorption) and RAA 5 (In Well Aeration and Off-Gas Carbon Adsorption). This is because RAA 3 involves the construction of a two-foot wide by 30-foot deep by 1,080 foot long interceptor trench while RAAs 4 and 5 involve primarily well installation.

The interceptor trench under RAA 3 represents specialized technology that is available from a limited number of vendors, whereas, the air sparging technology of RAA 4 is relatively commonplace and in well aeration (RAA 5) is a relatively new technology offered by a few vendors in the United States. Two of these companies are IEG Technologies Corporation and EG&G Environmental.

The proposed groundwater monitoring plan coupled with routine system maintenance and monitoring should be sufficient to provide sufficient notice of a system failure under either RAA 3, 4 or 5. The purpose of the monitoring is to provide for system adjustments with sufficient time so that a significant contaminant release to the environment will not occur. Because each system under RAA 3, 4, and 5 will require construction within a wetlands area and because air and water discharges are incorporated into the designs, federal and state agency interaction will be required.

Cost

The estimated total present worth costs of the alternatives, excluding RAA 1 - No Action, range from $299,800 for RAA 2 - No Action with Institutional Controls to $3,000,500 for RAA 3 - Groundwater Collection and On-Site Treatment. These costs are based on the assumption of 30 years of active use. The ranking of the alternatives in terms of costs is as follows:

RAA 1 - No Action $0
RAA 2 - No Action with Institutional Controls $299,800
RAA 4 - In Situ Air Sparging and Off-Gas Carbon Adsorption $2,459,600
RAA 5 - In Well Aeration and Off-Gas Carbon Adsorption $2,519,700
RAA 3 - Groundwater Collection and On-Site Treatment $3,000,500

Figure 12 graphically displays a comparison of costs for RAAs 2, 3, 4, and 5.

USEPA/State Acceptance

The USEPA and NC DEHNR are in favor of either RAA 3 or 5 since both alternatives involve treatment and containment of the plumes leading edge.
Community acceptance is difficult to evaluate since public interest in Site 35 is minimal. It can, however, be assumed that the community would not object to interim treatment of a groundwater condition that is impacting Brinson Creek.

9.0 SELECTED REMEDY

The interim preferred remedial action alternative is RAA 5 (In Well Aeration and Off-Gas Carbon Adsorption). The following paragraphs describe the process by which RAA 5 was selected over RAAs 1, 2, 3, and 4. This process involved a comparison/contrast evaluation of the five RAAs based on seven criteria: overall protectiveness, compliance with ARARs, long-term effectiveness/permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, cost, USEPA/State acceptance, and community acceptance. (Table 3 presents a complete summary of the alternatives evaluation; Table 4 provides a glossary of the evaluation criteria).

RAA 1 (No Action) and RAA 2 (No Action With Institutional Controls) are no action alternatives; RAA 3 (Groundwater Collection and On-Site Treatment), RAA 4 (In Situ Air Sparging and Off-Gas Carbon Adsorption), and RAA 5 (In Well Aeration and Off-Gas Carbon Adsorption) are source control alternatives. RAAs 3, 4, and 5 are preferred over the no action alternatives because source control alternatives are more effective at complying with ARARs achieving remediation goals, contributing to the overall protection of human health and the environment, and achieving a permanent reduction in toxicity, mobility, and volume of waste.

Of the three source control alternatives, RAA 3 is the most difficult to implement because it involves constructing a large permeable trench (approximately 2 feet wide, by 30 feet deep, by 1,080 feet long) in the soft ground of a wetlands area. RAA 4 and RAA 5, on the other hand, have similar implementability ratings because the major construction activity, in both cases, involves the drilling and installation of multiple vertical wells. Since well installation at OU No. 10 has been executed successfully in the past, RAAs 4 and 5 should be relatively easy to implement compared to RAA 3.

Despite its more difficult implementability, RAA 3 would likely be the easiest alternative to operate and maintain because it involves fewer operable components than RAAs 4 and 5. Additionally, under RAAs 4 and 5, high metals in the groundwater could precipitate and oxidize easily because these RAAs involve in situ aeration. The process could clog the well screens which would require frequent maintenance or even well replacement.

Both RAA 3 and RAA 5 performed well under the short-term and long-term effectiveness/performance evaluation. RAA 4, however, did not perform well. When the groundwater surface is within several feet of the ground surface, like it is at OU No. 10, vapor extraction (a main component of RAA 4) is difficult to control and there is a risk of releasing toxic vapors to the atmosphere. Thus, RAA 4 could pose a risk to the community that RAAs 3 and 5 do not.

Under the final criterion, cost effectiveness, RAA 4 resulted in the lowest net present worth, $2,459,600, although the cost of RAA 5 is nearly the same, $2,519,700. RAA 3, however, requires $3,000,500 which is roughly $500,000 more than RAAs 4 and 5. RAAs 4 and 5 are nearly tied as the most cost effective alternatives with RAA 4 being slightly less expensive.

In conclusion, neither RAA 1 nor RAA 2 was selected to be the preferred alternative because of the potential environmental impacts associated with a no action alternative. RAA 3 was not selected because of its high cost and difficult implementability. Despite its similarities to RAA 5, RAA 4 was not selected because of the possible release of toxic vapors associated with vapor extraction at Operable Unit No. 10. Thus, RAA 5, which is nearly the most cost effective alternative, was selected as the interim preferred remedial action. Figure 10 presents a plan view of this interim proposed remedial action.

The viability of in well aeration technology (RAA 5) at Camp Lejeune will be determined by means of a field pilot test scheduled to be initiated in September 1995. A Draft Report of results will be available in February, 1996. Additionally, the field pilot test will provide important design support data. If it is determined, based on the results of the field pilot test, that in well aeration cannot perform as required, RAA 3 (Groundwater Collection and On-Site Treatment)
will be selected as the Interim Preferred Remedial Action.

Remedy Description

The major components of RAA 5 include:

- Six aeration wells spaced at approximately 180 feet (center to center). These wells would be installed in a line between the proposed highway and Brinson Creek.

- A submersible pump incorporated into each well. These pumps are placed near the bottom of the wells. They draw in contaminated groundwater and pump it to the stripping zone of the aeration system.

- An aeration system in each well. As water is pumped in from the bottom of the well, air is injected into the water allowing the VOCs to move from the dissolved phase to the vapor phase. As the water is aerated, it is forced back out into the formation.

- A header system that delivers pressurized air from the compressor/blowers at each well to the well heads.

- An air extraction header system that runs from the well heads to a carbon adsorption unit adjacent to the well. This system is equipped with a vacuum pump(s) that draw VOC laden air from the wellheads to a carbon adsorption unit.

- Carbon adsorption units that adsorb vapor phase VOCs from the contaminated air prior to discharge to the atmosphere. These units along with the blowers, vacuum pumps and controls will be housed in individual treatment buildings which will also enclose the in well aeration well heads.

- Each well head has an upper observation well (slightly above groundwater table) and a lower observation well below the groundwater table.

- Implementation of aquifer use restrictions.

- Long term groundwater monitoring.

Estimated Costs

The costs that will be incurred to implement RAA 5 are as follows:

- Capital Cost - $1,248,300
- Annual O&M - $82,320

The total net present worth (over 30 years) of these costs is $2,519,700. It is important to note that the cost estimate was calculated for the FS evaluation and should not be considered a construction quality estimate. An FS cost estimate should have an accuracy of +50 or -30 percent (EPA, 1988).

10.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 121 which include: (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The evaluation of how RAA 5 satisfies these requirements for Site 35 is presented below.

Protection of Human Health and the Environment

RAA 5 provides protection to human health and the environment through the in-situ remediation of contaminated groundwater that exceeds state groundwater standard. The potential risks associated with exposure to surficial groundwater is eliminated under this alternative.
Compliance With Applicable or Relevant and Appropriate Requirements

RAA 5 will comply with ARARs identified in the FS. Chemical-specific ARARs include the Federal Maximum Contaminant Levels (MCLs) and North Carolina Water Quality Standards for Groundwater (NCWQS). Location-specific ARARs which are potentially applicable to OU No. 10 and therefore may require compliance from RAA 5 include: the Fish and Wild Life Coordination Act, the Federal Endangered Species Act, the North Carolina Endangered Species Act, Executive Order 11990 on Protection of Wetlands, Executive Order 11988 on Floodplain Management, and RCRA Location Requirements. Action-specific ARARs which may be applicable to OU No. 10 and RAA 5 are defined by the Resource Conservation Recovery Act, the Clean Water Act, the Clean Air Act, the Safe Drinking Water Act, and the Department of Transportation.

Cost-Effectiveness

The selected remedy, RAA 5, has been evaluated to be the most cost-effective of the alternatives considered (exclusive of the no action alternatives).

Utilization of Permanent Solutions and Alternative Treatment Technologies

RAA 5 represents a permanent treatment solution. That is, it utilizes, a permanent solution and alternative treatment technology to the maximum extent practicable.

Preference for Treatment as a Principal Element

RAA 5 satisfies the preference for treatment as a principal element since the contaminated groundwater exceeding the remediation goals will be treated in-situ.

11.0 RESPONSIVENESS SUMMARY

Overview

At the time of the public comment period (May 10 through June 10, 1995), the Department of the Navy/Marine Corps had already selected a preferred alternative for the remediation of contaminated groundwater at Operable Unit No. 10 (Site 35). The preferred alternative specified in the Interim ROD is in well aeration and off-gas carbon adsorption. This alternative involves the in-situ treatment of contaminated surficial groundwater in the area between the highway right-of-way and Brinson Creek.

No written comments were received during the public comment period or at the public meeting on May 10, 1995. In addition, the EPA Region IV and the NC DEHNR are in support of the preferred alternative. Based on the lack of public comments, it appears that there is no public opposition to the preferred alternative.

Background On Community Involvement

A record review of the MCB Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and base/community clubs. The file search did not locate written Installation Restoration Program concerns of the community.

A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there have been few expressed interests or concerns specific to the environmental sites (including Site 35). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community, relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including base
personnel, residents, local officials, and off-base residents.

- Prepared a Community Relations Plan, September 1990.
- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-base residents, military, and civilian interests.
- Prepared a revised Preliminary Draft Community Relations Plan, August 1993.
- Established two information repositories.
- Established the Administrative Record for all of the sites at the base.
- Released PRAP for public review in repositories, May 9, 1995.
- Released public notice announcing public comment and document availability of the PRAP, April 29, 1995.
- Held Technical Review Committee meeting, May 10, 1995, to review PRAP and solicit comments.
- Held public meeting on May 10, 1995, to solicit comments and provide information. No members of the community attended the meeting, consequently no transcript was prepared.

Summary of Comments Received During the Public Comment Period and Agency Responses

No comments to this document were received during the public comment period. No representatives of the public at large attended the public meeting held on May 10, 1995.

12.0 REFERENCES


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<td></td>
<td></td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td></td>
<td>! X X</td>
<td></td>
<td>X X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>beta-BHC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dieldrin</td>
<td>! X X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Endrin Ketone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Endrin Aldehyde</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Endrin</td>
<td>! X X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>gamma-BHC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>! X X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heptachlor Epoxide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Methoxychlor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

! Selected for comparison to existing criteria.
X Selected with respect to human health risk.
### TABLE 2
TOTAL SITE RISK
OPERABLE UNIT NO. 10 (SITE 35)
INTERIM RECORD OF DECISION, CTO-0232
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Receptors</th>
<th>Soil Receptors</th>
<th>Groundwater Receptors</th>
<th>Surface Water Receptors</th>
<th>Sediment Receptors</th>
<th>Fish Receptors</th>
<th>TOTALS Receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICR</td>
<td>HI</td>
<td>ICR</td>
<td>HI</td>
<td>ICR</td>
<td>HI</td>
</tr>
<tr>
<td>Future Child Resident</td>
<td>4.1 E-05</td>
<td>0.90</td>
<td>2.0E-03</td>
<td>64</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(&lt;1)</td>
<td>(98)</td>
<td>(98)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Adult Resident</td>
<td>1.9E-05</td>
<td>0.10</td>
<td>4.3E-03</td>
<td>28</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(&lt;1)</td>
<td>(99)</td>
<td>(99)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Military Personnel</td>
<td>3.2E-06</td>
<td>0.10</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Construction Worker</td>
<td>1.0E-07</td>
<td>0.02</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(100)</td>
<td>(100)</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Child Resident</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>ND</td>
<td>0.02</td>
<td>3.0E-07</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>ND</td>
<td>(&lt;1)</td>
<td>(&lt;1)</td>
</tr>
<tr>
<td></td>
<td>(&lt;1)</td>
<td>(100)</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Adult Resident</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>ND</td>
<td>0.01</td>
<td>3.0E-07</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>ND</td>
<td>(&lt;1)</td>
<td>(&lt;1)</td>
</tr>
<tr>
<td></td>
<td>(&lt;1)</td>
<td>(100)</td>
<td>(100)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- ICR = Incremental Lifetime Cancer Risk
- HI = Hazard Index
- Total = Soil + Groundwater
- ND = Not Determined
- NA = Not Applicable
<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA 1 (No Action)</th>
<th>RAA 2 (No Action with Institutional Controls)</th>
<th>RAA 3 (Groundwater Collection and On-Site Treatment)</th>
<th>RAA 4 (In Situ Air Sparging and Off-Gas Carbon Adsorption)</th>
<th>RAA 5 (In Well Aeration and Off-Gas Carbon Adsorption)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OVERALL PROTECTIVENESS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>! Human Health</td>
<td>Potential risks associated with groundwater exposure will remain. Some reduction in contaminant levels may result from natural attenuation.</td>
<td>Aquifer-use restrictions mitigate risks from direct groundwater exposure.</td>
<td>Active collection and treatment will reduce contaminant levels in groundwater within capture zone of interceptor trench (estimated at 100 feet upgradient maximum). Aquifer-use restrictions will also mitigate risks from direct groundwater exposure.</td>
<td>Active in situ volatilization and biodegradation will reduce contaminant levels in groundwater within radius of influence of wells (estimated at 25 feet). Aquifer-use restrictions will also mitigate risks from direct groundwater exposure.</td>
<td>Active in-well volatilization and biodegradation will reduce contaminant levels in groundwater within radius of influence of wells (estimated at 45 to 60 feet). Aquifer-use restrictions will also mitigate risks from direct groundwater exposure.</td>
</tr>
<tr>
<td>! Environment</td>
<td>Contaminated groundwater will continue to be a source of future contamination to Brinson Creek.</td>
<td>Contaminated groundwater will continue to be a source of future contamination to Brinson Creek.</td>
<td>Interceptor trench serves as a barrier to contaminated groundwater discharge to Brinson Creek.</td>
<td>Air sparging wells and SVE wells serve as a barrier to contaminated groundwater discharge to Brinson Creek.</td>
<td>Aeration wells serve as a barrier to contaminated groundwater discharge to Brinson Creek.</td>
</tr>
<tr>
<td><strong>COMPLIANCE WITH ARARs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>! Chemical-Specific</td>
<td>No active effort made to reduce groundwater contaminant levels to below federal or state ARARs.</td>
<td>No active effort made to reduce groundwater contaminant levels to below federal or state ARARs.</td>
<td>Reductions in groundwater contaminant levels to below federal or state ARARs. Reductions upgradient will be less substantial if at all.</td>
<td>Reductions in groundwater contaminant levels to below federal or state ARARs. Reductions upgradient will be less substantial if at all.</td>
<td>Reductions in groundwater contaminant levels to below federal or state ARARs. Reductions upgradient will be less substantial if at all.</td>
</tr>
<tr>
<td>! Location-Specific</td>
<td>Not Applicable.</td>
<td>Not Applicable.</td>
<td>Wetlands and alligators (endangered species) are concerns because of proposed location of interceptor trench. It is assumed that necessary approvals can be obtained.</td>
<td>Wetlands and alligators (endangered species) are concerns because of proposed location of interceptor trench. It is assumed that necessary approvals can be obtained.</td>
<td>Wetlands and alligators (endangered species) are concerns because of proposed location of interceptor trench. It is assumed that necessary approvals can be obtained.</td>
</tr>
</tbody>
</table>
### SUMMARY OF ALTERNATIVES EVALUATION

**OPERABLE UNIT NO. 10 (SITE 35)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA 1: No Action</th>
<th>RAA 2: No Action with Institutional Controls</th>
<th>RAA 3: Groundwater Collection and On-Site Treatment</th>
<th>RAA 4: In Situ Air Sparging and Off-Gas Carbon Adsorption</th>
<th>RAA 5: In Well Aeration and Off-Gas Carbon Adsorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction of Toxicity, Mobility or Volume</td>
<td>No reduction except by natural attenuation.</td>
<td>No reduction except by natural attenuation</td>
<td>Reduction of organic and inorganic contaminants expected within capture zone of trench</td>
<td>Reduction of organic contaminants expected within radius influence of wells.</td>
<td>Reduction of organic contaminants expected within radius influence of wells.</td>
</tr>
<tr>
<td>Residuals Remaining After Treatment</td>
<td>No active treatment process applied.</td>
<td>No active treatment process applied.</td>
<td>Residuals include metals sludge and spent carbon which would have to be disposed of properly.</td>
<td>Residuals requiring disposal include spent carbon and a small volume of condensed contaminated vapor (water).</td>
<td>Residuals requiring disposal include spent carbon and a small volume of condensed contaminated vapor (water).</td>
</tr>
<tr>
<td>Statutory Preference for Treatment</td>
<td>Not satisfied.</td>
<td>Not satisfied.</td>
<td>Satisfied except that area impacted by treatment is limited and does not include entire plume of contaminated surficial groundwater.</td>
<td>Satisfied except that area impacted by treatment is limited and does not include entire plume of contaminated surficial groundwater.</td>
<td>Satisfied except that area impacted by treatment is limited and does not include entire plume of contaminated surficial groundwater.</td>
</tr>
</tbody>
</table>

**SHORT-TERM EFFECTIVENESS**

<table>
<thead>
<tr>
<th></th>
<th>RAA 1: No Action</th>
<th>RAA 2: No Action with Institutional Controls</th>
<th>RAA 3: Groundwater Collection and On-Site Treatment</th>
<th>RAA 4: In Situ Air Sparging and Off-Gas Carbon Adsorption</th>
<th>RAA 5: In Well Aeration and Off-Gas Carbon Adsorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Protection</td>
<td>Risks to community not increased by remedy implementation.</td>
<td>Risks to community not increased by remedy implementation.</td>
<td>Minimal, if any, risks during collection and treatment.</td>
<td>Possible migration of toxic vapors through ground surface because vapor extraction is difficult to control when groundwater surface is within several feet of ground surface.</td>
<td>Minimal, if any, risks during operation and treatment.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA 1</td>
<td>RAA 2</td>
<td>RAA 3</td>
<td>RAA 4</td>
<td>RAA 5</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>No Action</td>
<td>No Action with Institutional Controls</td>
<td>Groundwater Collection and On-Site Treatment</td>
<td>In Situ Air Sparging and Off-Gas Carbon Adsorption</td>
<td>In Well Aeration and Off-Gas Carbon Adsorption</td>
</tr>
<tr>
<td>No Action</td>
<td>No Action</td>
<td>No Action</td>
<td>Groundwater Collection and On-Site Treatment</td>
<td>In Situ Air Sparging and Off-Gas Carbon Adsorption</td>
<td>In Well Aeration and Off-Gas Carbon Adsorption</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>Continued impacts from unchanged existing conditions.</td>
<td>Continued impacts from unchanged existing conditions.</td>
<td>Wetlands disturbance during installation could be significant. Trench will serve as a barrier for contaminated groundwater discharge to Brinson Creek.</td>
<td>Minimal wetlands disturbance. System will serve as a barrier for contaminated groundwater discharge to Brinson Creek.</td>
<td>Minimal wetlands disturbance. System will serve as a barrier for contaminated groundwater discharge to Brinson Creek.</td>
</tr>
<tr>
<td>Installation Period</td>
<td>Not Applicable.</td>
<td>Less than 30 days required to install additional groundwater monitoring wells.</td>
<td>60 to 90 days estimated to install trench and treatment system.</td>
<td>60 to 90 days estimated to install sparging and SVE wells and treatment system.</td>
<td>60 to 90 days estimated to install aeration wells and treatment system.</td>
</tr>
<tr>
<td>Implementability</td>
<td>No construction or operation activities.</td>
<td>Involves standard well installation and sampling only.</td>
<td>Soft ground in wetlands areas may hamper construction and result in delays. Once installed, operating is straightforward using commercially proven technology. Approximately 2,000 to 3,000 cubic yards of potentially contaminated soil excavated from the trench will require disposal. Lack of access may be a significant lost factor.</td>
<td>Construction of activities involve primarily well installation which has been previously executed successfully in this area. Disposal of drill cuttings required.</td>
<td>Construction of activities involve primarily well installation which has been previously executed successfully in this area. Disposal of drill cuttings required.</td>
</tr>
<tr>
<td>Ability to Construct and Operate</td>
<td>No construction or operation activities.</td>
<td>Involves standard well installation and sampling only.</td>
<td>Soft ground in wetlands areas may hamper construction and result in delays. Once installed, operating is straightforward using commercially proven technology. Approximately 2,000 to 3,000 cubic yards of potentially contaminated soil excavated from the trench will require disposal. Lack of access may be a significant lost factor.</td>
<td>Construction of activities involve primarily well installation which has been previously executed successfully in this area. Disposal of drill cuttings required.</td>
<td>Construction of activities involve primarily well installation which has been previously executed successfully in this area. Disposal of drill cuttings required.</td>
</tr>
</tbody>
</table>
### TABLE 3 (Continued)
**SUMMARY OF ALTERNATIVES EVALUATION**
**OPERABLE UNIT NO. 10 (SITE 35)**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA 1</th>
<th>RAA 2</th>
<th>RAA 3</th>
<th>RAA 4</th>
<th>RAA 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to Monitor Effectiveness</td>
<td>No Action</td>
<td>No Action with Institutional Controls</td>
<td>Proposed monitoring will provide an indication of effects of natural attenuation and progress of contaminants migration.</td>
<td>Proposed monitoring will give notice of failure so that system can be adjusted before a significant contaminant release occurs.</td>
<td>Proposed monitoring will give notice of failure so that system can be adjusted before a significant contaminant release occurs.</td>
</tr>
<tr>
<td>Availability of Services and Equipment</td>
<td>None required.</td>
<td>Well installation and sampling services available from multiple vendors.</td>
<td>Biopolymer trench technology available from a limited number of vendors.</td>
<td>Air sparging technology is available from multiple vendors.</td>
<td>Special permit to perform construction in wetlands may be required. Air and water discharge permits required.</td>
</tr>
<tr>
<td>Requirements for Agency Coordination</td>
<td>None required.</td>
<td>Must submit semi-annual reports to document sampling reports.</td>
<td>Special permit to perform construction in wetlands may be required. Air and water discharge permits required.</td>
<td>Special permit to perform construction in wetlands may be required. Air and water discharge permits required.</td>
<td>Special permit to perform construction in wetlands may be required. Air and water discharge permits required.</td>
</tr>
</tbody>
</table>

#### COSTS

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>RAA 1</th>
<th>RAA 2</th>
<th>RAA 3</th>
<th>RAA 4</th>
<th>RAA 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Present Worth (30 years)</td>
<td>$0</td>
<td>$299,800</td>
<td>$3,225,000</td>
<td>$2,810,800</td>
<td>$2,625,100</td>
</tr>
</tbody>
</table>

#### USEPA/State Acceptance

- Not preferred because impact to Brinson Creek would be unabated.
- Acceptable because impact to Brinson Creek would be controlled. In addition, EPA/State prefer treatment alternatives.
- Acceptable because impact to Brinson Creek would be controlled. In addition, EPA/State prefer treatment alternatives.
- Acceptable because impact to Brinson Creek would be controlled. In addition, EPA/State prefer treatment alternatives.
- Acceptable because impact to Brinson Creek would be controlled.

#### Community Acceptance

- Not preferred because impact to Brinson Creek would be unabated.
- Acceptance likely because impact to Brinson Creek would be controlled.
- Acceptance likely if off-gas discharges do not impact the neighboring populace.
- Acceptance likely if off-gas discharges do not impact the neighboring populace.
- Acceptance likely because impact to Brinson Creek would be controlled.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Protection of Human Health and Environmental</td>
<td>addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls</td>
</tr>
<tr>
<td>Compliance with ARARs/TBCs</td>
<td>addressed whether or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs), other criteria to be considered (TBCs), or other federal and state environmental statutes and/or provide grounds for invoking a waiver.</td>
</tr>
<tr>
<td>Long-term Effectiveness and Permanence</td>
<td>refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.</td>
</tr>
<tr>
<td>Reduction of Toxicity, Mobility, or Volume through Treatment</td>
<td>is the anticipated performance of the treatment options that may be employed in an alternative.</td>
</tr>
<tr>
<td>Short-term Effectiveness</td>
<td>refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.</td>
</tr>
<tr>
<td>Implementability</td>
<td>is the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.</td>
</tr>
<tr>
<td>Cost</td>
<td>includes capital and operation and maintenance costs. For comparative purposes, presents present worth values.</td>
</tr>
<tr>
<td>USEPA/State Acceptance</td>
<td>indicates whether, based on review of the RI and FS reports and the PRAP, the USEPA and state concur with, oppose, or have no comments on the preferred alternative.</td>
</tr>
<tr>
<td>Community Acceptance</td>
<td>assessed in the Record of Decision (ROD) following a review of the public comments received on the RI and FS reports on the PRAP.</td>
</tr>
</tbody>
</table>
FIGURES

<IMG SRC 0495240A>
<IMG SRC 0495240B>
<IMG SRC 0495240C>
<IMG SRC 0495240D>
<IMG SRC 0495240E>
<IMG SRC 0495240F>
<IMG SRC 0495240G>
<IMG SRC 0495240H>
<IMG SRC 0495240I>
<IMG SRC 0495240J>
<IMG SRC 0495240K>
<IMG SRC 0495240L>
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC

EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL ( SITE 5)
USMC/CHEM LDFL ( SITE 1)
USMC/BLDG PT 37 ( SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 08/23/1996
Operable Unit: 08
ROD ID: EPA/ROD/R04-96/280

Media: soil, groundwater, surface water, sediment

Contaminant: Metals, naphthalene, phenol, tetrachloroethane, DDD, DDE, DDT, dieldrin, PCBs, Arochlor, SVOCs, chrysene, pentachlorophenol, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, selenium, vanadium, zinc
Abstract: Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

Camp Lejeune Military Reservation (MCB Camp Lejeune) is a training base for the Marine Corps located in North Carolina approximately 45 miles south of New Bern, and 47 miles north of Wilmington, North Carolina. The site covers approximately 236-square miles and includes 14 miles of coastline. The eastern border is the Atlantic Ocean shoreline, while U.S. Route 17 and State Route 24 border the western and northwestern boundaries of MCB Camp Lejeune. Jacksonville, North Carolina borders the facility to the north.

Operable Unit 8 (OU8) is also known as Site 16. It is the Montford Point Burn Dump, which is located southwest of Montford Landing Road and Wilson Drive intersection within the Montford Point development area of Camp Johnson. OU 8 is approximately 4 acres in size. Northeast Creek is located approximately 400 feet southeast of the study area and flows in the southwesterly direction toward/into the New River.

The burn dump was opened in 1958 and closed in 1972. Practices at other burn dumps at MCB Camp Lejeune indicate the Montford Point Burn Dump may have accepted municipal waste or trash from the surrounding housing area and activity buildings. Records indicate that waste oils were also disposed of at Site 16. Typically the debris was burned and then graded to the perimeter of the disposal area so that more debris could be dumped and burned. Asbestos material that was once dumped on the surface has been removed.

Recently, Site 16 has been used for vehicle staging and for vehicle training exercises. A mock-up jet aircraft is located in the center of the study area. This aircraft is used in refueling exercises by tank truck operators. During these exercises, no fuel is used. A ditch extends around the western side of the former burn dump. There are no permanent structures at Site 16.
Remedy: The selected remedial alternative for OU 8 is no further action. Following land use restrictions being implemented by MCB Camp Lejeune, this remedial alternative involves taking no further remedial actions (including long-term monitoring) at the site and leaving the environmental media as they currently exist. However, should potential hazards posed by conditions at the site occur in the future, monitoring to verify that no unacceptable exposures have occurred may be authorized. The land use restrictions being implemented are to stop the development of this site for residential purposes and to prohibit the installation of supply water wells within 1,000 feet of the site.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 08
ONSLOW COUNTY, NC
08/23/1996
Commanding General
Building 1
Marine Corps Base
Camp Lejeune, North Carolina 28542

Subj: Record of Decision
Operable Unit 8, Site 16
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

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 the Remedial Action at Site 16. This remedy is supported by the previously completed Remedial Investigation and Baseline Risk Assessment Reports.

The selected remedial alternative is no further action. This involves taking no further remedial actions at the site and leaving the environmental media as they currently exist. 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.

Sincerely,

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kate Landman, LANTDIV
Patrick Watters, NCDEHNR
4WD-FFB
Commanding General
Building 1
Marine Corps Base
Camp Lejeune, North Carolina 28542

Subj: Record of Decision
Operable Unit 8, Site 16
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

Dear Sir:

The U.S. Environmental Protection Agency (EPA) Region IV has reviewed the above subject
decision document and concurs with the selected remedy for the Remedial Action at Site 16. This
remedy is supported by the previously completed Remedial Investigation and Baseline Risk
Assessment Reports.

The selected remedial alternative is no further action. This involves taking no further
remedial actions at the site and leaving the environmental media as they currently exist. 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.

Sincerely,

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kate Landman, LANTDIV
Patrick Watters, NCDEHNR

bcc: Frank Redmon, Federal Facilities Coordinator
Beau Mills, HQ

<IMG SRC 0496280C>
Ms. Gena Townsend  
United States Environmental Protection Agency, Region IV  
Waste Management Division  
345 Courtland Street  
Atlanta, Georgia 30365

Dear Ms. Townsend:

On September 30, 1996, Major General P.G. Howard, Commanding General, Marine Corps Base, Camp Lejeune signed the Record of Decision (ROD) for Operable Unit No. 8 (Site 16).

This ROD is enclosed for your records. We appreciate your agency's concurrence and will ensure that the land use restrictions specified in the ROD are included in the Base Master Plan.

If you have any questions or comments, please contact Mr. Neal Paul, Director, Installation Restoration Division, Environmental Management Department, at telephone (910) 451-5068.

Sincerely,

SCOTT A. BREWER, PE  
Deputy Assistant Chief of Staff  
Environmental Management  
By direction of  
the Commanding General

Encl:
(1) Record of Decision for Operable Unit No. 8

Copy to:
CMC (LFL, K. Dreyer)  
ATSDR (C. Hossum)

Copy to: (w/o encl)  
COMLANTNAVFACENGCOM (Code 1823, K. Landman)
FINAL

RECORD OF DECISION
OPERABLE UNIT NO. 8
(SITE 16)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0274

AUGUST 20, 1996

Prepared For:

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

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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<th>ACRONYM</th>
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<tbody>
<tr>
<td>AWQC</td>
<td>Ambient Water Quality Criteria</td>
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<tr>
<td>bgs</td>
<td>below ground surface</td>
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<td>CERCLA</td>
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<td>HI</td>
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<td>HQ</td>
<td>hazard quotient</td>
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<td>ICR</td>
<td>incremental cancer risk</td>
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<td>Installation Restoration Program</td>
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<tr>
<td>LANTDIV</td>
<td>Naval Facilities Engineering Command, Atlantic Division</td>
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<tr>
<td>mg/kg</td>
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<td>MCB</td>
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<td>MCL</td>
<td>Maximum Contaminant Level</td>
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<td>North Carolina Department of Environment, Health and Natural Resources</td>
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<td>NCP</td>
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<tr>
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<td>Proposed Remedial Action Plan</td>
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<td>TAL</td>
<td>target analyte list</td>
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<td>TCL</td>
<td>target compound list</td>
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<tr>
<td>µg/kg</td>
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<td>µg/L</td>
<td>microgram per liter</td>
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<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>U.S.</td>
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<td>VOC</td>
<td>volatile organic compound</td>
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Site Name and Location
Operable Unit No. 8
Site 16
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose
This decision document presents the selected remedy for Operable Unit (OU) No. 8 (Site 16), at Marine Corps Base (MCB) Camp Lejeune, North Carolina. The selected remedy for OU No. 8 was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU No. 8.

Description of the Selected Remedy
The selected remedial alternative for OU No. 8 is no further action. Following land use restrictions being implemented by MCB, Camp Lejeune, this remedial alternative involves taking no further remedial actions (including long term monitoring), at the site and leaving the environmental media as they currently exist. However, should potential hazards posed by conditions at the site occur in the future, monitoring to verify that no unacceptable exposures have occurred may be authorized. The land use restrictions being implemented, via the Base Master Plan, are to preclude the development of this site for residential purposes and to prohibit the installation of supply water wells within 1,000 feet of this site.

The no further remedial action decision is justifiable, as the conditions at OU No. 8 are protective of human health and the environment, and no additional remedial action is necessary to ensure this protection.

<IMG SRC 0496280F>
1.0 INTRODUCTION

This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 8 (Site 16) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The environmental media at this site were investigated as part of a Remedial Investigation (RI). Based on the results of the RI preferred remedial action alternatives were identified in a Proposed Remedial Action Plan (PRAP) document. Then, the public was given the opportunity to comment on the RI and PRAP. Based on comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for OU No. 8 (Site 16). This ROD document presents the final selected remedy along with a summary of the remedy selection process.

The ROD is organized into 9 main sections. Section 1.0 presents an introduction, and Section 2.0 presents the site name and location, and a brief description of the site layout. Section 3.0 presents a history of the site and previous investigations/enforcement activities conducted there. Section 4.0 highlights community participation events that have occurred during the development of this ROD. Section 5.0 describes the scope and role of the response action developed to address the site contamination, and Section 6.0 summarized the nature and extent of this site contamination (i.e., the site characteristics). Section 7.0 summarizes the site risks as determined by human health and ecological risk assessments. Section 8.0 provides the final remedy selected. Finally, Section 9.0 provides the responsiveness summary which contains a summary of comments received during the public comment period.

2.0 SITE NAME, LOCATION AND DESCRIPTION

MCB Camp Lejeune is a training base for the United States (U.S.) Marine Corps located in Onslow County, North Carolina. MCB Camp Lejeune is located approximately 45 miles south of New Bern and 47 miles north of Wilmington, North Carolina. The facility covers approximately 236 square miles and includes 14 miles of coastline. The military reservation is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The eastern border of MCB Camp Lejeune is the Atlantic shoreline; while U.S. Route 17 and State Route 24 border the western and northwestern boundaries of MCB Camp Lejeune, respectively. The City of Jacksonville, North Carolina, borders the facility to the north.

OUs are formed as an incremental step toward addressing individual site concerns and to simplify specific problems associated with a site or a group of sites. Currently, there are 41 Installation Restoration Program (IRP) sites at MCB Camp Lejeune. These 41 IRP sites have been grouped into 17 OUs, with OU No. 8 being one of the 17 OUs within MCB Camp Lejeune. Site 16 is the only site within OU No. 8. Figure 1 is a location map of OU No. 8 in relation to MCB Camp Lejeune.

Site 16, the Montford Point Burn Dump, is located southwest of Montford Landing Road and Wilson Drive intersection within the Montford Point development area of Camp Johnson. Site 16 is approximately 4 acres in size. Northeast Creek is located approximately 400 feet southeast of the study area and flows in the southerly direction towards/into the New River. Figure 2 depicts the topography and general site features of Site 16.

As shown on Figure 2, most of Site 16 is cleared; however, the area which surrounds Site 16 is comprised of pine and hardwood forest. An opening in the southeast corner of the study area leads to Northeast Creek.

3.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Limited information is available concerning the past operational history of the burn dump; however, Site 16 was opened about 1958 and was closed in 1972. Practices at other burn dumps at MCB Camp Lejeune indicate that the Montford Point Burn Dump may have accepted municipal waste or trash from the surrounding housing area and activity buildings. Records indicate that waste oils were also disposed at Site 16. Typically, the debris was burned and then graded to the perimeter of the disposal area so that more debris could be dumped and burned. Asbestos material that was once dumped on the surface has been removed.
Recently, Site 16 has been used for vehicle staging and for vehicle training exercises. A mock-up jet aircraft is located in the center of the study area. This aircraft is used in refueling exercises by tank truck operators. During these exercises, however, no fuel is used. A four-foot wide ditch, believed to be a fire break, is present in the southwest portion of the study area. This ditch extends around the western side of the former burn dump. There are no permanent structures at Site 16.

MCB Camp Lejeune was placed on the CERCLA National Priorities List (NPL) effective October 4, 1989 (54 Federal Register 41015; October 4, 1989). The United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and Department of the Navy (DoN) entered into the Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at the Base were thoroughly investigated and appropriate CERCLA response/Resource Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented, as necessary, to protect the public health and environment.

No investigations were conducted at Site 16 prior to the Remedial Investigation (RI) Report. Therefore, the remainder of this section discusses the RI Report exclusively.

The field program for the RI Report for Site 16, conducted in mid 1994 to early 1995, consisted of a site survey, and sampling of the surface soil, subsurface soil, groundwater, surface water and sediment. The sampling locations associated with these various media are identified on Figure 3.

The site survey task consisted of an initial survey of site features and a post investigation survey of the sampling locations and monitoring wells.

Thirty-two surface soil samples (collected from 0 to 1 foot below ground surface [bgs]) and thirty-five subsurface soil samples (collected from 1 foot bgs to just above the groundwater table) were collected and analyzed for full Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics. In order to identify the types of material which may have been disposed of at Site 16, four test pits were excavated as part of the subsurface soil investigation. Samples were not collected from the test pits due to their close proximity to the soil borings, the lack of encountering waste material, and that no elevated photoionization detector readings were detected which would indicate potential contamination.

Six shallow groundwater monitoring wells were installed to determine the presence or absence of contamination in the surficial aquifer which may have resulted from past burning and disposal activities. Groundwater was sampled using USEPA Region IV's low flow purging and sampling techniques during all sampling rounds. The first round of groundwater sampling was conducted in November/December 1994. Groundwater samples were analyzed for full TCL organics and TAL total (unfiltered) and dissolved (filtered) metals. In early February of 1995, a second round of groundwater samples was collected and analyzed for full TCL organics and TAL total metals. At the request of NC DEHNR representatives a third groundwater sample was collected from monitoring well 16-MW05 in March 1996 and analyzed for TCL volatile organics only.

Five surface water samples and ten sediment samples (collected from 0 to 6 inches and 6 to 12 inches) were collected along Northeast Creek. Each of the surface water and sediment samples were analyzed for full TCL organics and TAL inorganics. In addition, the sediment samples collected at the 0 to 6 inch sampling interval were also analyzed for total organic carbon and grain size.

In response to a comment from the NC DEHNR four additional surface soil samples were collected within a 10-foot radius of the detected elevated lead sample previously collected from location SB05. The four additional samples were collected from 0 to 1 foot bgs. and were analyzed for TAL total metals. The lead results for these four additional surface soil sample were all well within the Base Background results, and ranged from 9.5 mg/kg to 20.5 mg/kg.

4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Final RI Report and Final Proposed Remedial Action Plan (PRAP) for OU No. 8 at MCB Camp
Lejeune, North Carolina were released to the public on March 7, 1996. These documents were made available to the public at the information repositories maintained at the Onslow County Public Library and the MCB Camp Lejeune library. The notice of availability of these documents was published in the Jacksonville Daily News, on February 25, 1996.

A public comment period regarding OU No. 8 was held from March 7, 1996 through April 1, 1996, and a public meeting regarding the same was held on March 7, 1996. During this public meeting, representatives from the DoN and the Marine Corps discussed the preferred remedial action under consideration. Community concerns were also addressed during this public meeting.

Community comments regarding the preferred remedial action, and the response to the comments received during the noted comment period are included in the Responsiveness Summary section of this Record of Decision (ROD).

5.0 SCOPE AND ROLE OF RESPONSE ACTION

No further action is the selected remedial action for OU No. 8. The no further action decision is the final recommended action for OU No. 8. This decision is based on the findings of the RI field investigation, along with the results of the baseline human health and ecological risk assessments (RAs).

Justification for this decision is presented within the following sections of this ROD.

6.0 SITE CHARACTERISTICS

A brief summary of the nature and extent of contamination at Site 16 is provided below. This summary focuses on the primary problems at the site.

6.1 Soils

The pesticides 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyldichloroethylene (DDE), 4,4'-dichlordiphenyltrichloroethane (DDT), alpha-chlordane, and dieldrin are the most prevalent contaminants detected in the surface soil. 4,4'-DDE was detected in 26 of the 29 surface soil samples. The maximum pesticide concentration reported is for 4,4'-DDT at 540 micrograms per kilogram (µg/kg). Pesticide contamination is at relatively consistent concentration levels in the surface soil samples collected across Site 16. Pesticide contamination the subsurface soil is less frequent than in the surface. The most prevalent pesticide, 4,4'-DDE, was detected in only 3 of 32 samples. The pesticide levels detected in the surface and subsurface soil at Site 16 are similar to levels detected at other areas within MCB Camp Lejeune. Due to the fact that most of the pesticide contamination is present in surface soils, and that the contaminant concentrations are comparable to pesticide levels throughout the Base, it is believed that the pesticides in soil are due to Base-wide pest control activities that were prevalent in the 1970's and not concentrated dumping or disposal practices.

Surface soil contamination also consists of polychlorinated biphenyls (PCBs), Aroclor 1254 and Aroclor 1260. Aroclor 1254 is the most prevalent being detected in 13 of 29 surface soil samples. Additionally, the maximum contaminant level (2,100 µg/kg) is reported for Aroclor 1254. Aroclor 1254 is present in 2 of 32 subsurface locations. The detections of Aroclor 1254 and 1260 are from sampling locations across Site 16. PCBs are not found in the groundwater indicating that vertical migration to the water table has not occurred.

Semivolatile compounds are infrequently encountered at low levels in the surface soil. Other than bis(2-Ethylhexyl)phthalate, which is believed to be due to laboratory contamination, the most frequent semivolatile compound detected is chrysene (4 out of 29 samples). All of the semivolatile compounds concentrations are less than 130 µg/kg, which are relatively low. Subsurface soil is relatively absent of semivolatile contamination. Acenaphthene and pentachlorophenol (3 out of 32 samples) are the most prevalent semivolatiles in the subsurface soil. The concentration levels and presence of semivolatile compounds in the soil is random across Site 16. The source of the semivolatile compounds is believed to be due to historical open burning operations.

Other than common lab contaminants (e.g., methylene chloride, acetone, and toluene) volatile organic contamination is absent in the surface and subsurface soil.
The concentrations of several inorganic constituents exceed twice the average Base-specific background concentration. Comparing the results for surface and subsurface soil, it appears that there is little correlation between elevated metals concentrations in the surface and subsurface soil. For surface soils, arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, selenium, vanadium, and zinc were the predominant metals that exceed Base background levels more than once. In contrast, zinc is the only metal that exceeds Base background levels more than one time in the subsurface soil.

6.2 Groundwater

Two rounds of groundwater samples were collected from six shallow wells at Site 16. Additionally, a third groundwater sample was collected shallow monitoring well 16-MW05.

Volatile contaminants benzene and ethylbenzene were detected in one groundwater sample collected during the first round of groundwater sampling. Benzene and ethylbenzene were detected at levels of 37 micrograms per liter (μg/L) and 1 μg/L, respectively. Volatile contaminants were absent in all second round groundwater samples collected. Volatile organics were absent in the third groundwater sample collected from well 16-MW05.

Metals were the most prevalent and widely distributed contaminants in the groundwater. Elevated levels of total (unfiltered) metals during these sampling rounds included barium (maximum concentration 77.9 μg/L), iron (maximum concentration 712 μg/L), lead (maximum concentration 3.2 μg/L), manganese (maximum concentration 31.6 μg/L), and zinc (maximum concentration 80.5 μg/L). Iron is the only metal contaminant which exceeds State drinking water standards. Iron was detected above the State standard in one well. It is questionable; however, whether the iron is due to disposal operations, since the elevated levels of iron are common in shallow groundwater throughout the Base and region.

Semivolatile contamination in the groundwater was limited to low levels of naphthalene (maximum concentration 6 μg/L), bis(2-Ethylhexyl)phthalate (maximum concentration 5 μg/L), and phenol (maximum concentration 4 μg/L).

Pesticide and PCB contaminants were not detected in either round of sampling.

6.3 Surface Water/Sediment

Northeast Creek is the only surface water body in the vicinity of Site 16. One surface water and two sediment samples were collected from each of five sampling stations along Northeast Creek.

Volatile contaminants 1,1,2,2-Tetrachloroethane and 4-Methyl-2-pentanone were detected in one surface water sample at a concentration of 2 μg/L and 7 μg/L, respectively. No other volatile organics were detected in the surface water. Only 1,1,2,2-Tetrachloroethane exceeded its Ambient Water Quality Criteria (AWQC); however, this sample location is approximately a quarter mile downstream of OU No. 8 and therefore may not be directly site-related.

Semivolatile, pesticide, and PCB contaminants were not detected in the surface water. The occurrence of bis(2-Ethylhexyl)phthalate is a common laboratory contaminant that can be attributed to laboratory analysis of the samples.

Arsenic was detected in 4 out of 5 surface water samples. All of the arsenic detections where slightly above the AWQC, and although detected in surface and subsurface soils as well, did not trigger a human health risk for any of the media. Manganese was detected in 5 out of 5 surface water samples. All of the manganese detections were above the AWQC; however, these detections did not trigger a human health risk.

Volatile organics, carbon disulfide (1 out of 10 samples) and toluene (2 out of 10 samples) were detected in the sediment at concentrations of 2 μg/kg for each contaminant.

Semivolatile, pesticide, and PCB contamination is absent in the sediment.

Silver was detected in 1 out of 10 samples at a concentration of 1.2 milligrams per kilogram (mg/kg), slightly above the National Oceanic Atmospheric Administration Effects Range-Low
Table 1 presents a summary of the site contamination identified in the surface soil, subsurface soil, groundwater (rounds 1 and 2), surface water and sediment.

7.0 SUMMARY OF SITE RISKS

As part of the RI Report, a baseline human health RA and an ecological RA were conducted to evaluate the potential risks associated with exposure to the environmental media at Site 16. The baseline human health RA considered the most likely routes of potential exposure for both current and future risk scenarios. The key findings of each RA are summarized below.

7.1 Baseline Human Health Risk Assessment

Five environmental media were investigated during the RI including surface soil, subsurface soil, groundwater, surface water and sediment. Contaminants of potential concern (COPCs), which are site related contaminants used to quantitatively estimate human exposures and associated health effects, were selected for each of the environmental medium. Table 2 presents the selected COPCs based on the human health RA. In addition, Table 2 presents a comparison of contaminant levels to relevant criteria/standards.

As part of the baseline human health RA, a conceptual site model was developed to encompass current and future routes for potential exposure at Site 16. The potential receptors evaluated included current military personnel, future on-site residents (adults and children), and future construction workers. Figure 4 presents the Site 16 conceptual model, highlighting potential contaminant sources, migration pathways and potential receptors.

As part of the baseline human health RA, incremental cancer risk (ICR) values and hazard index (HI) values were calculated for each of the exposure routes and potential receptors. ICR refers to the cancer risk that is over and above the background cancer risk in unexposed individuals. ICRs are determined by multiplying the contaminant intake level (i.e., dose), with the cancer potency factor. The calculated risks are probabilities which are typically expressed in scientific notation (i.e., 1E-04). For example, an ICR of 1E-04 means that one additional person out of ten thousand may be at risk of developing cancer due to excessive exposure at a site if no actions are conducted. The USEPA acceptable target risk range is 1E-04 to 1E-06 (i.e., one in ten thousand to one in one million). Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as a hazard quotient (HQ). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The HI refers to noncarcinogenic effects and is a ratio for the level of exposure to an acceptable level for all contaminants of potential concern. An HI greater than or equal to unity (i.e., 1.0) indicates that there may be a concern for noncarcinogenic health effects.

Table 3 presents individual media ICRs and HIs, as well as the calculated total site ICRs and His. As shown on Table 3, all of the media/potential receptors evaluated had ICRs within the USEPA's acceptable target risk range of 1E-4 to 1E-6. Therefore, the potential receptors are not at adverse risk from carcinogens which are present in the soil, groundwater, surface water and/or sediment. All of the individual medium and potential receptors evaluated had HIs less than 1.0. The total HI value for future residential children; however, had a total HI equal to 1.19. This total HI value indicates that adverse noncarcinogenic health effects may occur upon prolonged exposure. Exposure to soil, via incidental ingestion in particular, drives the total noncarcinogenic risk for future residential children. Ninety-six percent of this risk was generated by the presence of Aroclor 1254, arsenic, aluminum, mercury, cadmium, and chromium. The remaining four percent of the risk was generated by the contaminants dieldrin, beryllium, copper, and zinc. Aroclor 1254, a PCB, in surface soil contributed 52 percent of the risk associated with soil ingestion by future residential children. The exposure scenario involving children is conservative; it assumes that the site would be developed into a residential area, and no land disturbance such as grading would result.

7.2 Ecological Risk Assessment
An ecological RA was conducted to evaluate if past disposal practices potentially impact the ecological integrity of aquatic and terrestrial communities on or adjacent to the site. The ecological RA identified surface water, sediment and surface soil as the media of concern. The ecological COPCs are presented on Table 4.

Overall, four inorganics (aluminum, barium, iron, and lead), along with the volatile organic compound (VOC), 4-Methyl-2-pentanone, were the only ecological COPCs retained for the surface water aquatic receptors. The ecological COPCs for the surface water terrestrial receptors included all of the noted aquatic COPCs, and the contaminants vanadium and 1,1,2,2-Tetrachloroethylene.

No semivolatile organic compounds (SVOCs), pesticides or PCBs were detected in any of the sediment samples. Carbon disulfide, silver, and vanadium were retained as ecological COPCs for sediment. Inorganics, pesticides, PCBs, and SVOCs appear to be the most significant COPCs retained for surface soil.

Manganese was the only COPC in the surface water that exceeded a surface water screening value (SWSV), while silver was the only COPC in the sediment that exceeded a sediment screening value (SSV). Overall, a slight potential adverse impact to aquatic receptors is expected from manganese (in the surface water) and silver (in the sediment). However, these contaminants do not appear to be site-related since there is no correlation between the sample concentration and the proximity of the samples to the site. For example, manganese was detected above its SWSV at similar levels approximately one quarter of a mile upstream, adjacent to the site, as well as one quarter of a mile downstream of the site. Silver was only detected at one sampling location approximately on quarter of a mile upstream of the site.

Several COPCs in the surface soil exceeded their respective surface soil screening values (SSSVs). Most of the surface soil samples were collected in areas that are non-vegetated and/or gravel covered. There are also some exceedances of the SSSVs in the wooded areas surrounding the open area; therefore, there is the potential for adverse impacts to terrestrial flora and fauna in these areas as well. No areas of dead or stressed vegetation were visually observed during either the field investigations or the habitat characterization. Although COPCs in these areas do exceed SSSVs, the exceedences are not expected to be ecologically significant to the terrestrial floral or faunal population due to the current use of the land, most of which is not conducive to habitats of the modeled ecological receptors.

There is a slight potential risk to the cottontail rabbit from site contaminants. The rabbit's diet is 100 percent vegetation. Since most of the site is unvegetated (as it is used for vehicle storage and training), the rabbit will not ingest vegetation within most of Site 16. Considering this aspect, the risk to the rabbit is overestimated and therefore, does not appear to be a significant risk from site-related COPCs.

The majority of the risk to the raccoon was due to aluminum in the surface water. Since the aluminum is not site-related, there does not appear to be a significant risk to the raccoon from site-related COPCs.

No threatened or endangered species are know to reside at or near Site 16; therefore, no adverse impacts to these species are expected. Likewise, there are no wetlands which would provide a habitat to a variety of plant and animal species.

In summary, a potential decrease in the aquatic receptor population from site-related COPCs is not expected. Similarly, a potential decrease in the terrestrial vertebrate receptor population from site-related COPCs is not expected.

8.0 DESCRIPTION OF THE "NO ACTION" ALTERNATIVE

As noted previously, the selected remedial alternative for OU No. 8 is no further action. Although the total scenario HI for residential child exposure to soil is slightly greater than 1.0, no HQ from a single chemical exceeds 1.0. However, since the human health RA indicated that PCBs are the main contributor to potential noncarcinogenic risks under the future residential child scenario, an evaluation was conducted to determine if remediation of PCB-soil is feasible.
The PCB concentrations were evaluated against the USEPA guidance for the cleanup of PCBs under CERCLA. Aroclor 1254 was detected in 13 of the 29 surface soil samples at concentrations ranging from 41 µg/kg, or 0.041 parts per million (ppm), to 2,100 µg/kg, or 2.1 ppm. Based on EPA Publication PB91-921206 entitled Guidance on Remedial Actions for Superfund Sites with PCB Contamination, concentrations of 0.1 ppm to 10 ppm will generally fall within the protective range (10⁻⁴ to 10⁻⁶), with respect to residential land use. Since the detected concentrations of PCBs at OU No. 8 did not present an unacceptable current or future carcinogenic human health risk, and since the maximum detected concentration (i.e., 2.1 ppm) is within the suggested remediation range for residential land use (i.e., 1 to 10 ppm), remediation of the PCB-soil is not warranted for the protection of human health.

Although the HI for residential children will remain above 1.0, the Camp Lejeune Master Plan is being changed to preclude the development of this site for residential purposes and to prohibit the installation of water supply wells within 1,000 feet of the site.

In conclusion, no human health risks were identified under the current land use exposure scenarios and no areas of concern were identified at OU No. 8. Therefore, no further action is deemed appropriate. This alternative involves taking no further remedial actions (including long-term monitoring), at the site and leaving the environmental media as they currently exist. This remedial alternative will have no cost associated with it.

9.0 RESPONSIVENESS SUMMARY

The selected remedy for OU. No. 8 is no further action.

Based on comments received during the public comment period and the lack of attendance at the March 7, 1996 public meeting, the public appears to support the preferred alternative. In addition, the USEPA Region IV and NC DEHNR are in support of the selected remedy outlined herein for OU No. 8.

9.1 Background on Community Involvement

A record review of the MCB, Camp Lejeune files indicate that the community involvement centers mainly on a social nature, including the community outreach programs and base/community clubs. The file search did not locate written Installation Restoration Program (IRP) concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Site 16). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the Base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Prepared a Community Relations Plan, September, 1990.
- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-Base residents, military and civilian interests.
- Established two information repositories.
- Established the Administration Record for all of the sites at the Base.
- Released the PRAP for OU No. 8 for public review in the repositories, March 7, 1996.
- Released public notice announcing public comment and document availability of the PRAP on February 25, 1996.
Held a Technical Review Committee meeting on March 7, 1996 to review the PRAP and solicit comments.

Held a public meeting on March 7, 1996, to solicit comments and provide information. There was no public participation at the meeting.

9.2 Comments Received During the Public Comment Period and Agency Response

A public meeting was held on March 7, 1996 in the Onslow County Library in Jacksonville, North Carolina. Representatives from LANTDIV, MCB, Camp Lejeune, USEPA Region IV, NC DEHNR, and OHM Corporation attended the meeting. There was no participation from the community at this meeting. The transcript for the public meeting is provided in Appendix A. Comments provided by NC DEHNR are summarized as follows. No comments were received from the public.

NC DEHNR requested a third groundwater sample be collected from monitoring well 16-MW05. Due to the inconclusive data from the initial two rounds, this sample was analyzed for TCL volatile organics. The results of this analysis confirmed the absence of benzene, which was detected in the initial round but absent in the second round of sampling. The response to this was to collect the additional sample and present the findings in this document.

NC DEHNR requested that soil screening levels, which are protective of groundwater, be developed for the contaminants detected in the subsurface soil at Site 16. The response to this is that the levels will be taken from USEPA Region III’s Risk-Based concentration Table published October 4, 1995. The values in this table are felt to be the most conservative and are acceptable to state and federal regulators. These values appear in Table 1 of this document.
<table>
<thead>
<tr>
<th>Media</th>
<th>Fractin</th>
<th>Contaminant</th>
<th>Criteria</th>
<th>Comparison</th>
<th>NE</th>
<th>NE</th>
<th>Min.</th>
<th>Max.</th>
<th>Frequency</th>
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<td></td>
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<td>52J</td>
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<td>1/29</td>
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<td>Southern</td>
<td></td>
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### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**

**OPERABLE UNIT NO. 8 (SITE 16)**

**RECORD OF DECISION, CTO-0274**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

**Site Contamination**

<table>
<thead>
<tr>
<th>Media Fraction</th>
<th>Contaminant</th>
<th>Comparison Criteria</th>
<th>Comparison Min.</th>
<th>Max.</th>
<th>Frequency</th>
<th>Detection Criteria</th>
<th>Comparison Criteria</th>
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<td>Aldrin</td>
<td>NE</td>
<td>3.4J</td>
<td>3.4J</td>
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<td>Endrin</td>
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<td>14J</td>
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<td>gamma-Chlordane</td>
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### Summary of Site Contamination

**Operable Unit No. 8 (Site 16)**  
**MCB, Camp Lejeune, North Carolina**

#### Site Contamination

<table>
<thead>
<tr>
<th>Media</th>
<th>Fracton</th>
<th>Contaminant</th>
<th>Criteria</th>
<th>Min.</th>
<th>Max.</th>
<th>Frequency</th>
<th>Criteria</th>
<th>Criteria</th>
<th>Location/Distribution</th>
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<tr>
<td>Surface</td>
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<td>Inorganics</td>
<td>Aluminum</td>
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### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**
**OPERABLE UNIT NO. 8 (SITE 16)**
**RECORD OF DECISION, CTO-0274**
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**  
**OPERABLE UNIT NO. 8 (SITE 16)**  
**RECORD OF DECISION, CTO-0274**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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</table>

**Footnotes:**
1. Detections compared to maximum base background concentration.
2. SMCL = Secondary Maximum Contaminant Level.
3. NA = Not Applicable.
4. NE = No Criteria Established.
6. NJ = Tentatively identified compound estimated value.
7. SSL = Region III Air-Based Concentration Soil Screening Level.
8. MCL = Maximum Contaminant Level.
10. AWQC = Ambient Water Quality Criteria (Human Health; Water and Organisms).
11. µg/L = microgram per liter (ppb).
12. µg/kg = microgram per kilogram (ppb).
13. mg/kg = milligram per kilogram (ppm).
15. NOAA ER-M = National Oceanic Atmospheric Administration Effective Range-Median.
16. "--" = undefined.
## Table 2
### Contaminants of Potential Concern
#### Evaluated in the Human Health Risk Assessment

**Operable Unit No. 8 (Site 16)**

**Record of Decision, CTO-0274**

**MCB Camp Lejeune, North Carolina**

<table>
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<tr>
<th>Contaminant</th>
<th>Surface Soil</th>
<th>Subsurface Soil</th>
<th>Groundwater</th>
<th>Surface Water</th>
<th>Sediment</th>
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</table>

| **Semivolatiles**                 |              |                 |             |               | !        |
| Phenol                            |              |                 |             |               | !        |
| Naphthalene                       |              |                 |             |               | !        |
| Phenanthrene                      |              |                 |             |               | !        |
| Bis(2-Ethylhexyl)phthalate        |              |                 |             |               | !        |
| Benzo(a)pyrene                    |              |                 |             |               | !        |
| **Pesticide/PCBs**                |              |                 |             |               | !        |
| Dieldrin                          |              |                 |             |               | !        |
| Aroclor-1254                      |              |                 |             |               | !        |
| Aroclor-1260                      |              |                 |             |               | !        |

| **Inorganics**                    |              |                 |             |               | !        |
| Aluminum                          |              |                 |             |               | !        |
| Arsenic                           | X            |                 | !           | X             | !        |
| Barium                            |              |                 |             | !             | !        |
| Beryllium                         | X            |                 |             | !             | !        |
| Calcium                           |              |                 |             | !             | !        |
| Chromium                          |              |                 |             | !             | !        |
| Cobalt                            |              |                 |             | !             | !        |
| Iron                              |              |                 |             | !             | !        |
| Lead                              | X            |                 | !           | !             | X        |
| Magnesium                         |              |                 |             | !             | !        |
| Manganese                         | X            |                 | !           | !             | !        |
| Potassium                         |              |                 |             | !             | !        |
| Silver                            |              |                 | !           | X             | !        |
| Sodium                            |              |                 | !           | !             | !        |
| Vanadium                          | X            | !               | X           | !             | !        |
| Zinc                              |              |                 |             |               | !        |

**Note:** No COPCs were retained for subsurface soil.

X = Selected as COPC for human health risk assessment.

! = Detected in media; compared to relevant criteria and standards; applicable to the groundwater.
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**Notes:**
- ICR = Incremental Lifetime Cancer Risk
- HI = Hazard Index
- () = Approximate percent contribution to the total ICR or HI values
- Total = Soil + Groundwater + Surface Water/Sediment
- NE = Not Evaluated for potential receptor
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<th>Terrestrial receptors</th>
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X = Retained as ecological COPC
APPENDIX A
PUBLIC MEETING TRANSCRIPT

MARINE CORPS BASE, CAMP LEJEUNE
PROPOSED REMEDIAL ACTION PLAN
OPERABLE UNIT NUMBER EIGHT (SITE 16)

Verbatim Transcript of Marine Corps Base, Camp Lejeune, Proposed Remedial Action Plan, Operable Unit Number Eight (Site 16).

BEFORE: Mr. Matthew Bartman
Baker Environmental
Airport Office Park, Building Three
420 Rouser Road
Coraopolis, Pennsylvania 15108

Stacy Tone, CCR
Court Reporter
Cape Fear Court Reporting
Post Office Box 1256
Wilmington, North Carolina 28402
March 7, 1996
I'm just going to flip through some of these sites and not talk about all the details, but just to show you pictures of the site.

This is the entrance to the burn dump, the former burn dump. Currently this area is used as a training area. It's in the Camp Johnson area. And it's used for the training of vehicle drivers, student drivers. Camp Johnson itself is a huge training area where they train the chefs. I'm not sure what else they -- what other type of training they do there. But there are barracks. There's no residential housing or anything there.

So, when we did the risk assessment, we looked at future residential scenarios. But it's unlikely in this area.

As you can see from the pictures on the back table, and also from this, there's a mock-up jet in the middle of what's now a vehicle park and training area. But what they do is they bring vehicles, the big training vehicles in here, and practice hooking them up to the jet and refueling aircraft, and they also do types of, like, practice maintenance on these vehicles here and different things. But no fuel is actually used in the operation. They just pump water or just hook up the hoses without any water itself.

This is a surface water runoff area in the southeastern portion of the site which leads to northeast creek. This is the southeastern portion of that site right.

March 7, 1996
AFTER THAT SURFACE WATER RUNOFF AREA THAT YOU CAN SEE NORTHEAST
creek in the foreground. It doesn't look much like a creek. It
looks more like the New River when you're actually there. It's
a pretty big surface water body.

WE CONDUCTED A FIELD PROGRAM OUT HERE IN MID-1994.

THAT'S WHEN WE STARTED THE SURFACE WATER SEDIMENT INVESTIGATION.

WE LIKE TO DO THAT IN MID-SUMMER WHEN THE SEASON'S HIGH AND
fish are flowing, the biota, and benefits and everything.

WE CONTINUED IN OCTOBER OF 1995 WITH THE SOIL AND
GROUNDWATER INVESTIGATION. AND THEN, FINISHED IN I BELIEVE
FEBRUARY OF '95 WITH A SECOND GROUNDWATER INVESTIGATION, SECOND
ROUND OF GROUNDWATER SAMPLING. BUT WE DID A SITE SURVEY, SOIL
INVESTIGATION, GROUNDWATER INVESTIGATION, SURFACE WATER
SEDIMENT. AND FROM THAT INFORMATION CONDUCTED HUMAN HEALTH AND
ECOLOGICAL RISKS.

I DON'T EVEN KNOW IF I NEED TO GO OVER NUMBERS. BUT
AS YOU CAN SEE, THE SURFACE SOIL INVESTIGATION, THE SAMPLING IN
RED SHOWS THE MONITORING WELLS THAT WE INSTALLED. THE BLACK
SHOW THE SOIL BORINGS THAT WE CONDUCTED.

WE COVERED THE AREA OF THE BURN DUMP PRETTY
EXTENSIVELY, IN BOTH SURFACE AND SUBSURFACE, AND ALSO COLLECTED
SEVERAL GROUNDWATER SAMPLES. I BELIEVE WE INSTALLED SIX SHALLOW
MONITORING WELLS.

ADDITIONALLY WE COLLECTED FIVE SURFACE WATER SEDIMENT
SAMPLES. AND ALSO WE CONDUCTED TEST PITS. THESE TEST PIT

March 7, 1996
LOCATIONS WE DUG IN ORDER TO LOCATE POSSIBLE SUBSURFACE
CONTAMINATION THAT MIGHT HAVE BEEN THERE FROM THE BURNING
ACTIVITIES.

AGAIN, THE MONITORING WELL LOCATIONS.

SURFACE WATER SEDIMENT SAMPLING LOCATIONS. AGAIN,

FIVE LOCATIONS, ONE SURFACE WATER SAMPLE TAKEN FROM EACH
LOCATION. TWO SEDIMENT SAMPLES TAKEN FROM EACH LOCATION.

WHAT WE FOUND THERE, WE FOUND PAH'S SCATTERED
THROUGHOUT THE BURN DUMP. THIS COULD HAVE BEEN DUE TO THE
BURNING ACTIVITIES. IT ALSO COULD BE DUE TO THE VEHICLE
TRAINING ACTIVITIES, INCOMPLETE COMBUSTION OF FUELS,

BENZOPYRENE, FAIRLY COMMON PAH FOUND, NOT AT EXTREMELY HIGH
LEVELS; FOUND AT SOIL BORING 16, WHICH WAS IN THE SOUTHERN
PORTION OF THE SITE, RIGHT AT THE PERIMETER OF THE SITE.

AS IS THE CASE WITH CAMP LEJEUNE, WE FOUND SEVERAL
PESTICIDES, Namely DDE AND DDT. CONCENTRATIONS LOOKED
RELATIVELY HIGH, BUT RIGHT AROUND WHAT WE WOULD NORMALLY FIND AT
CAMP LEJEUNE. AND AGAIN, THIS MAXIMUM CONCENTRATION WAS FOUND
AT SB05; IT WOULD BE IN THE NORTHERN PORTION OF THE SITE RIGHT
ABOVE THE JET AIRCRAFT.

WE ALSO FOUND EVIDENCE OF PCB'S, BOTH AT 1254 AND
1260. I GUESS, YOU KNOW, ONE OF THE EXPLANATIONS HERE IS
BECAUSE OF THE OILS USED TO IGIITE THE BURNS AND EVERYTHING.
AND THAT'S WHERE WE THINK THE PCB'S COME FROM. AGAIN, THEY WERE
DETECTED WIDESPREAD, NOT ANY IN CENTRAL LOCATION AROUND THE BURN

March 7, 1996
DUMP, AND THIS COULD BE A SCATTERIZATION -- OR THE SCATTERING OF
THE SAMPLES COULD BE DUE TO THE FACT THAT THE SOILS AT THE BURN
DUMP WERE MOVED AROUND, AND ALSO THE TRAINING ACTIVITIES THAT
ARE NOW BEING CONDUCTED MAY HAVE RELOCATED THE SOILS.

IN THE SUBSURFACE WE HAVE, AGAIN, THE PAH'S BEING
DETECTED. HOWEVER, THIS TIME WE HAVE PHENANTHRENE AND NOT THE
BENZOPYRENE. AND YOU REALLY DON'T EXPECT PAH'S TO BE FOUND IN
THE SUBSURFACE TOO OFTEN. AND AGAIN, WE HAVE PESTICIDES,
HOWEVER DETECTED NOT AS FREQUENTLY THIS TIME, AND MAINLY IN THE
SURFACE DRAINAGE AREA. THAT'S THE AREA THAT LEADS OFF TO THE
NORTHEAST CREEK. AND A LOT OF THAT COULD BE DUE TO HEAVY RUNOFF
IN THAT AREA AND THE PESTICIDES DRAINAGE INTO THAT AREA.

AGAIN, WE FOUND THE PCB'S BUT ONLY 1254 THIS TIME, AND
ONLY IN TWO SUBSURFACE SOIL SAMPLES. AND AS I EXPLAINED BEFORE,
WE HAVE DONE SEVERAL BACKGROUND SOILS, BOTH SURFACE AND
SUBSURFACE IN THIS AREA, FOR INORGANICS. WE'VE DONE
COMPARISONS, AND WE'RE WITHIN ONE ORDER OF MAGNITUDE FOR THE
INORGANICS IN THIS AREA.

ONE OF THE CONCERNS WE'VE UNCOVERED THIS AFTERNOON IS
THIS BENZENE WAS DETECTED IN ONE OF OUR MONITORING WELLS IN THE
FIRST ROUND OF SAMPLING. THE STATE OF NORTH CAROLINA HAS ASKED
US TO GO OUT AND RECONFIRM THIS. WE DIDN'T DETECT IT IN THE
SECOND ROUND, BUT, BECAUSE WE ONLY HAVE TWO ROUNDS OF SAMPLING,
WE DECIDED MAYBE WE SHOULD GO OUT AND TAKE A THIRD, THIRD ROUND
FOR VOLATILE SAMPLES. SO, THAT'S WHAT WE'RE DOING.

March 7, 1996
PHENOL WAS ALSO DETECTED. IT'S A HIGHLY WATER-SOLUBLE COMPOUND. AGAIN, MAXIMUM CONCENTRATION WAS FOUR MICROGRAM PER LITER, WELL BELOW THE STATE STANDARDS.

AS YOU WOULD THINK, PESTICIDES, PCB'S NOT DETECTED, ALTHOUGH THEY'RE IN THE SURFACE AND SUBSURFACE. ONE OF THE CONCERNS, AGAIN, WITH THE STATE THAT THEY POSE THIS AFTERNOON IS THAT WE DO SOME TYPE OF LEACHATE MODEL TO SEE THAT THESE CONTAMINANTS WOULD BE PROTECTED WITH GROUNDWATER. THE CONCENTRATIONS THAT WERE DETECTED IN THE SURFACE AND SUBSURFACE WOULD ALWAYS BE PROTECTED WITH GROUNDWATER. SO, THOSE ARE ONE OF THE THINGS THAT WE'LL BE PREPARING AND PRESENTING IN OUR ROD.

ONE OF THE THINGS I THINK I EXPLAINED, ROUND TWO, VOLATILE PESTICIDES AND PCB'S WERE AGAIN NOT DETECTED. BUT AGAIN, BECAUSE THE VOLATILES WEREN'T DETECTED IN ROUND TWO -- (THERE WAS A BRIEF INTERRUPTION.)

MR. BARTMAN: WE'RE GOING TO GO BACK AND DO THAT THIRD ROUND OF SAMPLING PROBABLY WITHIN THE WEEK.

NAPHTHALENE DETECTED IN SIX WELLS BUT BELOW STANDARDS, 21 MICROGRAMS PER LITER.

IRON EXCEEDED BOTH THE FEDERAL AND STATE STANDARDS, BUT THE FEDERAL STANDARD IS A SECONDARY STANDARD. WHY IT'S A PRIMARY STANDARD FOR THE STATE I'M NOT QUITE SURE. I GUESS CAUSE YOU DON'T HAVE SECONDARY STANDARDS IN THIS STATE.

INTERESTING THAT WE FOUND 1,1,2,2-TETRACHLOROETHANE IN ONE SURFACE WATER SAMPLE AT A CONCENTRATION OF 2 PPB, ABOVE THE

March 7, 1996
FEDERAL CRITERIA. UNRELATED TO THIS SITE, NOT FOUND IN ANY GROUNDWATER. POSSIBLY AN ANOMALY.

IN THIS CASE, SEMI-VOLATILES, PESTICIDES AND PCB'S WEREN'T DETECTED IN OUR SURFACE WATER SAMPLES AS YOU WOULD HOPEFULLY EXPECT.

ARSENIC IS THE ONLY METAL DETECTED ABOVE FEDERAL CRITERIA, FEDERAL CRITERIA BEING THE AMBIENT WATER QUALITY CRITERIA. OUR CONCENTRATIONS ARE 2.2 TO 3.1.

AS FAR AS SEDIMENT, WE USED THE NOAH CRITERIA TO EXAMINE THE LEVELS THAT WERE DETECTED, AND LOW LEVELS OF VOLATILE CARBON DISULFIDE AND TOLUENE WERE DETECTED. IT'S USUALLY THE CASE THAT THESE ARE USUALLY COMMON LAB CONTAMINANTS FOUND. UNFORTUNATELY OUR QUAPC SAMPLES DID NOT ENABLE US TO WRITE THIS OFF. SO, WE HAD TO RETAIN IT FOR RISK PURPOSES AND FOR EVALUATION PURPOSES.

THERE WERE NO SEMIVOLATILE ORGANIC CONTAMINANTS, PESTICIDES/PCB'S DETECTED IN THE SEDIMENT. AND SILVER WAS THE ONLY ONE DETECTED ABOVE ANY SEDIMENT CRITERIA.

AS FOR HUMAN HEALTH RISKS, WE EVALUATED ALL RECEPTORS, BOTH FUTURE -- I SHOULD SAY BOTH CURRENT AND FUTURE RECEPTORS.

IT'S ONE OF THE GUIDELINES OF THE EPA TO KNOW THE BASE MASTER PLAN MAY SAY THAT THERE WILL BE NO FUTURE RESIDENTIAL AREAS. WE STILL HAVE TO EVALUATE THOSE.

SO WE LOOKED AT ALL RECEPTORS, WE LOOKED AT ALL MEDIAS AND COMBINED THE RISKS FROM GROUNDWATER, SOIL, AND SURFACE WATER

March 7, 1996
SEDIMENT EXPOSURES. AND THE ONLY THING THAT WE CAME UP WITH WAS AN 
UNACCEPTABLE RISK WAS TO FUTURE RESIDENTIAL CHILDREN FROM A NON-
CARCINOGENIC RISK DRIVEN BY PCB 1254.

SO, THIS IS, I FEEL, A CONSERVATIVE RISK BECAUSE IT IS 
A NON-CARCINOGENIC RISK, AND IT IS TO FUTURE RESIDENTIAL 
CHILDREN.

FROM THE ECOLOGICAL STANDPOINT, WE LOOKED AT FLORA AND 
FAUNA AND TERRESTRIAL SPECIES INDIGENOUS TO THE AREA. SO WE 
LOOKED AT DEER, FOX, RACCOON AND QUAIL, AND THERE APPEAR TO BE 
NO ECOLOGICAL RISKS TO THESE SPECIES.

SO, WHAT WE PROPOSED FOR THIS SITE WAS NO FURTHER 
ACTION. BUT WE DO, I GUESS, AS OF TODAY WE DO HAVE A LITTLE BIT 
OF ADDITIONAL ACTION, AND THAT WOULD BE TO RESAMPLE THAT ONE 
WELL THAT HAS -- THAT HIT A BENZENE IN THE FIRST ROUND, AND ALSO 
TO COME UP WITH SOME CALCULATIONS IN PROTECTING THE GROUNDWATER.

SO, THAT'S ABOUT ALL WE'RE GOING TO BE DOING. AND 
HOPEFULLY THIS SITE WILL BE TAKEN CARE OF.

MR. NICHOLSON: YOU MAY HAVE SAID THIS, BUT I 
MISSED IT, HOW LONG HAS THE SITE BEEN THERE?

MR. BARTMAN: I'M SORRY. THE SITE WAS 
OPERATED -- THERE'S REALLY LIMITED INFORMATION ABOUT THE BURN 
DUMP -- FROM 1958, AND WE BELIEVE IT WAS CLOSED IN 1972.

MR. NICHOLSON: AND IS THERE -- WAS ANYTHING 
UNCOVERED IN THE TEST PIT?

MR. BARTMAN: NO.

March 7, 1996
MR. NICHOLSON: IS THERE ANY INDICATION THAT

A LOT OF SOIL HAS BEEN MOVED AROUND ON THIS SITE?

MR. BARTMAN: YES, YOU COULD GO OUT THERE TODAY AND FIND REMNANTS OF THE BURN DUMP, SO WE HAD SOIL SAMPLES AROUND THE PERIMETER OF THE BURN DUMP. IN FACT, WE HAD ONE SAMPLE WHERE WE HAD HIGH LEAD, AND IT WAS RECOMMENDED THAT WE GO OUT AND RESAMPLE THAT PARTICULAR AREA TO CONFIRM WHETHER IT WAS AN ANOMALY, ONE SPIKE, OR WHETHER WE HAD AN AREA OF CONCERN. AND IT WAS CONFIRMED THAT WE DIDN'T HAVE A CONCERNED AREA.

MR. NICHOLSON: IS THERE ANY INDICATION THAT THERE'S BEEN SOIL MOVED AROUND AT DEPTH? I WAS JUST INTERESTED IN, YOU KNOW, YOU WERE FINDING STUFF FIVE AND SIX FEET DEEP.

MR. BARTMAN: NO, WE HAVE NO INDICATION.

LIKE I SAID, WE DID FIVE TEST PITS. I BELIEVE THEY WERE 20 FEET IN LENGTH, 10 FOOT IN DEPTH AND THREE FOOT WIDE. AND THOSE TEST PITS WERE COMPLETED IN AREAS WHERE OUR SOIL BORINGS -- DURING OUR SOIL BORING EXCAVATION THAT THEY CAME UP EITHER WITH SOME TYPE OF BRIGHT OR BLACKENED DIRT OR STAINED DIRT. SO, WE CENTRALIZED OUR TEST PITS IN THOSE AREAS.

USUALLY THE BURNING ACTIVITIES CONDUCTED AT THE BASE WERE JUST ON THE SURFACE AND THIS MATERIAL WAS SCRAPED TO THE SIDE AND NOT BURIED. AND WE HAVE ANOTHER BURN DUMP THAT WE HAVE JUST PERFORMED AN INVESTIGATION ON WITH SIMILAR PRACTICES.

THERE WAS A REPORTED ASBESTOS REMOVAL COMPLETED IN THE EARLY '80S, I BELIEVE. I THINK IT WAS 100 CUBIC YARDS OF

March 7, 1996
ASBESTOS, OR FEET.

MR. MORRIS: FEET, I THINK.

MR. BARTMAN: YEAH. OF ASBESTOS. AND

THERE'S NOT ANY RECORDS OF WHERE IT WAS REMOVED TO, BUT IT WAS

REMOVED FROM THE SITE, FROM THE SURFACE OF THIS SITE.

HAVE WE FOUND -- I GUESS IF WE FIND CONTAMINATION IN

THE SHALLOW GROUNDWATER, THEN WE'LL HAVE TO REASSESS WHAT WE

NEED TO DO HERE.

QUESTIONS, COMMENTS?

MR. MORRIS: YOUR HIT OF 1,1,2,2 PCA,

WHERE WAS THAT IN THE --

MR. BARTMAN: (INTERPOSING.) THAT WAS IN

THE UP GRADED SAND.

MR. MORRIS: OKAY. BUT WHERE THE CREW HAS

GONE UP?

MR. BARTMAN: YEAH. THERE WAS NOT SITE

GRADING OR DOWNGRADING AT THE SITE. IT WAS UPGRADED.

MS. TOWNSEND: IT'S A POSSIBLE SITE OF

GRADING UP THERE? DO WE HAVE ALL THE UPGRADE?

MR. BARTMAN: SITE SEVEN IS UPGRADED.

MS. TOWNSEND: SITE SEVEN?

MR. MORRIS: THERE'S A VEHICLE WASH AREA

THAT'S A LITTLE WAYS UP FROM THERE WHICH IS STILL QUITE A WAYS

DOWN FROM SITE SEVEN. SO, SOMETHING MIGHT BE COMING FROM THERE.

MR. BARTMAN: ANYTHING OF THAT

March 7, 1996
CONCENTRATION WE FIND IN NORTHEAST CREEK, AND THAT'S HIGHLY, I
WOULD SAY, I THINK, TURBULENT, THAT'S A TURBULENT AREA, LOT OF
WATER INFLUENCE.

MR. PAUL: VERY TIDAL.

MR. BARTMAN: VERY TIDAL.

MR. DUNN: YOU GO IN ABOUT TWO FEET,

DON'T YOU?

MR. LOUGHMILLER: I'BD SAY ONE TO ONE AND A HALF
FEET IN THAT AREA.

MR. DUNN: YOU KNOW, THERE'S ABOUT TWO
OF THEM CLOSE TO THE GROUND.

MR. BARTMAN: THIS IS ONE OF THE FEW SITES
WE'VE BEEN ABLE TO GO NO ACTION. I CAN ONLY THINK OF ONE OTHER
SITE THAT WE'VE GONE NO ACTION BEFORE. MOST SITES ARE EITHER
DOING INCIDENT CONTROLS THROUGH LONG-TERM MONITORING. NOW WE'VE
GOTTEN INTO RECLASSIFICATION OF THE GROUNDWATER, SHIFTED USE OF
GROUNDWATER OR SOME TYPE OF REMEDIATION ALTERNATIVE. SO WE'RE
DOING OUR HOMEWORK. AND LIKE I SAID, ON ONE OF THOSE LONG TRIPS
WITH PATRICK, HE COULD FILL YOU IN ON EVERY ONE OF THOSE SITES,
AND WHERE WE'VE GONE TO AND WHAT WORK WE'VE DONE. THIS IS NOT
THE NORM. WE'RE USUALLY DOING SOME TYPE OF REMEDIAL
ALTERNATIVE.

MR. PAUL: ANYTHING ELSE?

MR. LOUGHMILLER: I WAS WONDERING HOW YOU GET
THE FISH FLOWING IN THE SUMMER TIME.

March 7, 1996
MR. BARTMAN: DID I SAY THE FISH FLOWING?

MR. LOUGHMILLER: YEAH.

MR. BARTMAN: FISH SWIMMING.

(WHEREUPON, THESE PROCEEDINGS CONCLUDED AT 7:34 P.M.)

March 7, 1996
STATE OF NORTH CAROLINA  
COUNTY OF NEW Hanover  

CERTIFICATE  

I, STACY TONE, CCR, NOTARY PUBLIC, DO HEREBY CERTIFY   
THAT THE FOREGOING PUBLIC HEARING WAS TAKEN BY ME AND   
TRANSCRIBED UNDER MY DIRECTION; AND THAT THE FOREGOING 13 PAGES  
CONSTITUTE A TRUE AND CORRECT TRANSCRIPT OF SAID PROCEEDINGS.   

I DO FURTHER CERTIFY THAT I AM NOT COUNSEL FOR, OR IN   
THE EMPLOYMENT OF ANY OF THE PARTIES TO THIS ACTION, NOR AM I  
INTERESTED IN THE RESULTS OF THIS ACTION.   

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS   
19TH DAY OF MARCH 1996.  

<IMG SRC 0496280J>  

MY COMMISSION EXPIRES:  SEPTEMBER 13, 2000   

March 7, 1996
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

- **Site Name:** CAMP LEJEUNE MILITARY RES. (USNAVY)
- **Address:** ONSLOW COUNTY, NC
- **EPA ID:** NC6170022580
- **EPA Region:** 04

Site Alias Name(s):

- USMC CAMP LEJEUNE MILITARY RESERVATION
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)
- USMC/BLDGS TP452 & TP451 (SITE 10)
- USMC/HADNOT POINT BURN DUMP (SITE 3)
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
- USMC/STORAGE LOTS 201 & 203 (SITE 12)
- USMC/CAMP GEIGER DUMP (SITE 4)
- USMC/BASE SAN LDFFL (SITE 5)
- USMC/CHM LDFL (SITE 1)
- USMC/BLDG PT 37 (SITE 6)
- USMC/K-326 RANGE (SITE 8)
- USMC/G4A RANGE (SITE 9)
- USMC CAMP LEJEUNE

Record of Decision (ROD):

- **ROD Date:** 10/09/1996
- **Operable Unit:** 07
- **ROD ID:** EPA/ROD/R04-97/017
- **Media:** Aquifer, groundwater, surface water, subsurface soil, sediment
Contaminant: VOCs, paint, compressed gasses, vehicle maintenance fluids, contaminated materials, motor oil, ethylene glycol (i.e., anti-freeze), aluminum, antimony, arsenic, cadmium, chromium, manganese, vanadium, zinc, 4,4-DDE, 4,4-DDT, barium, cobalt, copper, lead, nickel, BEHP, mercury, 1,2-dichloroethene, trichloroethene, silver, thallium, heptachlor epoxide, 4,4-DDD, alpha-chlordane, gamma-chlordane, phenanthrene, anthracene, benzo(a)anthracene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, carbazole, chrysene, benzo(a)pyrene, beryllium, 2-methylnaphthalene, naphthalene, fluorene, phenanthrene, chrysene, bis(2-ethylhexyl)phthalate, benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, 2,4-dimethylphenol, 4-methylphenol, acenaphthene, chloroform, 2-methylnaphthalene, benzo(k)fluoranthene, fluoranthene, pyrene, bis(2-ethylhexyl)phthalate, carbon disulfide, 3,3-dichlorobenzidine

Abstract: Marine Corps Base (MCB), Camp Lejeune is a training base for the United States Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 miles of coastline. Operable Unit 7 (OU 7) is one of 14 operable units located within MCB, Camp Lejeune. OU 7 is divided into three sites; Site 1, Site 28, and Site 30. Sites 1, 28, and 30 were grouped together because of the similar nature of the wastes that were reportedly disposed of at the sites and the geographic proximity of the sites. Site 1, the French Creek Liquids Disposal Area, is the northernmost site located within OU 7. The site is located approximately 1 mile east of the New River and 1 mile southeast of the Hadnot Point Industrial Area (HPIA). Site 1 is situated along both the north and south sides of Main Service Road near the western edge of the Gun Park Area and Force Troops Complex. There are two suspected disposal areas at the site: the northern disposal area and the southern disposal area. The site boundaries coincide with the boundaries of these disposal areas. The northern portion of Site 1 is surrounded by a treeline and a motor-cross training area to the north, a vehicle storage area associated with Building FC-100 to the east, Main Service Road to the south, and a treeline to the west. Most of the area within this portion of the site contains fenced-in buildings and parking areas. Building FC-120 serves as a motor transport maintenance facility for the Second Landing Support Battalion. A number of covered structures are used for temporary storage of paint, compressed gasses, vehicle maintenance fluids, spent or contaminated materials, and batteries. The southern portion of Site 1 is surrounded by Main Service Road to the north, Daly Road to the east, H.M. Smith boulevard to the south, and Gonzales Boulevard and a wooded area to the west. The area of the former southern disposal area now contains Buildings 739 and 816, a fenced-in
vehicle and equipment Administrative Deadline Lot (ADL), and a fenced-in hazardous materials storage area. The hazardous materials storage area, which is concrete-lined and bermed, is located north of Building 816. This storage area is used for the temporary storage of vehicle maintenance fluids, spent or contaminated materials, fuel, and batteries. In addition, a number of storage lockers are located throughout the southern portion of Site 1. These lockers are used to store paints and other flammable materials used by maintenance and machine shop personnel.

Site 28, the Hadnot Point Burn Dump, is the westernmost site located within OU 7. The site is located along the eastern bank of the New River and is located approximately 1 mile south of the HPIA on the Mainside portion of MCB, Camp Lejeune. The site is surrounded by the Hadnot Point Sewage Treatment Plant (STP) to the north, wooded and marshy areas to the east and south, and the New River to the west. The Hadnot Point STP is located on and adjacent to Site 28. A portion of the STP facility (the equalization lagoon) extends across Cogdels Creek, from west to east. The STP operates a number of clarifying, settling, an aeration ponds that are located on either side of Cogdels Creek. Both operational areas of the STP are fenced with six-foot chain link. The treated water from the STP discharges into the New River approximately 400 feet from the shoreline via an outfall pipe.

Site 30, the Sneads Ferry Road Fuel Tank Sludge Area, is the southernmost site located within OU 7. The site is situated along a tank trail which intersects Sneads Ferry Road from the west, approximately 1 mile south of the intersection with Marines Road, and roughly 4 1/2 miles south of the HPIA. The site is located adjacent to the Combat Town Training Area. The surrounding training areas and adjacent artillery ranges are used to prepare specialized personnel for various tactical operations and to simulate amphibious assault conditions. The site boundary coincides with the approximate extent of a suspended sludge disposal area. The majority of the Site 30 area is wooded containing trees of less than 3 inches in diameter and dense understory. Unimproved paths are found within and around the site. The tank trail that leads to the suspected disposal area is occasionally used as part of field training exercises.
**Remedy:**

The selected remedy for OU 7 is a combination of three separate remedies that were developed for Sites 1, 28, and 30, respectively. The main components of the selected remedy are described below. The Site 1 remedy includes institutional controls with a long-term groundwater monitoring plan in which groundwater samples are collected semiannually and analyzed for volatile organic compounds (VOCs). Aquifer use restrictions will be implemented to prohibit the future use of the aquifer under the site as a potable water source. Deed restrictions will limit the future use of the land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan. A long-term groundwater monitoring plan will be implemented at Site 28 in which groundwater samples are collected semiannually and analyzed for volatiles, lead, and manganese. Aquifer use restrictions will prohibit the future use of the aquifer under the site as a potable water source. Deed restrictions will limit the future use of land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan. No Action is the selected remedy at Site 30. The no action plan involves taking no further remedial actions (this includes conducting no further environmental investigations or sampling) at the site. The site and all of the environmental media located within the site will remain as they currently are.

**Text:**

Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 07
ONSLLOW COUNTY, NC
10/09/1996
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 the Remedial Action at Sites 1, 28 & 30. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

The selected remedy consists of institutional controls designed to prevent future potential exposure. The controls include restricting potable well installation, restrictions for future land use and a groundwater monitoring plan. 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.
Dear Sir:

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Sincerely,

Richard D. Green  
Acting Director  
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy  
Neal Paul, Camp Lejeune  
Kate Landman, LANTDIV  
Dave Lown, NCDEHNR

bcc: Frank Redmon, Federal Facilities Coordinator  
Beau Mills, HQ
FINAL

RECORD OF DECISION
OPERABLE UNIT NO. 7
SITES 1, 28, AND 30

MARINE CORPS BASE,
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0231

DECEMBER 14, 1995

Prepared For:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By

BAKER ENVIRONMENTAL, INC.
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LIST OF ACRONYMS AND ABBREVIATIONS

ADL                Administrative Deadline Lot
AOC                area of concern
ARAR               applicable and relevant or appropriate requirements
AST                Aboveground Storage Tank

BEHP               bis(2-ethyl hexyl)phthalate

CERCLA             Comprehensive Environmental Response, Compensation and Liability Act
COPC               contaminant of potential concern

DoN                Department of the Navy

EPIC               Environmental Photographic Interpretation Center

FS                 Feasibility Study

GW                 groundwater

HI                 hazard index
HPIA               Hadnot Point Industrial Area

IAS                Initial Assessment Study
ICR                incremental cancer risk
IR                 Installation Restoration

MCB                Marine Corps Base
lg/kg              micrograms per kilogram
lg/L               micrograms per liter

NC DEHNR           NC Department of Environment, Health, and Natural Resources
NCP                National Oil and Hazardous Substances Pollution Contingency Plan
NPL                National Priorities List
NPW                net present worth

O&G                oil and grease
O&M                operation and maintenance
OU                 Operable Unit

PAHs               polynuclear aromatic hydrocarbons
PCBs               polychlorinated biphenyls
PCE                tetrachloroethene
POL                petroleum, oil, and lubricants
PRAP               Proposed Remedial Action Plan
QI                 quotient index

RA                 Risk Assessment
RAA                remedial action alternative
RCRA               Resource Conservation and Recovery Act
RI                 Remedial Investigation
RI/FS              Remedial Investigation/Feasibility Study
RL                 remediation level
ROD                Record of Decision

STP                sewage treatment plant
SVOCs              semivolatile organic compounds

TCE                trichloroethene
USEPA              United States Environmental Protection Agency
UST                underground storage tank

VOCs               volatile organic compounds
DECLARATION

Site Name and Location
Operable Unit No. 7 (Site 1 - French Creek Liquids Disposal Area, Site 28 - Hadnot Point Burn Dump, Site 30 - Sneads Ferry Road Fuel Tank Sludge Area)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose
This decision document presents the selected remedy for Operable Unit (OU) No. 7 at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for OU No. 7.

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Assessment of the Site
Actual or threatened releases of hazardous substances from this operable unit, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present a potential threat to public health, welfare, or the environment.

Description of Selected Remedy
The selected remedy for OU No. 7 is a combination of three separate remedies that were developed for Sites 1, 28, and 30, respectively. The main components of the selected remedy are described below.

Site 1 Remedy: Institutional Controls
- A long-term groundwater monitoring plan in which groundwater samples are collected semiannually and analyzed for volatile organic compounds (VOCS).
- Aquifer use restrictions that will prohibit the future use of the aquifer under the site as a potable water source. The restrictions will be implemented via the Base Master Plan.
- Deed restrictions that will limit the future use of land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan.

Site 28 Remedy: Institutional Controls
- A long-term groundwater monitoring plan in which groundwater samples are collected semiannually and analyzed for volatiles, lead and manganese.
- Aquifer use restrictions that will prohibit the future use of the aquifer under the site as a potable water source. The restrictions will be implemented via the Base Master Plan.
- Deed restrictions that will limit the future use of land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan.

Site 30 Remedy: No Action
- No Action. The "no action" plan involves taking no further remedial actions (this includes conducting no further environmental investigations or sampling) at the site. The site and all of the environmental media located within the site will
remain as they currently are.

The selected remedy addresses the principal threats at OU No. 7. These threats include VOC contaminated groundwater in the shallow aquifer at Site 1, and inorganics contaminated groundwater in the shallow aquifer at Site 28. Because there were no principal threats identified at Site 30, no action is the selected remedy.

**Statutory Determinations**

The selected remedy is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs) and criteria to be considered (TBCs) directly associated with this action, and is cost-effective. The statutory preference for treatment is not satisfied because no active treatment is necessary at Sites 1, 28, and 30 in order to maintain adequate protection of human health and the environment. Under the selected remedy, five-year reviews the lead agency will be required for Sites 1 and 28.
1.0 SITE NAME, LOCATION, AND DESCRIPTION

Marine Corps Base (MCB), Camp Lejeune is a training base for the United States Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 miles of coastline.

Figure 1 presents a map of MCB, Camp Lejeune. As shown, the Base is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U. S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

OU No. 7 is one of 14 operable units located within MCB, Camp Lejeune. An "operable unit", as defined for the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), is a discrete action that comprises an incremental step toward comprehensively addressing site problems. With respect to MCB, Camp Lejeune, operable units were developed to combine one or more individual sites where Installation Restoration (IR) Program activities are or will be implemented. The sites which are combined into an operable unit share a common element. Operable Unit (OU) No. 7, the subject of this ROD, consists of three sites:

- Site 1, the French Creek Liquids Disposal Area
- Site 28, the Hadnot Point Burn Dump
- Site 30, the Sneads Ferry Road Fuel Tank Sludge Area

Sites 1, 28, and 30 were grouped together because of the similar nature of the wastes that were reportedly disposed of at the sites and the geographic proximity of the sites.

As shown on Figure 1, OU No. 7 is located on the eastern portion of the Base, situated between the New River and Sneads Ferry Road, south of the Hadnot Point Industrial Area (HPIA). The following paragraphs present brief descriptions of each of the three sites that constitute OU No. 7.

1.1 Site 1

Site 1, the French Creek Liquids Disposal Area, is the northernmost site located within OU No. 7. As shown on Figure 1, the site is located approximately one mile east of the New River and one mile southeast of the HPIA. Site 1 is situated along both the north and south sides of Main Service Road near the western edge of the Gun Park Area and Force Troops Complex.

Figure 2 presents a map of Site 1 that identifies the approximate boundaries of two suspected disposal areas at the site: the northern disposal area and the southern disposal area. The site boundaries coincide with the boundaries of these disposal areas. The following subsections describe the northern and southern portions of Site 1 and the surrounding areas.

Northern Portion of Site 1

As shown on Figure 2, the northern portion of Site 1 is surrounded by a treeline and a motor-cross training area to the north, a vehicle storage area associated with Building FC-100 to the east, Main Service Road to the south, and a treeline to the west. Most of the area within this portion of the site contains fenced-in buildings and parking areas. The former northern disposal area is located in this portion of Site 1. The majority of the former northern disposal area now contains two fenced-in areas that are associated with Buildings FC-120 and FC-134.

Building FC-120 serves as a motor transport maintenance facility for the Second Landing Support Battalion. It is a two story brick structure with offices and several vehicle maintenance bays. Building FC-134, located to the north of Building FC-120, provides offices and communication equipment storage also for the Second Battalion. It is a brick structure with offices and one garage bay.

A number of covered material storage areas are located to the north and west of Building FC-120. These smaller covered structures are used for temporary storage of paint, compressed gasses, vehicle maintenance fluids, spent or contaminated materials, and batteries. In addition to these covered storage structures, an above ground storage tank (AST) area, located adjacent to the northern side of Building FC-120, is utilized to store spent motor oil and ethylene glycol (i.e., anti-freeze). Also, a gasoline service island is located to the west of Building FC-120.
The two pumps at the service island provide fuel for vehicles undergoing maintenance at Building FC-120. An underground storage tank (UST) of unknown capacity is associated with this active service island.

Two equipment wash areas are located adjacent to the northern disposal area. The first wash area is located approximately 250 feet west of Building FC-120 and the second lies approximately 100 feet east of Building FC-134. Both equipment wash areas are concrete-lined and employ an oil and water separator collection basin. A third oil and water separator is located to the northwest of Building FC-120.

There are two surface water features (a sediment retention pond and a swampy area) that influence drainage near the northern portion of the site. The retention pond, located north of Building FC-134, receives surface water runoff via a gravel drainage ditch from the parking lot, the three oil and water separators, and the surrounding areas. Surface water runoff north of Building FC-134 drains into the swampy area toward a topographic low area.

As shown on Figure 2, the approximate direction of shallow groundwater flow is northwest.

Southern Portion of Site 1

As shown on Figure 2, the southern portion of Site 1 is surrounded by Main Service Road to the north, Daly Road to the east, H.M. Smith boulevard to the south, and Gonzales Boulevard and a wooded area to the west. The area of the former southern disposal area now contains Buildings 739 and 816, a fenced-in vehicle and equipment Administrative Deadline Lot (ADL), and a fenced-in hazardous materials storage area.

The hazardous materials storage area, which is concrete-lined and bermed, is located north of Building 816. This storage area is used for the temporary storage of vehicle maintenance fluids, spent or contaminated materials, fuel, and batteries. In addition, a number of storage lockers are located throughout the southern portion of Site 1. These lockers are used to store paints and other flammable materials used by maintenance and machine shop personnel.

Several small buildings are located adjacent to the suspected southern disposal area. These buildings house a number of support offices, recreation facilities, machine shops, light-duty vehicle and equipment maintenance bays, and equipment storage areas. Heat is provided to the majority of these buildings by kerosene-fired stoves. Kerosene fuel is stored in ASTs located beside each building.

Two vehicle maintenance ramps are also located near the southern portion of Site 1. The first ramp is located immediately to the south of Building 739 and the second lies to the north of Building GP-19. Both maintenance ramps are constructed of concrete and are used for the upkeep of vehicles and equipment.

In addition, three oil and water separator collection basins are located near the southern portion of Site 1. One separator is located adjacent to the Building 739 vehicle maintenance ramp, one separator is located southeast of Building GP-19, and one separator is located approximately 100 feet south of Building 816, adjacent to an equipment wash area. Discharge from the separators and wash areas flows into a stormwater sewer and then into the drainage ditch adjacent to H.M. Smith Boulevard.

Besides receiving discharge from the separators, the drainage ditch also receives surface water runoff from the southernmost portions of the site and nearby parking lots. Although it is a site-related surface water feature, the ditch is mainly dry year round. The ditch starts within the site boundaries, flows west toward the HPIA Sewage Treatment Plant (adjacent to Site 28), then empties into Cogdels Creek. Cogdels Creek eventually discharges into the New River which is located approximately one mile west of Site 1.

1.2 Site 28

Site 28, the Hadnot Point Burn Dump, is the westernmost site located within OU No. 7 (refer to Figure 1). The site is located along the eastern bank of the New River and is approximately one mile south of the HPIA on the Mainside portion of MCB, Camp Lejeune.
Figure 3 presents a map of Site 28. As shown, the site is surrounded by the Hadnot Point Sewage Treatment Plant (STP) to the north, wooded and marshy areas to the east and south, and the New River to the west. Cogdels Creek flows into the New River at Site 28 and forms a natural divide between the eastern and western portions of the site. Vehicle access to the site is via Julian C. Smith Boulevard near its intersection with 0 Street. The eastern and western portions of the site are served by an improved gravel road.

A majority of the estimated 23 acres that constitute Site 28 are used for recreation and physical training exercises. The site is predominantly comprised of two lawn and recreation areas, known collectively as the Orde Pond Recreation Area, that are separated by Cogdels Creek. Picnic pavilions, playground equipment, and a stocked fish pond (Orde Pond) are located within this recreation area. They are regularly used by Base personnel and their families. In addition, field exercises and physical training activities frequently take place at the recreation area.

The Hadnot Point STP is located on and adjacent to Site 28. A portion of the STP facility (the equalization lagoon) extends across Cogdels Creek, from west to east. The STP operates a number of clarifying, settling, and aeration ponds that are located on either side of Cogdels Creek. Both operational areas of the STP are fenced with six-foot chain link. The treated water from the STP discharges into the New River approximately 400 feet from the shoreline via an outfall pipe.

As shown on Figure 3, the shallow groundwater appears to be flowing toward Cogdels Creek from all points on the site.

1.3 Site 30

Site 30, the Sneads Ferry Road Fuel Tank Sludge Area, is the southernmost site located within OU No. 7 (refer to Figure 1). The site is situated along a tank trail which intersects Sneads Ferry Road from the west, approximately 1 mile south of the intersection with Marines Road, and roughly 4-1/2 miles south of the HPIA. The site is located adjacent to the Combat Town Training Area. The surrounding training areas and adjacent artillery ranges are used to prepare specialized personnel for various tactical operations and to simulate amphibious assault conditions.

Figure 4 presents a map of Site 30. The site boundary depicted on Figure 4 coincides with the approximate extent of a suspected sludge disposal area. The majority of the Site 30 area is wooded containing trees of less than three inches in diameter and dense understory. Unimproved paths are found within and around the site. The tank trail that leads to the suspected disposal area is occasionally used as part of field training exercises. As shown on Figure 4, one of two streams which comprise the headwaters of Frenchs Creek lies approximately 1,500 feet west of Site 28. Surface water runoff and groundwater flow directions are generally to the west and north toward Frenchs Creek.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

MCB, Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) on October 4, 1989 (54 Federal Register 41015, October 4, 1989). The United States Environmental Protection Agency (USEPA) Region IV; the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR); and the United States Department of the Navy (DoN) then entered into a Federal Facilities Agreement for MCB, Camp Lejeune in February 1991. The primary purpose of the Federal Facilities Agreement was to ensure that environmental impacts associated with past and present activities at MCB, Camp Lejeune were thoroughly investigated and appropriate CERCLA response/Resource Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented as necessary to protect public health and the environment.

The following subsections describe the history (i.e., the past land usages and waste disposal practices) of Sites 1, 28, and 30, and a summary of previous site investigations/enforcement activities.

2.1 Site History

2.1.1 Site 1
Site 1 had been used by several different mechanized, armored, and artillery units since the 1940s. Reportedly, liquid wastes generated from vehicle maintenance were routinely poured onto the ground surface. During motor oil changes, vehicles were driven to a disposal point and drained of used oil. In addition, acid from dead batteries was reportedly hand carried from maintenance buildings to disposal points. At times, holes were reportedly dug for waste acid disposal and then immediately backfilled. Thus, the disposal areas at Site 1 are suspected to contain petroleum, oil, and lubricants (POL) and battery acid.

The total extent of both the northern and southern disposal areas is estimated to be between seven and eight acres. The quantity of POL waste disposed at the areas is estimated to be between 5,000 and 20,000 gallons; the quantity of battery acid waste is estimated to be between 1,000 and 10,000 gallons.

Site 1 continues to serve as a vehicle and equipment maintenance/staging area.

2.1.2 Site 28

Site 28 operated from 1946 to 1971 as a burn area for a variety of solid wastes generated on the Base. Reportedly, industrial waste, trash, oil-based paint, and construction debris were burned then covered with soil. In 1971, the burn dump ceased operations, and was graded and seeded with grass.

The total volume of fill within the dump is estimated to be between 185,000 and 375,000 cubic yards. This estimate was based upon a surface area of 23 acres and a depth ranging from five to ten feet.

2.1.3 Site 30

Site 30 was reportedly used by a private contractor as a cleaning area for emptied fuel storage tanks from other locations. The tanks were used to store leaded gasoline that contained tetraethyl lead and related compounds. Since fuel residuals remaining in the emptied tanks were reportedly washed out at Site 30, the disposal area is suspected to contain fuel sludge and wastewater from the washout of the tanks.

The suspected disposal area measures approximately 7,500 square yards. It is estimated that, at a minimum, 600 gallons of sludge were removed from tanks and drained onto the ground surface during the cleaning process. This estimate was based on the projected volume of material remaining in two 12,000 gallon tanks and the amount of material below their outflow ports. Supplemental information suggests that the site may have been used for the disposal of similar wastes from other tanks. The quantity and composition of the waste is unknown. However, it is suspected to have contained tetraethyl lead and cleansing compounds.

2.2 Previous Investigations/Enforcement Activities

Previous investigations conducted at OU No. 7 include an Initial Assessment Study (IAS), a Confirmation Study, a soil assessment at Site 1, an aerial photographic investigation, and various surface water, sediment, and groundwater investigations. A comprehensive description of each investigation is included in the RI/FS reports; brief descriptions are presented below.

2.2.1 Initial Assessment Study

In 1983, an IAS was conducted at MCB, Camp Lejeune to evaluate potential hazards at various sites throughout the Base. The IAS was based upon a review of historical records and aerial photographs, field inspections, and personnel interviews. Conclusions from the IAS indicated that a number of sites, including Sites 1, 28, and 30, contained potential source areas of contamination and warranted further investigations.

2.2.2 Confirmation Study

As a result of the IAS, a Confirmation Study was conducted at MCB, Camp Lejeune between 1984 and 1987. The study consisted of two steps: a Verification Step, performed in 1984, and a Confirmation Step, performed in 1986 and 1987. The purpose of the study was to investigate
potential contaminant source areas identified during the IAS. The following paragraphs summarize the results of the Confirmation Study at Sites 1, 28, and 30, and the final recommendations that were made based on these results.

2.2.2.1 Site 1 Results

At Site 1, the Confirmation Study focused on the presence of potential contaminants in groundwater, surface water, and sediment. Organic and inorganic contaminants were identified in the groundwater samples collected at the site. The volatile organic compounds (VOCS) tetrachloroethene (PCE) and trichloroethene (TCE) were identified at levels exceeding present standards in a number of groundwater samples. In addition, oil and grease (O&G) was detected in groundwater, surface water, and sediment samples. The presence of the O&G was most likely due to the POL that had reportedly been disposed of at Site 1.

2.2.2.2 Site 28 Results

At Site 28, the Confirmation Study focused on the presence of potential contaminants in groundwater, surface water, sediment, and fish tissue. Overall, inorganics were the most prevalent contaminant group detected throughout both rounds of the Confirmation Study. Groundwater, surface water, and sediment samples suggested that the inorganics, with the exception of mercury in surface water, originated from the disposal area at the site.

Concentrations of inorganics in groundwater generally decreased from one sampling round to the next, during 1984 and 1986. Inorganic concentrations in sediment, however, increased from the first to the second sampling round. Surface water samples obtained from Cogdels Creek identified cadmium and mercury at concentrations that, in certain cases, exceeded state surface water standards. Lead was detected at concentrations exceeding federal screening values in sediment samples collected from Cogdels Creek and shallow groundwater samples collected during both the 1984 and 1986 investigations. In addition, mercury was detected in surface water and shallow groundwater samples. The distribution of mercury throughout the site suggested that the contaminant was not only present at the site, but may also have migrated from an upstream location.

In addition to the inorganics detected in the groundwater, VOCS were detected in samples collected from one monitoring well at the site. The detected concentrations exceeded regulatory limits for TCE and vinyl chloride. VOCS were not detected in groundwater samples from any of the other three existing wells.

The pesticide Alpha-BHC and polychlorinated biphenyls (PCBs) were detected in fish tissue obtained from Orde Pond in 1984. However, Alpha-BHC was detected at low concentrations and the PCBs were suspected to have bioaccumulated in the food chain. Also, PCBs were not detected elsewhere during the Confirmation Study at Site 28. Thus, neither the pesticide nor the PCBs appeared to be site related.

2.2.2.3 Site 30 Results

At Site 30, the Confirmation Study focused on the presence of potential contaminants in groundwater, surface water, and sediment. For the groundwater investigation, two monitoring wells were installed at the site. Lead was detected in the samples collected from these wells at levels exceeding state and federal drinking water standards. In the surface water, no detectable levels of target compounds were identified. During the sediment investigation, data collected suggested that O&G was present in both the suspected disposal area and stream bed sediments at Site 30. However, it was not clear whether the presence of O&G could be attributed to heavy vehicular traffic or emergency vehicle maintenance in the Combat Town Training Area.

2.2.2.4 Recommendations of the Confirmation Study

The Confirmation Study recommended further characterization of Sites 1, 28, and 30 and a risk assessment to complete the RI/FS process. The Confirmation Study also recommended that additional surface water and sediment investigations of Cogdels Creek, between Site 28 and the HPIA, be conducted to determine possible upstream sources of contamination.

2.2.3 Soil Assessment at Site 1
In 1991, a soil assessment was conducted at Site 1. The purpose of this assessment was to evaluate the soil quality at the site prior to initiating a proposed construction project near the southern disposal area. Analytical results from the soil investigation identified the presence of several inorganics. Concentrations of detected inorganics, including cadmium, chromium, lead, and manganese, were, in general, consistent throughout the site. Contaminants were also detected in soil samples collected from upgradient locations. The distribution and comparable nature of detected inorganics in the soil and environmental media sampled during other investigations suggested that these inorganics are found throughout adjoining areas.

2.2.4 Aerial Photographic Investigation

In 1992, an aerial photographic investigation was completed by the USEPA's Environmental Photographic Interpretation Center (EPIC) for several areas within MCB, Camp Lejeune. The investigation employed photographs to locate and assess potential sources of contamination, and to delineate the extent of disposal activities within the study area.

At Site 1, black-and-white aerial photographs dating from 1944, 1949, 1952, 1956, 1960, 1964, 1984, 1988, and 1990 were made available for the examination of surface conditions. The photographs indicated that over time, significant clearing and construction had occurred within the suspected disposal areas. Operations including the staging of equipment and vehicles also appeared to increase over time.

At Site 28, black-and-white aerial photographs dating from 1949, 1952, 1956, 1960, and 1964 were used for the visual analysis of surface conditions. Additional photographs from 1938 and 1943 were employed to establish a basis of comparison, prior to development of the Camp Lejeune Military Reservation. The aerial photographs contained visual evidence of past waste disposal activities and assisted in defining areas of concern at the site.

At Site 30, a black-and-white aerial photograph taken in 1964 was made available for examination of surface conditions. Although the photograph was taken prior to the reported disposal event, 1970, information from the photograph was employed to evaluate potential source areas of contamination.

2.2.5 Surface Water and Sediment Investigation

In 1993, an additional surface water and sediment investigation of Cogdels Creek and the New River was conducted to support RI scoping activities. The most prevalent contaminants detected in the surface water and sediment samples were polynuclear aromatic hydrocarbon (PAH) compounds, pesticides, and inorganics. PAH compounds were detected in sediment samples from both Cogdels Creek and the New River. Some of the highest PAH concentrations were detected in a sediment sample from the New River, downstream of Site 28. PAH compounds were also detected upstream of the site, in sediments collected from Cogdels Creek.

2.2.6 Additional Groundwater Investigation

In 1993, an additional groundwater investigation was conducted at Sites 1, 28, and 30 to support RI scoping activities. This study included one round of groundwater sampling from five wells at Site 1, four wells at Site 28, and two wells at Site 30.

At Site 1, analytical results from the groundwater investigation identified the presence of inorganics. Concentrations of detected inorganics, including cadmium, chromium, lead, and manganese, were, in general, consistent throughout the site. Potential contaminants were also detected in groundwater samples obtained from upgradient locations. The distribution and comparable nature of detected inorganics in the groundwater and environmental media sampled during other investigations suggests that these inorganics are found throughout adjoining areas.

At Site 28, the most prevalent contaminants detected in the groundwater samples collected under this investigation were PAHs and inorganics. Inorganics were frequently detected at concentrations in excess of state and federal groundwater standards.

At Site 30, groundwater samples were collected from the two existing monitoring wells. Inorganics were detected in both wells with the detections at the easternmost well being
generally greater than the detections at the westernmost well. Cadmium, chromium, and lead were all detected at levels exceeding federal and state standards at the easternmost well.

2.2.7 Remedial Investigation

In 1994, Baker Environmental, Inc. (Baker) conducted an RI for OU No. 7. The following investigations were conducted at each site:

- **Site 1**
  - Soil Investigation (128 samples)
  - Groundwater Investigation (19 samples; two rounds of samples)
- **Site 28**
  - Soil Investigation (94 samples)
  - Groundwater Investigation (13 samples; two rounds of samples)
  - Surface Water and Sediment Investigations (14 surface water and 27 sediment samples)
  - Benthic and Aquatic Investigations (6 benthic and 19 aquatic samples)
- **Site 30**
  - Soil Investigation (25 samples)
  - Groundwater Investigation (3 samples; two rounds of samples)
  - Surface Water and Sediment Investigations (3 surface water and 6 sediment samples)

Note that surface water and sediment samples were initially proposed at the drainage ditch located along the southern portion of Site 1. However, due to a lack of surface water, the ditch did not represent a classifiable surface water body used for human consumption or recreation, nor did it represent an ecological habitat.

Based on the analytical results from the sampling of environmental media, contaminants of potential concern (COPCs) were identified. A human health risk assessment (RA) and an ecological RA were conducted to evaluate the potential risks associated with these COPCs. The results of the RAs are summarized in a later section of this ROD.

The following sections briefly summarize the results of the RI conducted at each site.

2.2.7.1 Site 1 Results

Table 1 presents a summary of the RI analytical results for Site 1. This summary includes a range of detected concentrations and comparison criteria. Please note that because of asphalt and gravel overburden material, a number of surface soil samples were not retained for laboratory analysis.

**Soil:** VOCs were not found in surface soils, but were detected in four out of 110 subsurface soil samples. TCE and toluene were detected at very low concentrations in samples from the northern central portion of the study area.

Semivolatile organic compounds (SVOCs) were not encountered in surface soils, but were detected in a number of subsurface soil samples. Most notable among the SVOCs detected were three PAH compounds, di-n-butylphthalate, and BEHP.

The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endrin aldehyde, alpha-chlordane, and gamma-chlordane were detected in the soil at Site 1. Each of these pesticides was detected, at low concentrations, in at least two of the 124 soil samples. The pesticide 4,4'-DDT was the most prevalent, with 10 positive detections ranging from 1.6 to 18 micrograms per kilogram (µg/Kg), and the highest pesticide concentration was that of 4,4'-DDE at 120 µg/Kg.

The PCBs Aroclor 1254 and Aroclor 1260 were each detected once within the subsurface soil. Aroclor 1254 was detected on the southern portion of the site at a concentration of 18 µg/Kg. Aroclor 1260 was detected near the center of the northern disposal area at a concentration of 1,300 µg/Kg.
Several inorganics were also detected in the surface and subsurface soil at Site 1. However, the detected concentrations of these inorganics did not significantly differ from Base-specific background concentrations. Therefore, the positive detections of inorganics in soil did not appear to be the result of past disposal practices.

Groundwater: Positive detections of VOCs in groundwater were limited to the northern portion of the study area. TCE was detected in three samples obtained from the shallow aquifer. The maximum TCE concentration, 27 micrograms per liter (μg/L), was detected in the north central portion of the study area. This detected concentration slightly exceeds the federal standard for TCE, 2.8 μg/L. Figure 5 shows a possible plume of TCE that was delineated based on positive detections of this compound and the direction of groundwater flow, northwest. Two other VOCs, 1,2-dichloroethene and 1,1-dichloroethene, were observed at maximum concentrations of 21 μg/L and 2 μg/L, respectively. Neither level exceeded federal or state standards. The maximum 1,2-dichloroethene and 1,1-dichloroethene concentrations were detected at monitoring well 1-GW10, located to the west of the suspected northern disposal area. Vinyl chloride was also detected at a maximum concentration of 4 μg/L, which exceeds the state and federal drinking water standards, at monitoring well 1-GW10.

Like VOCs, the positive detections of SVOCs were limited to the northern portion of the study area. Phenol and diethylphthalate were detected during the first sampling round only in the deep aquifer at concentrations of 6 μg/L and 1 μg/L, respectively.

Inorganics were the most prevalent among contaminants detected in the groundwater at Site 1. However, the positive detections of inorganics were distributed sporadically throughout the site. As a result, most of the inorganics did not appear to be site related. Iron and manganese, in particular, were detected at maximum concentrations of 29,200 μg/L and 1,200 μg/L. These levels exceeded state drinking water standards. However, positive detections of iron and manganese were distributed sporadically throughout the site, indicative of natural site conditions rather than disposal activities. In addition, iron and manganese concentrations in groundwater throughout MCB, Camp Lejeune often exceed state and federal standards. During past studies, manganese concentrations at a nearby potable water supply well and at several Site 1 wells exceeded the standards, but fell within the range of concentrations for samples collected elsewhere at MCB, Camp Lejeune.

2.2.7.2 Site 28 Results

Table 2 presents a summary of the RI analytical results for Site 28. This summary includes a range of detected concentrations and comparison criteria.

Soil: VOCs were found in one surface soil sample and two subsurface soil samples at very low concentrations. The VOCs benzene, PCE, and 1,1,1-trichloroethane were each detected once within the 72 soil samples collected at Site 28. Based upon their wide dispersion, infrequent detection, and low concentration, the occurrence of VOCs in soils at Site 28 did not appear to be a significant problem resulting from previous disposal practices.

SVOCs, among the other organic compounds within soil at Site 28, appeared to be the most directly linked to past disposal practices. Several SVOCs were identified in both surface and subsurface soil samples, primarily from the western disposal area. A majority of SVOCs detected in soil samples were PAH compounds, most probably resulting from past burning of waste material or refuse.

The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane appeared to be the most widely scattered compounds within surface and subsurface soils at Site 28. Each of the five pesticides was detected in at least 15 of the 72 soil samples. The pesticide 4,4'-DDE was the most prevalent, with 44 positive detections ranging from 3.1 μg/Kg in subsurface soil to 1,600 μg/Kg in surface soil. The highest pesticide concentration was that of 4,4'-DDT at 7,300 μg/Kg in the subsurface soil. In general, higher concentrations of those pesticides more frequently detected were limited to the western portion of the site around the picnic area.

Three PCBs, Aroclor 1242, Aroclor 1254, and Aroclor 1260, were detected in subsurface soil samples. The maximum PCB concentration was 140 μg/Kg from a location in the center of the site on the northern side of the fence surrounding the treatment plant.
Inorganics were detected in both surface and subsurface soil samples from the western portion of the study area at concentrations greater than one order of magnitude above Base-specific background levels. In general, elevated inorganics concentrations were limited to soils obtained from the western portion of the study area. The inorganics copper, lead, manganese, and zinc were observed at maximum concentrations greater than two orders of magnitude above Base-specific background levels. The same three inorganics had several positive detections in excess of the one order of magnitude level.

Groundwater: Positive detections of VOCs in groundwater were limited to the central western portion of the study area. Chloroform, ethylbenzene, and xylene were detected in a single shallow groundwater sample obtained from a temporary well located there.

SVOCs were detected in five of ten shallow groundwater samples obtained during the first sampling round from the western portion of the study area. These SVOCs included fluorene, phenanthrene, fluoranthene, pyrene, and chrysene. The maximum SVOC concentration, 99 g/L of naphthalene, was detected within the sample from a temporary monitoring well located in the central western portion of the study area. SVOC analyses of groundwater samples were not performed as part of the second sampling round.

The pesticides 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, and gamma-chlordane were each detected at least once within samples obtained from six shallow monitoring wells located on the western portion of Site 28, during the first sampling round. The pesticides 4,4'-DDE and 4,4'-DDD were detected within five and six shallow groundwater samples, respectively. The highest pesticide concentration detected was 9 g/L of 4,4'-DDD, within the sample obtained from a monitoring well in the center of the site. A second round of groundwater samples was obtained from those monitoring wells that presented evidence of pesticide contamination during the first sampling round. However, groundwater samples obtained during the second sampling round did not contain pesticides. This was most likely the result of a low-flow sampling technique used during the second round.

Inorganics were the most prevalent and widely distributed contaminants in groundwater at Site 28 and were found distributed throughout the site. Concentrations of inorganics, in samples obtained during both sampling rounds, were generally higher in shallow groundwater samples than in samples collected from the deeper aquifer. Lead was detected, and confirmed by the second sampling round in only 1 of the 12 shallow and deep groundwater samples. Lead levels (at a maximum concentration of 126 g/L) exceeded the state and federal drinking water standard from a well located in the north-central portion of the site. Iron and manganese were the most prevalent inorganic elements detected during both sampling rounds. Concentrations of iron and manganese were confirmed by the second sampling round to have exceeded either federal or state standards within 7 groundwater samples.

Surface Water: In New River surface water, copper exceeded federal screening values but at levels that were indicative of a low potential for risk. Lead and zinc exceeded screening values slightly at a single station. Aluminum exceeded its screening value slightly in Orde Pond.

Sediment: In the sediments, lead exceeded screening values only once in Cogdels Creek at a low level but exceeded screening values significantly in the New River at one station. Antimony exceeded its screening value moderately at the same station in the New River. This station may be associated with runoff from an active firing range located approximately 3 miles southwest of the site. Pesticides exceeded screening values throughout Cogdels Creek with the highest exceedances in the lower reach of the creek near the confluence with the New River. However, these exceedances represent only a moderate potential for risk to aquatic receptors. The levels of pesticides detected in the sediments may be a result of routine application in the vicinity of Site 28, especially near the sewage treatment plant and recreation area.

Benthic and Aquatic: Results of the analysis of benthic macroinvertebrates and fish populations indicated that Cogdels Creek and the New River support an aquatic community that is representative of a tidally-influenced freshwater and estuarine ecosystem with both freshwater and marine species. The absence of pathologies observed in fish indicated that the surface water and sediment quality does not adversely impact the fish community. The benthic community demonstrated the typical tidal/freshwater species trend of primarily chironomids and oligochaetes in the upper reaches of Cogdels Creek and polychaetes and amphipods in the lower reaches of Cogdels Creek and the New River. Species representative of both tolerant and
intolerant taxa were present and the overall community composition did not indicate a benthic community adversely impacted by surface water and sediment quality.

2.2.7.3 Site 30 Results

Table 3 presents a summary of the RI analytical results for Site 30. This summary includes a range of detected concentrations and comparison criteria.

Soil: The VOC 1,1,1-trichloroethane was the only organic compound detected in surface soil samples at Site 30. 1,1,1-trichloroethane was detected at concentrations of 2 and 3 \( \text{g/Kg} \) from two sampling locations situated along the tank trail on the northeastern edge of the site boundary. No other positive detections of VOCs or SVOCs were observed among surface soil samples.

Inorganics were detected in the surface soil samples retained from Site 30. However, none of the positive detections of priority pollutant inorganics exceeded Base-specific background levels for surface soil.

The VOC 1,1,1-trichloroethane was the only organic compound detected in subsurface soil samples at Site 30. It was detected at a concentration of 2 \( \text{g/Kg} \) in a sample located near the center of the suspected disposal area. No other positive detections of VOCs or SVOCs were observed among subsurface soil samples.

Chromium was the only inorganic detected in subsurface soil at concentrations greater than Base-specific background levels. The maximum chromium concentration among subsurface soil samples was 13.2 \( \text{g/Kg} \). Four of the 12 chromium detections slightly exceeded the maximum Base-specific background concentration. The four detections were scattered throughout the study area.

Groundwater: Chloroform, a VOC, was the only organic compound detected in the shallow groundwater during the first sampling round. Chloroform was detected at a concentration of 9 \( \text{g/L} \) in monitoring well 30-GW01. During the second sampling round, chloroform was once again detected (at 3 \( \text{g/L} \)) in a groundwater sample obtained from monitoring well 30-GW01. No other VOCs were detected.

Inorganics, both total and dissolved fractions, were detected in samples obtained from each of the three monitoring wells at Site 30. Chromium, iron, lead, and manganese were each detected among the three groundwater samples at concentrations which exceeded either federal or state drinking water standards for total inorganics. Chromium, iron, lead, and manganese were detected at maximum concentrations of 111, 41,400,59.1, and 181 \( \text{g/L} \), respectively. With the exception of iron, none of these positive detections, in excess of either federal or state standards, exceeded Base-specific background levels. During the second sampling round, iron was detected at a concentration of 692 \( \text{g/L} \) (based on total inorganics analyses) in a sample from monitoring well 30-GW03. This detected concentration exceeded the state standard of 300 \( \text{g/L} \).

Surface Water: Three surface water samples from Frenchs Creek were submitted for laboratory analysis. Lead and mercury were the only inorganics identified at concentrations in excess of EPA Region IV screening values. Both lead and mercury detections were observed in a sample located upgradient of the study area. Lead and mercury were detected at concentrations of 2.3 and 0.15 \( \text{g/L} \), respectively. No other total inorganics concentrations were in excess of screening values. Further, VOCs and SVOCs were not detected in any of the three surface water samples.

Sediment: VOCs were not detected among the six sediment samples retained for analysis from Frenchs Creek. The SVOC BEHP was detected in two Frenchs Creek sediment samples. The concentrations of BEHP at the upstream and downstream locations were 3,900 and 2,600 \( \text{g/Kg} \), respectively. No inorganics concentrations among the six sediment samples exceeded screening values.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS and PRAP documents for OU No. 7 were released to the public in July 1995. These documents were made available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division.
Office (Building 67, Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 7 mailing list were sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI/FS documents was published in the "Jacksonville Daily News" in July, 1995. A public comment period was held from October 5, 1995 to November 3, 1995. In addition, a public meeting was held on October 5, 1995, to respond to questions and to accept public comments on the final PRAP for Site 1. The public meeting minutes were transcribed and a copy of the transcript was made available to the public at the aforementioned locations. A Responsiveness Summary, included as part of the final ROD, was prepared to respond to the significant comments, criticisms and new relevant information received during the comment period.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

Because the potential contaminants identified at Sites 1, 28, and 30 appear to be unrelated, separate response actions were developed for each site. The response action, or selected remedy, for OU No. 7 is a combination of the three separate response actions that were developed for Sites 1, 28, and 30.

The response action for Site 1 was developed to address the groundwater area of concern (AOC) identified on Figure 5. This AOC is a plume in the shallow aquifer that contains low levels of TCE. The extent of this AOC was approximated based on monitoring well locations where TCE exceeded its remediation level, 5 \( \mu \text{g/L} \). (Remediation levels are concentrations to which contaminated material must be remediated. They are based on federal, state, and local standards and risk-based criteria; they are developed for COPCs that contributed to unacceptable risk levels.)

In some shallow groundwater samples collected at Site 1, manganese and mercury exceeded their remediation levels - 50 and 1.1 \( \mu \text{g/L} \), respectively. However, manganese and mercury were not included in the scope of the response action because they did not appear to be site related contaminants. The following statements support the theory that manganese and mercury are not site related contaminants.

- Manganese concentrations (i.e., both total and filtered) in groundwater at MCB, Camp Lejeune often exceed the state and federal standard of 50 \( \mu \text{g/L} \) (Baker, 1994). Elevated manganese levels, at concentrations above the standard, were reported in samples collected from a number of Base potable water supply wells. Manganese concentrations at several Site 1 wells exceeded the standard, but fell within the range of concentrations for samples collected elsewhere at MCB, Camp Lejeune. As a result, manganese does not appear to be a site related contaminant. Instead, manganese appears to naturally occur at concentrations exceeding its remediation level in groundwater throughout the Base.

- Mercury exceeded its remediation level at only one well by 0.1 \( \mu \text{g/L} \), which is a relatively minor exceedance. In addition, mercury was not detected in any of the dissolved inorganics samples. Consequently, it is likely that suspended solids in the total inorganics sample created the high detection of mercury. Thus, mercury does not appear to be a site related contaminant.

- There is no record of any historical use, either industrial or disposal, of manganese or mercury at Site 1. This information further supports the theory that manganese and mercury are not site related contaminants.

The response action for Site 28 was developed to address the groundwater AOCs identified on Figure 6. These AOCs include monitoring well locations where manganese and lead exceeded their remediation levels - 50 and 15 \( \mu \text{g/L} \), respectively.

The response action for Site 30 was developed to address site conditions that already appear to protective of human health and the environment.

5.0 SUMMARY OF SITE CHARACTERISTICS

This section contains a brief summary of the site characteristics at OU No. 7, as determined during the RI.
The soils underlying Site 1 are generally consistent throughout the shallow and deep subsurface. The soils consist of mostly silty sands with thinly interbedded layers of clay and silty clay which are discontinuous. One to two feet of fill material is present throughout the site, especially in areas where construction or regrading activities have occurred. The top of the deep aquifer was encountered at approximately 25 to 27 feet bgs.

Groundwater flow within the surficial aquifer was determined to be to the west-northwest with a relatively low gradient of 0.0027. The groundwater flow direction within the deep aquifer was not determined due to a limited number of wells; however, it is expected to be to the west in the direction of the New River. Slightly different groundwater elevations (i.e., head differentials) were noted between the surficial and deep aquifer monitoring wells. In general, there is a downward movement (head) of groundwater at the site. Groundwater flow velocity within the surficial aquifer was estimated at 2.9 x 10^{-3} feet/day.

Two water supply wells were identified within a one-mile radius of Site 1. Both wells, however, were put out of service by Base personnel due to VOCs in the groundwater.

The most prevalent pesticides detected were dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endrin aldehyde, and alpha-chlordane. They were detected, at low concentrations, in at least two of the 124 soil samples. The pesticide 4,4'-DDT was the most prevalent, and the highest pesticide concentration was that of 4,4'-DDE.

The PCBs Aroclor 1254 and 1260 were each detected once within the subsurface sample set.

VOCs were not found in surface soils and were detected in only four subsurface samples scattered throughout the site. In particular, TCE and toluene were detected at very low concentrations.

SVOCs were not encountered in surface soils, but were detected in a number of subsurface samples. Most notable among the SVOCs detected were three PAH compounds and di-n-butylphthalate.

Based on a comparison of Base-specific background levels, positive detections of inorganics at Site 1 do not appear to be the result of past disposal practices.

Inorganics were the most prevalent among potential contaminants in groundwater at Site 1 and were found distributed throughout the site. Iron and manganese were detected at concentrations which exceeded the state drinking water standards and barium, calcium, magnesium, potassium, and sodium were also detected in each of the shallow and deep groundwater samples.

In general, VOC analytical results from the first and second sampling events correlated. TCE was detected in samples obtained from three shallow monitoring wells. The maximum TCE concentration was detected within a sample from monitoring well 1-GW17. The VOCs 1,2-dichloroethene, 1,1-dichloroethene, vinyl chloride, and xylenes were also observed in the shallow aquifer. The SVOCs phenol and diethylphthalate were detected during the first sampling round only in a sample from deep well 1-GW17DW.

The potential noncarcinogenic or carcinogenic risks from exposure to the surface soil and subsurface soil at Site 1 were within acceptable levels for the current military receptor and the future construction worker receptor, respectively.

There were potential noncarcinogenic and carcinogenic risks to the future residential child and adult receptors upon exposure to groundwater. The potential noncarcinogenic risks from groundwater are 17.8 and 7.6 for the child and adult receptor, respectively. These values exceed the acceptable level of 1.0. The
potential carcinogenic risk from groundwater was 1.8x10^{-4} for the adult receptor. This risk exceeds the acceptable risk range of 1x10^{-4} to 1x10^{-6}. Arsenic and manganese were the primary COPCs contributing to the risks.

- On comparison of arsenic and manganese levels in the groundwater to federal and state standards, only manganese exceeds the criteria. The concentration of arsenic that was used to determine potential risk was exceeded at five wells. Three of these wells are located off site (i.e., wells 1-GW10, 1-GW11, and 1-GW12). The concentration of manganese used to determine potential risk was the maximum level (1,200 \text{ l}g/L) found at off-site well 1-GW10. This level was found only once among the shallow and deep wells, excluding another off-site well, 1-GW11, which had a concentration of 1,070 \text{ l}g/L. The remaining detects of manganese were at least a magnitude less than the maximum level. Although these two metals contributed to the site risks from groundwater exposure, the levels used to calculate risk were primarily from off-site wells. Consequently, it is reasonable to assume that the risks from groundwater due to the presence of arsenic and manganese may be overestimates of risk and are highly conservative values.

- Inorganics appear to be the only site related COPCs that may have the potential to affect the integrity of terrestrial receptors at Site 1. There were no aquatic receptors identified that would be exposed to site related COPCs. In addition, there were no threatened or endangered species or critical habitats identified at Site 1. Therefore, there is no ecological risk expected to these receptors.

- Surface soil quality indicated a slight potential for cadmium and chromium concentrations to decrease the integrity of terrestrial invertebrates or plants at the site. However, because the site concentrations only just exceeded the literature values, it is not expected that these contaminants would present a significant ecological risk to these terrestrial receptors.

- Other terrestrial receptors may be exposed to the contaminants in the surface Soils by ingestion. For the deer, rabbit, fox, and quail receptors used in this ERA, there does appear to be a slight ecological risk to terrestrial vertebrate receptors. However, this risk is expected to be low because of the low level of the exceedances of the terrestrial reference values.

### 5.2 Site 28

- The soils underlying Site 28 are generally consistent throughout the shallow and deep subsurface. The soils consist of mostly silty sands with thinly interbedded layers of clay and silty clay which are discontinuous. A large quantity of fill material and debris (e.g., glass, metal, brick, and wire), varying in thickness from 3 to 22 feet, underlies the western portion of the site. The location and thickness of the fill and debris appear to coincide with existing information and results of previous investigations. The top of the deep aquifer was encountered at approximately 40 feet bgs.

- Groundwater within the surficial aquifer discharges into Cogdels Creek. The water table gradient is relatively low (0.004). Flow velocity within the surficial aquifer was estimated at 4.1 x 10^{-7} \text{ feet/day}. Groundwater flow within the deep aquifer was determined to be to the west-southwest with a relatively low gradient of 0.0013. Slighty different groundwater elevations (i.e., head differentials) were noted between the surficial and deep aquifer monitoring wells. In general, there is a downward movement (head) of groundwater at the site.

- There are no water supply wells within a one-mile radius of Site 28.

- Among organic compounds, SVOCs within soil samples at Site 28 appear to be the most directly linked to past disposal practices. Several SVOCs were identified in both surface and subsurface soil samples, primarily from the western disposal area. A majority of SVOCs detected in soil samples were PAH compounds, most probably resulting from combustion of waste material or refuse.
Inorganic elements were detected in both surface and subsurface soil samples from the western portion of the study area at concentrations greater than one order of magnitude above Base-specific background levels. The inorganics copper, lead, manganese, and zinc were observed at maximum concentrations greater than two orders of magnitude above Base-specific background levels. The same three metals also had several positive detections in excess of the one order of magnitude level.

The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane were detected in at least 15 of the 72 soil samples. In general, higher concentrations of those pesticides more frequently detected, were limited to the western portion of the site.

Three PCBs (Aroclor 1242, 1254, and 1260) were detected in soil samples obtained from borings at Site 28.

The VOCs benzene, PCE, and 1,1,1-trichloroethane were each detected once within the soil samples collected at Site 28. Based upon their wide dispersion, infrequent detection, and low concentration, the occurrence of VOCs in soils does not appear to be the result of past disposal practices.

Inorganic elements were the most prevalent and widely distributed contaminants in groundwater at Site 28 and were found distributed throughout the site. Lead was detected, and confirmed by the second sampling round, within only 1 of the 12 shallow and deep groundwater samples at a concentration which exceeded the state and federal standards. Iron and manganese were the most prevalent inorganic elements detected during both sampling rounds. Concentrations of iron and manganese were confirmed by the second sampling round to have exceeded either federal or state standards within 7 groundwater samples.

SVOCs were detected in five of ten shallow groundwater samples obtained during the first sampling round. SVOC analyses of groundwater samples were not performed as part of the second sampling round.

The pesticides 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, and gamma-chlordane were each detected at least once within samples obtained from six shallow monitoring wells during the first sampling round. A second round of groundwater samples was obtained from those monitoring wells that presented evidence of pesticide contamination during the first sampling round. However, groundwater samples obtained during the second sampling round did not exhibit pesticides.

The VOCs chloroform, ethylbenzene, and xylene were detected in a single shallow groundwater sample obtained from a temporary well.

In the current case, potential noncarcinogenic and carcinogenic risks to the military personnel, recreational adult, and fisherman were within acceptable risk levels. For the current recreational child receptor, there was a potential noncarcinogenic risk from New River sediment. The noncarcinogenic risk from the ingestion pathway was 1.2, which is slightly greater than the acceptable risk level of 1.0. The COPC driving this noncarcinogenic risk was antimony.

In the future case, the total potential noncarcinogenic risk to the child receptor (i.e., total noncancer risk is 23) exceeds the acceptable risk level of one. This risk is attributed to exposure to groundwater, subsurface soil, and sediment from the New River. For the adult receptor, there were noncarcinogenic and carcinogenic risks from exposure to groundwater. The risks to the construction worker were within acceptable risk levels.

The results indicate that inorganics in groundwater, subsurface soil and sediment are driving the potential noncarcinogenic and carcinogenic risks at the site. These inorganics are antimony, arsenic, copper and zinc in the subsurface soil; manganese in groundwater; and antimony in the sediment of the New River. It is important to note that upon the segregation of the soil noncarcinogenic risks based on the effects on different target organs, the soil noncarcinogenic risk may be an
In terms of lead health impacts, use of the lead uptake biokinetic model indicates that exposure to surface soil, subsurface soil and groundwater at this site generates blood lead levels in children that are within acceptable levels.

It is important to note that the future exposure scenario is based on potential residential development of Site 28. At present the site is a recreational/picnic area, and is used for training military personnel. It is highly unlikely that the site will become a residential area in the foreseeable future. Consequently, exposure to subsurface soil and groundwater under a residential scenario is highly conservative and unlikely, given the present site conditions. It follows that the potential risks associated with this exposure scenario are conservative and may be overestimated values.

Inorganics and pesticides appear to be the most significant site related COPCs that have potential to affect the integrity of the aquatic receptors at Site 28. For the terrestrial receptors at Site 28, inorganics appear to be the most significant site-related COPC that have the potential to affect the integrity of the ecosystem.

In New River surface water, copper exceeded aquatic reference values but at levels that were indicative of a low potential risk. Lead and zinc only exceeded 1.0 slightly at a single station. Copper exceeded the surface water reference values in Cogdels Creek, and aluminum exceeded 1.0 in Orde Pond. However, the exceedance was only slightly above 1.0.

In the sediments, lead exceeded aquatic reference values only once in Cogdels Creek at a low level but exceeded aquatic reference values significantly in the New River at one station. Antimony exceeded its sediment aquatic reference values moderately at the same station in the New River. This station may be associated with runoff from the active firing range. Pesticides exceeded the sediment aquatic reference values throughout Cogdels Creek with the highest exceedances in the lower reach of the creek near the confluence with the New River. These exceedances represent a moderate potential for risk to aquatic receptors. The levels of pesticides detected in the sediments may be a result of routine application in the vicinity of Site 28, especially near the STP and recreation area.

Results of the analysis of benthic macroinvertebrates and fish populations indicate that Cogdels Creek and this reach of the New River support an aquatic community that is representative of a tidally-influenced freshwater and estuarine ecosystem with both freshwater and marine species. The absence of pathologies observed in the fish sampled from Cogdels Creek and the New River indicates that the surface water and sediment quality does not adversely impact the fish community relative. The benthic community demonstrated the typical tidal/freshwater species trend of primarily chironomids and oligochaetes in the upper reaches of Cogdels Creek and polychaetes and amphipods in the lower reaches of Cogdels Creek and in the New River. Species representative of both tolerant and intolerant taxa were present and the overall community composition did not indicate a benthic community adversely impacted by surface water and sediment quality.

During the habitat evaluation, no areas of vegetation stress or gross impacts from site contaminants were noted. Based on the soil toxicity data for cadmium, chromium, copper, manganese, nickel, and zinc, these inorganics at Site 28 may decrease the integrity of terrestrial invertebrates or plants at the site. Based on the evaluation of the deer, rabbit, fox, raccoon, and quail receptors, there does appear to be an ecological risk to terrestrial vertebrate receptors. This risk is expected to be significant if greater exposure to those contaminants results.

5.3 Site 30

The soils underlying Site 30 are generally consistent throughout the shallow and subsurface. The soils consist of mostly silty sands.
Groundwater flow within the surficial aquifer was determined to be to the west-northwest with a moderate gradient of 0.015. Groundwater flow velocity within the surficial aquifer was estimated at 0.15 feet/day.

Two operating water supply wells were identified within a one-mile radius of Site 30. Both wells are located hydraulically upgradient from the site and are not expected to be impacted by disposal of washwater from the tank cleaning operations at the site.

The VOC 1,1,1-trichloroethane was detected in two surface soil samples retained from Site 30. No other positive detections of VOCs or SVOCs were observed among surface soil samples.

Fourteen inorganics were detected in the surface soil samples retained from Site 30. None of the positive detections of priority pollutant metals exceeded Base-specific (i.e., MCB, Camp Lejeune) background levels for surface soil.

1,1,1-trichloroethane was detected in the subsurface soil sample at 30-SB09, located near the center of the suspected disposal area. No other positive detections of VOCs or SVOCs were observed among subsurface soil samples.

Seventeen inorganics were detected in subsurface soils at Site 30. Chromium was the only inorganic detected in subsurface soil at concentrations exceeding Base-specific inorganic background levels.

Chloroform was the only VOC or SVOC identified during the first groundwater sampling round.

During the first sampling round, 17 total inorganics were detected within at least one groundwater sample at Site 30. Eleven dissolved inorganics were also detected within at least one of the three groundwater samples. Chromium, iron, lead, and manganese were each detected among the three groundwater samples from Site 30 at concentrations which exceeded either federal or state standards for total inorganics. None of these positive detections, in excess of either federal or state standards, were above Base-specific background levels.

During the second sampling round, chloroform was once again detected in a groundwater sample obtained from 30-GW01. No other VOCs were detected.

During the second sampling round, ten total inorganics were detected in at least one shallow groundwater sample from Site 30. Eight dissolved inorganics were also detected within at least one of the nine groundwater samples. Iron was detected during the second sampling round at a concentration in excess of the state standard, based on total inorganics analyses.

Eleven total inorganics were positively identified in the surface water samples submitted for laboratory analysis from Frenchs Creek. Lead and mercury were the only inorganics identified at concentrations in excess of either chronic screening values or state standards. Further, VOCs and SVOCs were not detected in any of the surface water samples.

VOCs were not detected among the six sediment samples retained for analysis from Frenchs Creek. The SVOC BEHP was detected in two Frenchs Creek sediment samples. Both detections were in excess of the 1,200 µg/Kg laboratory contaminant level. Sixteen inorganics were detected in at least one of the six sediment samples from Frenchs Creek. No inorganics concentrations among the six sediment samples exceeded screening values.

The potential noncancerogenic and carcinogenic risks associated with exposure to subsurface soil, surface water, and sediment for the receptors evaluated at this site were within acceptable levels.

The red-cockaded woodpecker is known to inhabit Site 30. However, the potential
adverse impacts to these protected species are expected to be low since the terrestrial food chain model did not show an adverse risk to the bird.

- Three inorganics were detected in the surface water at concentrations that may decrease the integrity of the aquatic community. However, because the concentrations of these inorganics were higher in the upstream station than in the downstream stations, they do not appear to be site related. No COPCs detected in the sediments exceeded any of the sediment aquatic reference values. Therefore, there does not appear to be a significant risk to aquatic receptors from site-related COPCs.

- No contaminants detected in the surface soils were retained as COPCs. In addition, the quotient index (QI) for the terrestrial food chain model was greater than the acceptable QI limit of 1.0 for only one species. The QI for the raccoon, 1.72, was slightly greater than 1.0. Therefore, there does not appear to be a significant risk to the terrestrial receptors from site-related COPCs.

### 6.0 SUMMARY OF SITE RISKS

As part of the RI, a human health RA and an ecological RA were conducted for Sites 1, 28, and 30. These RAs were conducted to evaluate the potential risks associated with COPCs detected at each site. The following subsections briefly describe the results of the RAs. The RI report contains more extensive information pertaining to the RAs.

#### 6.1 Site 1 - Human Health Risk Assessment

The human health RA investigated three environmental media at Site 1: surface soil, subsurface soils, and groundwater. Table 4 lists the COPCs that were evaluated for each of these media. (Surface water and sediment samples were collected from a drainage ditch at Site 1. However, this ditch did not represent a classifiable surface water body used for human consumption or recreation nor did it represent an ecological habitat. Consequently, the surface water and sediment samples were removed from the risk evaluation.)

Under the current exposure scenario, on-site military personnel were assumed to be the potential receptors. Under the future exposure scenario, future residents (both children and adults) and future construction workers were assumed to be the potential receptors. Exposure to soil via ingestion, dermal contact, and inhalation was analyzed for military personnel; exposure to soil via ingestion, dermal contact, and inhalation was analyzed for future construction workers; and exposure to soil and groundwater via ingestion, dermal contact, and inhalation was analyzed for future residents.

Table 5 presents the incremental cancer risk (ICR) values and the hazard index (HI) values that were generated for each COPC during the RA. ICR values indicate carcinogenic risk and HI values indicate noncarcinogenic risk. USEPA considers ICR values between or less than a 1x10^-4 to 1x10^-6 range, and HI values less than 1.0, to be generally acceptable and protective of human health and the environment. On Table 5, ICR and HI values that exceeded these acceptable limits are shaded.

As shown on Table 5, the potential risks (carcinogenic and noncarcinogenic) associated with exposure to the surface soil and subsurface soil COPCs were within acceptable limits. Therefore, soil was not determined to be a medium of concern at Site 1. However, there were some potential future risks associated with ingestion of the groundwater COPCs that exceeded acceptable limits. The potential noncarcinogenic risks from groundwater were calculated to be 17.3 and 7.6 for the child and adult receptors, respectively. These values exceeded the acceptable level of 1.0. In addition, the potential carcinogenic risk from groundwater was calculated to be 1.7x10^-4 for the adult receptor. This risk exceeded the acceptable range of 1x10^-4 to 1x10^-6. Arsenic and manganese were the primary COPCs contributing to these risks. As a result, groundwater was considered a medium of concern at the site.

Although arsenic and manganese in the groundwater created some potential risk if ingested by future residents, it is important to keep in perspective the way in which this risk was determined. The approach used was highly conservative. At Site 1, it was the future residential scenario that created risk. However, this scenario is unlikely to occur in the foreseeable future because Site 1 is actively being used as vehicle maintenance and equipment storage area.
In addition, ingestion of groundwater by future residents is unlikely to occur because shallow groundwater at Site 1 is not used as a potable water source.

In addition, upon comparison of arsenic and manganese levels in the groundwater to state and federal regulatory standards, only manganese exceeded its standard. Thus, although both arsenic and manganese contributed to the site risks, arsenic did not exceed regulatory standards. This indicates the highly conservative nature of the human health RA.

Another factor to consider is that the levels of arsenic and manganese used to calculate groundwater exposure risks were primarily taken from off-site wells. Also, concentrations at these off-site wells either did not exceed regulatory standards or exceeded the standards infrequently. Consequently, it is reasonable to assume that the risks associated with arsenic and manganese are over-estimations of the risk that actually exists.

6.2    Site 1 - Ecological Risk Assessment

In addition to the human health RA, an ecological RA was conducted for Site 1 during the RI. The purpose of the ecological RA was to determine if COPCs were adversely impacting the ecological integrity of aquatic and terrestrial communities on or adjacent to the site. The ecological RA also evaluated the potential effects of COPCs on sensitive environments including wetlands, protected species, and fish nursery areas. The following paragraphs describe the state of aquatic and terrestrial communities at Site 1 as determined in the ecological RA.

Within the boundaries of Site 1, there were no aquatic communities identified that would be exposed to site related COPCs. The only surface water feature in which aquatic communities could exist is the southern drainage ditch, but this ditch is dry most of the time. As a result, the assessment concluded that there is no ecological risk associated with aquatic communities.

Surface soil was the only environmental medium analyzed for terrestrial receptors. The surface soil COPCs evaluated are the same as the surface soil COPCs listed on Table 4, excluding 4,4'-DDE.

The only site related COPCs that could potentially affect terrestrial communities were inorganics. In particular, the presence of cadmium and chromium in surface soil indicated a slight potential for affecting terrestrial invertebrates and plants at the site. However, because the concentrations of these inorganics only slightly exceeded the literature values used to determine risk, cadmium and chromium were not expected to present a significant ecological risk. (Cadmium concentrations ranged from 0.62 to 2.0 mg/Kg which only slightly exceeds the literature value of 0.5 mg/Kg; chromium concentrations ranged from 1.5 to 13.1 mg/Kg which only slightly exceeds the literature value of 10 mg/Kg.)

Based on the terrestrial food chain model, there appeared to be a slight risk for deer, rabbit, fox, and quail receptors. However, this risk was expected to be insignificant because of the low levels by which terrestrial reference values were exceeded. The QI, a value which must be less than 1.0 for site conditions to be considered ecologically protective, was calculated to be less than 1.0 for all COPCs except manganese. The QI for manganese was 1.32 for the rabbit and 1.57 for the quail. However, because these QIs were less than 2.0, and because the site is located within a heavy industrial/commercial area where rabbits, quail, deer, etc. do not normally live, there is most likely only a small potential that the animals are being adversely affected by site conditions. Thus, the risk appears to be insignificant.

6.3    Site 29 - Human Health Risk Assessment

The human health RA investigated five environmental media at Site 28: surface soil, subsurface soil, groundwater, surface water, and sediment. Table 6 lists the COPCs that were evaluated for each of these media.

Under the current exposure scenario, on-site military personnel and residents (both children and adults) were assumed to be the potential receptors. Under the future exposure scenario, future residents (both children and adults) and future construction workers were assumed to be the potential receptors. Table 7 summarizes the exposure pathways that were analyzed for each potential receptor.
Tables 8, 9, and 10 present the ICR and HI values that were generated for the child receptor, the adult receptor, and the military/fisherman/construction worker receptors, respectively. USEPA considers ICR values between or less than the $1 \times 10^{-4}$ to $1 \times 10^{-6}$ range, and HI values less than 1.0, to be generally acceptable and protective of human health and the environment. On Tables 8, 9, and 10, ICR and HI values that exceeded these acceptable limits are shaded.

In the current case, potential noncarcinogenic and carcinogenic risks to the military personnel, recreational adult, and fisherman were within acceptable risk levels. For the current recreational child receptor, there was a potential noncarcinogenic risk from New River sediment. The noncarcinogenic risk from the ingestion pathway was 1.2, which is slightly greater than the acceptable risk level of 1.0. The COPC driving this noncarcinogenic risk was antimony.

In the future case, the total potential noncarcinogenic risk to the child receptor, 23, exceeded the acceptable risk level of 1.0. This risk was attributed to exposure to groundwater, surface soil, subsurface soil, and sediment from the New River. Antimony in the groundwater; antimony, arsenic, copper, and zinc in the subsurface soil; and antimony in the sediment were the COPCs driving this risk. Carcinogenic and noncarcinogenic risks to the potential adult residential receptor exceeded the USEPA acceptable risk range due to the exposure of contaminated groundwater. Risks to construction workers were within acceptable risk levels.

It is important to note that because the soil noncarcinogenic risks are segregated based on the effects on different target organs, the soil noncarcinogenic risk may be an overestimate. It also is important to note that the future exposure scenario was based on potential residential development of Site 28. At present, the site is a recreational/picnic area located within training areas on the base. It is highly unlikely that the site will become a residential area in the foreseeable future. Consequently, exposure to subsurface soil and groundwater under a residential scenario is highly conservative and unlikely given the present site conditions. It follows that the potential risks associated with this exposure scenario are conservative and may be overestimated values.

With respect to lead health impacts, use of the lead uptake biokinetic model indicated that exposure to surface soil, subsurface soil, and groundwater at this site generated blood lead levels in children that were within acceptable levels.

6.4 Site 28 - Ecological Risk Assessment

In addition to the human health RA, an ecological RA was conducted for Site 28 to assess potential ecological impacts associated with COPCs. The environmental media evaluated during the ecological RA included surface soil; surface water in the New River, Cogdels Creek, and Orde Pond; sediment in the New River, Cogdets Creek, and Orde Pond; and fish tissue, both fillet and whole body, in the New River and Orde Pond. Table 11 lists the COPCs evaluated for each of these environmental media.

Inorganics and pesticides appeared to be the most significant site related COPCs that could have the potential to affect the integrity of the aquatic receptors at Site 28. For the terrestrial receptors at Site 28, inorganics appeared to be the most significant site related COPC that could have the potential to affect their integrity. Although the American Alligator had been observed at Site 28, potential adverse impacts to this threatened or endangered specie were low due to the low levels of most contaminants in its critical habitat.

In the New River surface water, copper exceeded aquatic reference values but at levels that were indicative of a low potential for risk. In addition, the QIs for lead and zinc (2.8 and 4.2, respectively) only slightly exceeded the acceptable limit of 1.0 at a single station. Copper exceeded the surface water reference values in Cogdels Creek, and aluminum exceeded the surface water reference values in Orde Pond. However, these exceedences were only slightly above the reference values. As a result, the risk associated with surface water appears to be insignificant.

In the sediment, lead exceeded the sediment aquatic reference values only once in Cogdels Creek at a low level but exceeded its sediment aquatic reference values significantly in the New River at one station. Antimony exceeded its sediment aquatic reference values moderately at the same station in the New River. This station may be associated with runoff from the nearby active firing range. Therefore, the risk does not appear to be from site related sources. Pesticides
exceeded the sediment aquatic reference values throughout Cogdels Creek with the highest exceedences in the lower reach of the creek near the confluence with the New River. These exceedences represented a moderate potential for risk to aquatic receptors. However, Cogdels Creek receives runoff from several other sites at MCB, Camp Lejeune so the risk does not appear to be entirely related to a source at Site 28. Also, pesticide levels detected in the sediment may be a result of routine pesticide application in the general vicinity of Site 28, especially near the STP and recreational area.

Results of the analysis of benthic macroinvertebrates and fish populations indicated that Cogdels Creek and the New River support an aquatic community that is representative of a tidally-influenced freshwater and estuarine ecosystem with both freshwater and marine species. The absence of pathologies in the fish indicated that the surface water and sediment quality did not adversely impact the fish community. The benthic community demonstrated the typical tidal/freshwater species trend of primarily chironomids and oligochaetes in the upper reaches of Cogdels Creek and polychaetes and amphipods in the lower reaches of Cogdels Creek and in the New River. Species representative of both tolerant and intolerant taxa were present, and the overall community composition did not indicate a benthic community adversely impacted by surface water and sediment quality.

During the habitat evaluation, no areas of vegetation stress or gross impacts from site contaminants were noted. Based on the soil toxicity data for several inorganics (cadmium, chromium, copper, manganese, nickel, and zinc) these constituents at Site 28 may decrease the integrity of terrestrial invertebrates or plants at the site. Based on the evaluation of the rabbit, raccoon, and quail receptors, there did appear to be an ecological risk to terrestrial vertebrate receptors. However, the QIs for the rabbit, raccoon, and quail were 58.1, 1.46, and 65.9, respectively, which only slightly exceeded the acceptable limit of 1.0. Thus, the risk appears to be insignificant.

6.5 Site 30 - Human Health Risk Assessment

For the human health RA at Site 30, the environmental media of concern were surface soil, subsurface soil, groundwater, surface water, and sediment. No COPCs were identified for surface soil or groundwater. However, COPCs for subsurface soil, surface water, and sediment were identified and evaluated. Table 12 lists these COPCs. In addition, Table 13 summarizes the exposure dose input parameters used during the human health RA.

Table 14 presents the ICR and HI values generated for Site 30. The noncarcinogenic risk values did not exceed the acceptable level of 1.0; the carcinogenic risk values did not exceed the acceptable level of 1x10^-4. As a result, unacceptable carcinogenic and noncarcinogenic risks did not appear to exist at Site 30, and the site conditions appear to be protective of human health and the environment. When carcinogenic and noncarcinogenic values do not exceed the acceptable levels, a "no action" plan (i.e., leaving the site as is; taking no further remedial actions) may be justifiable. Based on the carcinogenic and noncarcinogenic risk values for Site 30, no remedial actions are required.

6.6 Site 30 - Ecological Risk Assessment

The media of concern that were evaluated during the ecological RA include surface water, sediment, and surface soil. The COPCs evaluated for these media are the same as the human health COPCs listed on Table 12, with the addition of iron in the surface water and copper and iron in the sediment.

At Site 30, inorganics in surface water appeared to be the only site related COPCs that had the potential to impact aquatic communities. These inorganics included aluminum, lead, and mercury. However, the concentrations of these surface water inorganics were higher in the upstream sampling locations than in the downstream sampling locations. As a result, these inorganics did not appear to be site related and did not warrant a remedial action at Site 30. In sediment, COPCs were not detected at concentrations that could potentially impact aquatic communities.

COPCs in surface soil were not retained for the ecological RA evaluation, so surface soil did not appear to impact terrestrial communities. Based on the terrestrial food chain model, one COPC, manganese, had a very small potential to affect raccoons. The QI for the raccoon was 1.72 which only slightly exceeds the acceptable limit of 1.0. However, the model indicated that no
other terrestrial species were being adversely impacted by COPCs at the site. Therefore, there
did not appear to be a significant risk to terrestrial communities from site related COPCs.
Furthermore, remedial actions did not appear to be necessary in order to protect the integrity
of terrestrial communities.

Several threatened and/or endangered species are known to inhabit MCB; Camp Lejeune. The
red-cockaded woodpecker, in particular, is known to inhabit the area of Site 30. However, the
ecological RA conducted for terrestrial communities did not identify any significant risks
within the habitats that these protected species are likely to exist. Therefore, the "no action"
plan may be justifiable with respect to ecological concerns.

7.0 DESCRIPTION OF ALTERNATIVES

In the process of selecting a response action for OU No. 7, remedial action alternatives (RAAs)
were developed for the contaminated media at each site. Five RAAs were developed for groundwater
at Site 1:

- RAA No. 1 - No Action
- RAA No. 2 - Institutional Controls
- RAA No. 3 - Extraction and On-Site Treatment
- RAA No. 4 - In-Well Aeration and Off-Gas Carbon Adsorption
- RAA No. 5 - Extraction and Off-Site Treatment

Two RAAs were developed for groundwater at Site 28:

- RAA No. 1 - No Action
- RAA No. 2 - Institutional Controls

Alternatives employing active treatment of the groundwater COPCs were not developed for Site 28
due to the nature of the COPCs, manganese and lead. Manganese appears to naturally occur at high
levels in the region, and lead was only detected at concentrations above state and federal
standards in one of nine samples (in the unfiltered sample, not the filtered sample). This is
strong evidence that manganese and lead are not site related contaminants. Based on this
evidence, the decision was made not to develop active treatment alternatives. However, because
Site 28 is used as a recreational area, a no action alternative and an institutional controls
alternative were developed to ensure adequate protection of human health.

For Site 30, one RAA, the no action alternative, was developed.

The following subsections briefly describe the RAAs developed for each site. The FS report
contains more detailed information pertaining to the RAAs.

7.1 Site 1 Alternatives

- Site 1: RAA No.1 - No Action
  
  Capital Cost: $0
  
  Annual Operation and Maintenance (O&M) Costs: $0
  
  Net Present Worth (NPW): $0
  
  Time to Implement: None

Under the no action RAA, no additional remedial actions will be performed to reduce the
toxicity, mobility, or volume of the groundwater AOC. The no action alternative is required by
the NCP to provide a baseline for comparison with other remedial action alternatives that
provide a greater level of response.

Although this RAA does not involve active remediation, passive remediation of the groundwater
may occur over time via natural attenuation processes. These processes include naturally
occurring biodegradation, volatilization, dilution, photolysis, leaching, adsorption, and
chemical reactions between subsurface materials.

Since COPCs will remain at the site under this RAA, the NCP requires the lead agency to review
the effects of this alternative no less often than once every five years.
Site 1: RAA No. 2 - Institutional Controls

- Capital Cost: $0
- Annual O&M Costs: $40,000
- NPW: $600,000
- Time to Implement: 6 months

Under RAA No. 2, no remedial actions will be performed to reduce the toxicity, mobility, or volume of the groundwater AOC at Site 1. Instead, the following institutional controls will be implemented: a long-term groundwater monitoring plan, aquifer-use restrictions, and deed restrictions. Under the groundwater monitoring plan, samples will be collected semiannually from eight existing shallow monitoring wells, one existing deep monitoring well, and water supply well HP-638, and analyzed for VOCs. Thirty years of monitoring was assumed for cost estimating purposes.

The continued groundwater monitoring will detect any improvement or deterioration in groundwater quality at the site, and will monitor the movement of the plume. The aquifer-use restrictions will prohibit the groundwater from being used as a potable water source, and the deed restrictions will limit the future use of land at Site 1, including placement of wells.

Although this RAA does not involve active remediation, passive remediation of the groundwater may occur over time via natural attenuation processes. These processes include naturally occurring biodegradation, volatilization, dilution, photolysis, leaching, adsorption, and chemical reactions between subsurface materials.

Because COPCs will remain on site under RAA No. 2, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

Site 1: RAA No. 3 - Extraction and On-Site Treatment

- Capital Cost: $990,000
- Annual O&M Costs: $70,000
- NPW: $2,100,000
- Time to Implement: 18 months

RAA No. 3 is a source collection and treatment alternative. Under RAA No. 3, three extraction wells will be installed to pump groundwater from the surficial aquifer to the ground surface. The collection system will be designed so that the radii of influence of these wells will intercept the AOC and provide a hydraulic barrier if the AOC migrates in the direction of groundwater flow (northwest). After being extracted, the groundwater will receive treatment at an on-site treatment plant. Treatment will include air stripping for VOC (i.e., TCE) removal, and precipitation, flocculation, sedimentation, and filtration for suspended solids/inorganics removal. The treated groundwater will be discharged off site to Cogdels Creek.

The exact time required for this pump and treat alternative to remediate the aquifer is unknown given the overall complexity and uncertainty associated with groundwater remediation. However, 30 years of system operation was assumed for cost estimating purposes.

In addition to extraction, treatment, and discharge, RAA No. 3 incorporates a long-term groundwater monitoring plan to measure the effects of the remedial action alternative. Wells included under this plan will be monitored semiannually for VOCs. Also, deed restrictions and aquifer-use restrictions will be implemented under this RAA.

Until the remediation levels are met, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

Site 1: RAA No. 4 - In Well Aeration and Off-Gas Carbon Adsorption

- Capital Cost: $640,000
- Annual Groundwater Monitoring O&M Costs: $40,000
- Annual System O&M Costs: $20,000
- NPW: $1,300,000
- Time to Implement: 12 months
In-well aeration is a type of air sparging in which air is injected into a well creating an in-well air-lift pump effect. This pump effect causes the groundwater to flow in a circulation pattern: into the bottom of the well and out of the top of the well. As the groundwater circulates through the well, the injected air stream strips volatiles. (As a result, in-well aeration is often referred to as in-well air stripping.) The volatiles are captured at the top of the well and treated via a carbon adsorption unit.

Under RAA No. 4, four in-well aeration wells will be installed along the lengthwise extent of the plume. The radius of influence of each well is expected to be approximately 120 to 160 feet. Thus, the wells will intercept the contaminated plume as it travels in the direction of groundwater flow.

A separate vacuum pump, knockout tank, and carbon adsorption unit will be located near the opening of each aeration well. The knockout tank will remove any liquids that have traveled up the well and the carbon adsorption unit will treat off-gases that were stripped within the well. Treated vapors from the carbon adsorption unit will be discharged to the atmosphere.

Because in-well aeration is a relatively new and innovative technology, a field pilot test is recommended prior to initiating the system design. The pilot test will determine the loss of efficiency over time as a result of inorganics precipitation and oxidation on the well screen, the radius of influence of the aeration wells under various heads of injection air pressure, the rate of off-gas organic contaminant removal via carbon adsorption, and carbon breakthrough times.

The exact time required for the in-well aeration system to remediate the aquifer is unknown given the overall complexity and uncertainty associated with groundwater remediation. However, 3 years of system operation was assumed for cost estimating purposes.

In addition to the in-well aeration system, RAA No. 4 incorporates a long-term groundwater monitoring plan to measure the effects of the remedial action alternative. Wells included under this plan will be monitored semiannually for VOCs. Also, deed restrictions and aquifer-use restrictions will be implemented under this RAA.

Until the remediation levels are met, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

- Site 1: RAA No. 5 - Extraction and Off-Site Treatment

  Capital Cost: $500,000  
  Annual Groundwater Monitoring O&M Costs: $40,000  
  Annual System O&M Costs: $130,000  
  NPW: $1,400,000  
  Time to Implement: 18 months

RAA No. 5 is another source collection and treatment alternative. Under RAA No. 5, three extraction wells will be installed to pump groundwater from the surficial aquifer to the ground surface. The radii of influence of these wells will intercept the AOC and provide a hydraulic barrier if the AOC migrates in the direction of groundwater flow. Once groundwater is extracted, it will be transported to the HPIA Treatment System, an existing treatment system that is located within Site 78 (the HPIA operable unit) at MCB, Camp Lejeune. Although the system is currently treating VOC contaminated groundwater from Site 78, it has the capacity to accept more. The groundwater will be transported to the system by tanker trucks. At the HPIA Treatment System, the groundwater will receive VOC and inorganics treatment via air stripping, carbon absorption, and suspended solids/metals pretreatment.

The exact time for the pump and treat system to remediate the aquifer is unknown given the overall complexity and uncertainty associated with groundwater remediation. However, 30 years of system operation was assumed for cost estimating purposes.

In addition, RAA No. 5 will incorporate a long-term groundwater monitoring plan to measure the effects of the remedial action alternative. Wells included under this plan will be monitored semiannually for VOCs. Also, deed restrictions and aquifer-use restrictions will be implemented under this RAA.
Until the remediation levels are met, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

7.2 Site 28 Alternatives

- Site 28: RAA No. 1 - No Action

  Capital Cost: $0
  Annual O&M Costs: $0
  NPW: $0
  Time to Implement: None

Under the no action RAA, no additional remedial actions will be performed to reduce the toxicity, mobility, or volume of the groundwater VOCs. The no action alternative is required by the NCP to provide a baseline for comparison with other remedial action alternatives that provide a greater level of response.

Since COPCs will remain at the site under this RAA, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

- Site 28: RAA No. 2 - Institutional Controls

  Capital Cost: $0
  Annual O&M Costs: $50,000
  NPW: $800,000
  Time to Implement: 6 months

Under RAA No. 2, no additional remedial actions will be performed to reduce the toxicity, mobility, or volume of the groundwater VOCs. Instead, the following institutional controls will be implemented: a long-term groundwater monitoring program, aquifer-use restrictions preventing the use of the aquifer as a potable water source, and deed restrictions prohibiting the future construction of potable water supply wells. Under the groundwater monitoring program, samples will be collected semiannually (at five existing shallow wells and two existing deep wells) and analyzed for semivolatiles and metals. Thirty years of monitoring was assumed for cost estimating purposes.

Since COPCs will remain at the site under this RAA, the NCP requires the lead agency to review the effects of this alternative no less often than once every five years.

7.3 Site 30 Alternatives

- Site 30: No Action Alternative

  Capital Cost: $0
  Annual O&M Costs: $0
  NPW: $0
  Time to Implement: None

Under the no action RAA, no additional remedial actions will be performed at Site 30. Conditions at the site appear to be protective of human health and the environment so the lead agency will not be required to review the effects of this alternative every five years.

8.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

In the process of selecting a response action for OU No. 7, the RAAs for Sites 1 and 28 were comparatively analyzed. (A comparative analysis was not conducted for Site 30 since only one alternative was developed.) This section summarizes the comparative analysis which was based on nine evaluation criteria: overall protectiveness of human health and the environment; compliance with applicable and relevant or appropriate requirements (ARARs); long-term effectiveness/permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost; USEPA/state acceptance; and community acceptance. Table 15 provides definitions of these evaluation criteria, Table 16 summarizes the Site 1 RAA analysis, and Table 17 summarizes the Site 28 RAA analysis.
8.1 Site 1

8.1.1 Overall Protection of Human Health and the Environment

RAA No. 1, the no action alternative, does not reduce potential risks to human health and the environment except possibly through natural attenuation of the groundwater AOC. On the other hand, RAA Nos. 2, 3, 4, and 5 all provide some means, other than natural attenuation, for reducing potential risks. RAA Nos. 2, 3, 4, and 5 involve institutional controls which will reduce risks. In addition, RAA Nos. 3, 4, and 5 involve active remediation systems (groundwater extraction/on-site treatment, in-well aeration, and groundwater extraction/off-site treatment) which provide additional protection to human health and the environment. However, the additional protection that RAA Nos. 3, 4, and 5 provide through active remediation systems may not be necessary considering the minimal risks associated with the groundwater AOC.

If the contaminated plume is left alone to passively remediate via natural attenuation, the residual risk that remains will be minimal for the following reasons:

- TCE was detected at low concentrations, 8 $\text{lg/L}$ and 27 $\text{lg/L}$, that only slightly exceed the remediation level of 5 $\text{lg/L}$. These low groundwater concentrations, in addition to non-detectable levels in the soil, indicate that there is no significant source of TCE at the site. Instead, the TCE is most likely the result of random, isolated spills.

- Based on the results of an analytical model for solute transport in groundwater, VOCs at Site 1 do not currently impact the nearest receptor, a former water supply well that is currently inactive.

- Vinyl chloride was detected at a low concentration, 4 $\text{lg/L}$, which only slightly exceeds the state standard of 0.015 $\text{lg/L}$ and the federal standard of 2 $\text{lg/L}$. Based on this low concentration, and the fact that vinyl chloride was detected at only one well, it does not appear that there is a significant source of vinyl chloride at the site.

Considering the minimal risks associated with the contaminated groundwater, institutional controls (RAA No. 2) will be adequate for protecting human health and the environment. Groundwater extraction and treatment (RAA Nos. 3 and 5) and in-well aeration (RAA No. 4) will be unnecessary to provide adequate protection. No action, however, provides no protection. Therefore, RAA No.1 may be inferior to the other four alternatives, and RAA Nos. 3, 4, and 5 may overcompensate for the minor risks that exist at the site.

8.1.2 Compliance with ARARs

Under all five RAAs, the groundwater AOC is expected to eventually meet federal and state chemical-specific ARARs. Under RAA Nos. 1 and 2, contaminants are expected to meet ARARs via passive remediation (or natural attenuation). Under RAA Nos. 3, 4, and 5, contaminants are expected to meet ARARs via active remediation (extraction/treatment or in-well aeration).

RAA Nos. 3, 4, and 5 can be designed to meet all of the location- and action-specific ARARs that apply to them. No location- or action-specific ARARs apply to RAA Nos. 1 and 2.

8.1.3 Long-Term Effectiveness and Permanence

Because all five RAAs involve some form of remediation, whether it is active or passive, they are all expected to be effective at decreasing COPC levels in the long run. In addition, the results of all RAAs are expected to be permanent.

Although residual risks associated with untreated COPCs will be minimal, RAA No. 1 is the only alternative that will allow residual risk to remain uncontrolled at the site. RAA Nos. 2, 3, 4, and 5 involve long-term groundwater monitoring plans, aquifer-use restrictions, and deed restrictions, which are all adequate and reliable controls; RAA No. 1 involves no controls. As a result, RAA Nos. 2, 3, 4, and 5 can mitigate the potential for human health exposure through the use of institutional controls, but RAA No. 1 cannot. However, the adequacy and reliability of institutional controls depends on their continued implementation and enforcement.
Under all five RAAs, untreated contaminants will remain at the site indefinitely. As a result, all five RAAs require 5-year reviews to ensure that adequate protection of human health and the environment is maintained. Under RAA Nos. 3, 4, and 5, however, this review will not be necessary once the remediation levels are achieved.

8.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

RAA Nos. 1 and 2 do not involve active treatment processes so these alternatives will only reduce toxicity, mobility, or volume of the AOC via passive remediation. RAA Nos. 3, 4, and 5, however, involve extraction/treatment and in-well aeration so they will reduce the toxicity, mobility, and volume of the AOC via active remediation. (RAA Nos. 3, 4, and 5 satisfy the statutory preference for treatment.)

There are no treatment residuals associated with RAA Nos. 1 and 2. Under RAA Nos. 3, 4, and 5, however, active treatment processes will create residuals like metals sludge, spent carbon, and contaminated condensed vapor. These additional residuals will require proper disposal.

8.1.5 Short-Term Effectiveness

All five RAAs are expected to reduce COPC levels. However, RAA Nos. 3, 4, and 5 will create the most risk during implementation. Risks to the community and workers will be increased during extraction well, aeration well, piping, and treatment plant installation and operation. RAA No. 2 creates some minor risks associated with groundwater sampling, but these are insignificant compared to the risks associated with RAA Nos. 3, 4, and 5. Implementation of RAA No. 1 will create no risks.

The exact time required for the RAAs to remediate the aquifer is unknown given the complexity and uncertainty associated with groundwater remediation. However, the time in which RAA Nos. 3 and 5 are expected to achieve the remedial action objectives is relatively large compared to RAA No. 4. The relative amount of time required for natural attenuation to restore the aquifer (i.e., RAA Nos. 1 and 2) is expected to be much greater than the time required for RAA Nos. 3, 4, and 5. Regardless, all RAAs, with the exception of the no action alternative, involve continued groundwater monitoring for 30 years.

8.1.6 Implementability

RAA No. 1 is the most implementable, if not the most effective, alternative. RAA Nos. 2, 3, and 5 use conventional, well-demonstrated, and commercially available technologies so these RAAs are proven to be implementable and reliable. RAA No. 4 (in-well aeration), however, involves an emerging technology that does not have an extensive commercial track record. A field pilot test is necessary to determine this alternative's implementability. Regardless, RAA Nos. 3, 4, and 5 create more risk than RAA No. 2 during implementation.

8.1.7 Cost

In terms of NPW, the no action alternative (RAA No. 1) would be the least expensive RAA to implement, followed by RAA No. 2, RAA No. 4, RAA No. 5, and then RAA No. 3. The estimated NPW values in increasing order are $0 (RAA No. 1), $600,000 (RAA No. 2), $1,300,000 (RAA No. 4), $1,400,000 (RAA No. 4), and $2,100,000 (RAA No. 3).

8.1.8 USEPA/State Acceptance

To be addressed following USEPA/NC DEHNR review of the ROD.

8.1.9 Community Acceptance

To be addressed following the public comment period.

8.2 Site 28

8.2.1 Overall Protection of Human Health and the Environment

RAA No. 1, the no action alternative, does not reduce potential risks to human health and the
environment. On the other hand, RAA No. 2 does reduce potential risks because it involves institutional controls that can prevent future exposure to the groundwater.

Regardless, the magnitude of residual risks is considered to be minimal. The groundwater COPCs exceeding remediation levels, lead and manganese, do not pose substantial risks to human health or the environment for the following reasons:

- Manganese concentrations (from both unfiltered and filtered samples) in groundwater at MCB, Camp Lejeune often exceed the state and federal secondary standard of 50 μg/L. Elevated manganese levels, at concentrations above the state standard, were reported in samples collected from a number of Base potable water supply wells. Manganese concentrations at several Site 28 wells exceeded the state standard, and all but one sample fell within the range of concentrations for samples collected elsewhere at MCB, Camp Lejeune.

- Lead was detected above its remediation level at only one well. This well, which is situated in an area of loosely compacted fill material, exhibited high turbidity (above 10 turbidity units) and total suspended solids (111 mg/L). In addition, lead was only detected in the unfiltered water sample, not the filtered water sample, taken at this well. All of this information suggests that the high lead concentration detected may be the result of suspended solids, and the unfiltered sample represented lead in the soil and groundwater, not just the amount of lead that is dissolved in the groundwater.

Considering the minimal risks associated with lead and manganese in the groundwater, institutional controls (RAA No.2) will be adequate for protecting human health and the environment. No action, however, provides no protection.

8.2.2 Compliance with ARARs

Under RAA Nos. 1 and 2, manganese levels are expected to exceed their chemical-specific ARARs. However, this is not a great concern because manganese at the Base appears to naturally occur at levels exceeding ARARs. Lead, however, is not expected to exceed ARARs because the high lead detection is believed to be the result of suspended solids in the unfiltered water sample.

No location- or action-specific ARARs apply to RAA Nos. 1 and 2.

8.2.3 Long-Term Effectiveness and Permanence

RAA No. 1 allows the most residual risk, and RAA No. 2 allows less residual risk. Regardless, the magnitude of any residual risk will be minimal for the three reasons stated earlier.

RAA No. 2 involves monitoring, aquifer-use restrictions, and deed restrictions, which are all adequate and reliable controls; RAA No. 1 involves no controls. As a result, RAA No. 2 can mitigate the potential for groundwater exposure, but RAA No. 1 cannot. Also, the effectiveness of RAA No. 2 can be determined more often than the effectiveness of RAA No. 1.

Both RAAs require 5-year reviews to ensure that adequate protection of human health and the environment is maintained.

8.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

RAA Nos. 1 and 2 do not involve active treatment processes so these alternatives will not reduce toxicity, mobility, or volume of the groundwater AOC. Additionally, neither RAA satisfies the statutory preference for treatment.

8.2.5 Short-Term Effectiveness

Implementation of RAA Nos. 1 and 2 will not increase risks to the community. RAA No. 1 will not increase risks to workers, but RAA No. 2 will. RAA No. 2, however, will not significantly increase worker risks because worker protection will be utilized during groundwater sampling. In addition, groundwater sampling has been successfully implemented in the past with minimal worker risks.
No additional environmental impacts are expected under RAA Nos. 1 and 2.

8.2.6 Implementability

RAA No. 1 is the most implementable, if not the most effective, alternative. RAA No. 2 is not as implementable as RAA No. 1, but it is still easily implementable. RAA No. 2 involves conventional, well-demonstrated, and commercially available technologies, and it has been easily implemented in the past.

Unlike RAA No. 1, RAA No. 2 requires the submission of semiannual sampling reports. RAA No. 1 requires no coordination with agencies.

8.2.7 Cost

In terms of NPW, the no action alternative (RAA No. 1) would be the least expensive RAA to implement, followed by RAA No. 2. The estimated NPW values in increasing order are $0 (RAA No. 1) and $800,000 (RAA No. 2).

8.2.8 USEPA/State Acceptance

To be addressed following USEPA/NC DEHNR review of the ROD.

8.2.9 Community Acceptance

To be addressed following the public comment period.

9.0 SELECTED REMEDY

This section of the ROD presents the selected remedy for OU No. 7. A description of the selected remedy is presented along with the estimated costs to implement the remedy. In addition, the remediation levels to be attained at the conclusion of the remedy are discussed.

9.1 Remedy Description

The selected remedy for OU No. 7 consists of the three separate remedies developed for Sites 1, 28, and 30:

9.1.1 Site 1 Remedy - Institutional Controls (RAA No. 2)

- A long-term groundwater monitoring plan that is depicted in Figure 7. As shown, eight wells will be sampled semiannually and the samples will be analyzed for VOCs.
- Aquifer use restrictions that will prohibit the future use of the aquifer as a potable water source. The restrictions will be implemented via the Base Master Plan.
- Deed restrictions that will limit the future use of land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan.

9.1.2 Site 28 Remedy - Institutional Controls (RAA No. 2)

- A long-term groundwater monitoring plan that is depicted in Figure 8. As shown, six wells will be sampled semiannually and the samples will be analyzed for lead and manganese.
- Aquifer use restrictions that will prohibit the future use of the aquifer as a potable water source. The restrictions will be implemented via the Base Master Plan.
- Deed restrictions that will limit the future use of land at the site, including placement of wells. The restrictions will be implemented via the Base Master Plan.

9.1.3 Site 30 Remedy - No Action

The selected remedy for Site 30 is the "no action" plan. The "no action" plan involves taking no
further remedial actions (this includes conducting no further environmental investigations or sampling) at the site. The site and all of the environmental media located within the site will remain as they currently are.

9.2 Estimated Costs

The following costs were estimated for the Sites 1, 28, and 30 remedies:

<table>
<thead>
<tr>
<th>Site</th>
<th>Capital Cost</th>
<th>Annual O&amp;M</th>
<th>NPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>$0</td>
<td>$40,000</td>
<td>$600,000</td>
</tr>
<tr>
<td>Site 28</td>
<td>$0</td>
<td>$30,000</td>
<td>$500,000</td>
</tr>
<tr>
<td>Site 30</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

The following total cost was estimated for the OU No. 7 remedy (the cost for the OU No. 7 remedy is the costs of the Sites 1, 28, and 30 remedies combined):

<table>
<thead>
<tr>
<th>Total for OU No. 7</th>
<th>Capital Cost</th>
<th>Annual O&amp;M</th>
<th>NPW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$0</td>
<td>$70,000</td>
<td>$1,100,000</td>
</tr>
</tbody>
</table>

9.3 Remediation Levels

Although an operation period of 30 years was assumed for cost estimations, the selected remedy will actually be operated until the remediation levels developed in the FS are met. The following paragraphs describe the remediation levels for Sites 1 and 28. (Remediation levels were not developed for Site 30 because site conditions were determined to be protective of human health and the environment.)

9.3.1 Site 1

The remediation level for TCE in groundwater is 5.0 \( \text{mg/L} \). This remediation level is based on the North Carolina state water quality standard.

Since the selected remedy does not involve active remediation, the remediation levels are expected to be achieved via passive remediation, or natural attenuation processes. The long-term groundwater monitoring plan will indicate when the remediation level has been achieved.

9.3.2 Site 28

The remediation levels for lead and manganese in groundwater are 15 \( \text{mg/L} \) and 50 \( \text{mg/L} \), respectively. These remediation levels are based on North Carolina state water quality standards.

The long-term groundwater monitoring plan will indicate when lead has achieved its remediation level. In the case of manganese in the groundwater, however, the remediation level will probably never be achieved because this inorganic appears to naturally occur at high levels at MCB, Camp Lejeune.

10.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 121 which include: (1) protect human health and the environment; (2) comply with ARARs; (3) achieve cost-effectiveness; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The evaluation of how the remedy for OU
No. 7 satisfies these requirements is presented below.

10.1 Protection of Human Health and the Environment

Institutional controls will provide protection to human health by preventing exposure to potential contaminants in the groundwater at Sites 1 and 28. Institutional controls prevent human exposure because they prohibit the surficial aquifer from being used as a potable water source, and they prohibit the placement of wells within the aquifer.

The selected remedies will not provide any additional protection to the environment. However, based on the ecological risk assessment for Sites 1 and 28, risks for aquatic and terrestrial receptors appear to be insignificant. At Site 1, there were no ecological risks for aquatic receptors and ecological risks for terrestrial receptors only slightly exceeded acceptable limits. In addition, Site 1 is located within a heavy industrial/commercial area where terrestrial receptors do not normally live. At Site 28, risks for aquatic receptors from surface water and sediment only slightly exceeded acceptable limits. In addition, sediment in the New River appears to be affected by a nearby active firing range rather than an on site source, and surface water and sediment in Cogdels Creek appear to be affected by runoff from other sites in addition to Site 28. Also, pesticides in the sediment appear to be the result of routine pesticide application in the general vicinity of Site 28. Although there was an ecological risk for terrestrial receptors at Site 28, the risk only slightly exceeded acceptable limits so it appears to be insignificant.

Based on these low ecological risks, additional protection to the environment was determined to be unnecessary at Sites 1 and 28.

At Site 30, the no action alternative will be protective because the site conditions already appear to be protective of human health and the environment. There were no unacceptable risks to human health and the slight risk generated for raccoons at the site appears to be insignificant.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedies for Sites 1 and 28 will allow potential contaminants to remain untreated at levels exceeding chemical-specific ARARs. However, natural attenuation is expected to eventually reduce TCE levels at Site 1 to below chemical-specific ARARs. In addition, lead in the groundwater at Site 28 appears to be the result of suspended solids in the total inorganics sample. As a result, lead is expected to meet its chemical-specific ARARs during the execution of the long-term groundwater monitoring program. Manganese in the groundwater at Site 28, however, may never meet it chemical-specific ARARs because it appears to naturally occur at the Base at levels exceeding ARARs.

At Site 30, constituents detected in the environmental media already comply with chemical-specific ARARs.

The selected remedies for Sites 1 and 28 can be designed to meet all location- and action-specific ARARs that apply to them. No location- or action-specific ARARs apply to the no action alternative for Site 30.

10.3 Cost-Effectiveness

Aquifer use and deed restrictions provide a cost-effective remedy since there are no significant costs associated with their implementation other than administrative-type efforts. Groundwater monitoring programs are also cost-effective. Compared to the more costly alternatives that employ groundwater treatment, the selected remedies are more cost-effective because they provide a comparable level of protection. Compared to the no action alternatives, the selected remedies are more cost-effective because they provide at least some protection which is necessary at Sites 1 and 28.

There are no costs associated with the no action alternative for Site 30. As a result, this alternative is considered to be cost-effective.

10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies
The selected remedies will provide permanent, long-term remedies through the provision and enforcement of aquifer and deed restrictions in the Base Master Plan. However, the selected remedies do not employ alternative treatment technologies.

At Site 1, alternative treatment technologies were not selected because the risks associated with TCE in the groundwater appear to be minimal. TCE was detected at low concentrations (maximum of 27 \( \text{mg/L} \)) that only slightly exceeded the remediation level (5 \( \text{mg/L} \)). In addition, TCE was not detected in the soil so there does not appear to be a significant site-related TCE source. Also, based on an analytical model for solute transport in groundwater, VOCs at Site 1 do not currently impact the nearest receptor, a former water supply well that is currently inactive. Vinyl chloride was detected at a concentration (4 \( \text{mg/L} \)) that slightly exceeded state and federal standards (0.015 and 2 \( \text{mg/L} \), respectively). But based on this low detected concentration, and the fact that vinyl chloride was only detected in one well at the site, there does not appear to be a significant source of vinyl chloride at the site. Based on these minimal risks, alternative treatment technologies were deemed unnecessary for Site 1.

At Site 28, alternative treatment technologies were not selected because the risks associated with manganese and lead appear to be minimal. Manganese concentrations at the Base appear to naturally occur at levels exceeding the remediation level; lead was considered to be the result of high suspended solids in the one well it was detected in.

At Site 30, alternative treatment technologies were not considered because site conditions appear to be protective of human health and the environment.

10.5 Preference for Treatment as a Principal Element

The selected remedies do not satisfy the statutory preference for treatment. However, the remedies are still capable of providing adequate protection to human health and the environment. Treatment alternatives were not considered appropriate for the reasons discussed in Section 10.4.

11.0 RESPONSIVENESS SUMMARY

11.1 Overview

To be completed after the public meeting.

11.2 Background on Community Involvement

A record review of the MCB, Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and Base/community clubs. The file search did not locate written Installation Restoration Program concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including OU No. 7). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including base personnel, residents, local officials, and off-base residents.

- Prepared a Community Relations Plan, September 1990.

- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-base residents, military and civilian interests.
• Prepared a revised Final Community Relations Plan, February 1994.

• Established two information repositories.

• Established the Administrative Record for all of the sites at the base.

• Released PRAP for public review in repositories, July 1995.

• Released public notice announcing public comment and document availability of the PRAP, July 1995.

• Held Technical Review Committee meeting, September 19, 1995, to review PRAP and solicit comments.

• Held public meeting on October 5, 1995, to solicit comments and provide information. Five people attended.

11.3 Summary of Comments Received During the Public Comment Period and Agency Responses

A public meeting was held on October 5, 1995 in the Onslow County Library in Jacksonville, North Carolina. Five citizens from the Jacksonville area attended the meeting along with representatives of MCB, Camp Lejeune, LANTDIV, NC DEHNR, and Baker. A representative from USEPA Region IV was not present. The following summarizes the questions and responses from the public meeting.

General Questions

Question #1: How much will the National Superfund program be cut?

Response #1: The studies and cleanup programs at Camp Lejeune are funded by DERA, which will be cut by 50 percent over the next 5 years. We are hoping to get state and EPA involvement to help us ensure we secure funding for the next few years. The state of California got almost half the DERA budget. Jon Johnston at the EPA is supporting us. We hope that momentum will push the availability of funding.

Site 1 Questions

Question #1: How did you know where to look (regarding the areas to investigate)?

Response #1: The IAS (Initial Assessment Study) identified areas of concern based on personnel interviews, records, documents, and aerial photos.

Question #2: How many buildings are new construction and what are they used for?

Response #2: Most are pre-1980; one building was constructed in 1990. None of those were evaluated for environmental impact prior to construction. Now, there is an environmental working group that reviews all new construction prior to starting.

Question #3: What did this study find (regarding original 1988 investigation of Site 1)?

Response #3: Low levels of solvent in one well in the southern area (1-GW05); The possible contaminant was 1,2-DCE.

Question #4: What are TAL metals?

Response #4: These are the priority pollutant metals, the most toxic being lead, chromium, mercury, etc.

Question #5: Why do you collect samples for physical characteristics?

Response #5: To help characterize/classify the soils.

Question #6: What is the definition of shallow (regarding groundwater sampling)?
Response #6: Shallow is defined as groundwater samples collected within 25 feet of ground surface. The water table is approximately 15 feet deep. Deep is defined as greater than 100 feet below ground surface. Two deep wells and one water supply well was sampled.

Question #7: Was this well sampled and what were the results (regarding the water supply well)?

Response #7: The supply well was sampled in 1992 and had 2 parts per billion of benzene (Federal MCL is 5 ppb and the NC WQS is 1 ppb). The supply well was taken off line at that time (1992). During our investigation, the supply well was clean.

Question #8: Why did it come up clean (regarding the supply well)?

Response #8: Different sampling techniques may have been used or the contaminant may have disappeared (attenuated) by the time we sampled.

Question #9: What direction does the groundwater flow at Site 1?

Response #9: Groundwater flows east to west across the site. Our sampling focused on the center of the site (within the area of concern) and on the downgradient area. We installed shallow and deep wells here which came up clean for volatiles. The water supply well also came up clean.

Question #10: What do you mean by solids (regarding suspended solids in groundwater)?

Response #10: If you pump water directly from a well, you can get particles floating or suspended. These suspended solids will contribute to the total metals in groundwater.

Question #11: What metals are common (regarding groundwater)?

Response #11: Iron

Question #12: What is the typical pH of groundwater?

Response #12: Typically between 8 and 5.5 and as low as 4 to 4.5 in marshy areas.

Question #13: Why is it lower in marshy areas?

Response #13: High organic content in soils tends to lower the pH.

Question #14: Did you find any copper and zinc?

Response #14: Yes, they appear to be fairly consistent with levels found over the entire base.

(Brief discussion of low flow groundwater sampling and the results of the sampling efforts)

Question #15: What does 14/14 mean (regarding the results presented on a hand out)?

Response #15: This is a comparison to base background. We took 14 surface soil samples and analyzed for metals and 1 out of 14 indicates we had 1 hit (detection) above background samples (collected throughout the base).

Question #16: What do you mean by detection frequency of 14 of 14 for lead?

Response #16: For 14 samples, we had 14 samples which had detections higher than base background. On that handout, lead and zinc exceeded base background most frequently.

Question #17: Have you considered taking "background" samples, in say the Hoffman forest area?

Response #17: No. We have done something similar with surface water and sediment (and fish) at the White Oak River.
Question #18: How do you know if those metals you find in the soil will end up in the water table (reference to Day Care Center - Site 2)?

Response #18: We have done a extensive investigation to determine that possibility. This subject will be covered during a discussion of the human health risk assessment.

Question #19: Would all of the semivolatiles be characterized as persistent?

Response #19: We are not too surprised to find semivolatiles because as petroleum compounds weather, these are the heavier compounds that are left.

Question #20: Is your methodology completely standardized, i.e., if you collect a volume of sample and then collect a sample using a different method, could they result in different analyses?

Response #20: Yes, we follow the USEPA Region IV sample collection procedures and USEPA laboratory procedures.

Question #21: How long has it been since DDT was used?

Response #21: Quite awhile ago, at least 10 years. They are, however, very persistent in the environment.

Question #22: Are you sure that what you found in the shallow groundwater is from a historical origin, not from recent operations?

Response #22: We think it is from more recent operations, not historical. Levels that we are seeing here are probably indicative of very small spills. The soils are very permeable here and a very small amount would be all it would take to get these levels. Surrounding wells are clean, so we see it as a very isolated plume.

(Brief discussion on the results of the human health and ecologic risk assessments)

Question #23: Is this information now logged into base files now to prevent use of groundwater?

Response #23: Part of our proposed plan is to place deed restrictions on use of shallow groundwater.

Question #24: What happens if the base is closed (BRAC)? Who is responsible for cleaning it up?

Response #24: The federal government has the responsibility for clean up prior to turning it over to the general public.

(Brief discussion on the proposed actions)

Question #25: What are you basing the monitoring time on?

Response #25: 30 years.

Question #26: What will be the conditions in 30 years?

Response #26: We expect to see a decrease due to natural degradation.

Question #27: Can the TCE degrade into something more toxic?

Response #27: Generally, TCE will degrade into DCE and eventually vinyl chloride which is more toxic. Since we have low levels (TCE and vinyl chloride), we don't expect this to be a problem.

Question 28#: How long will there be a risk with this TCE? What is the half-life?

Response #28: We do evaluate that for potential risk. We would have to look up the toxicity profiles, available in the BRA of the RI report.
Question #29: How do you get your risk based values?

Response #29: The information comes from a USEPA database.

Question #30: How far out (distance) will the aquifer restrictions extend?

Response #30: The Camp Lejeune well head protection program identifies how far away a well must be from an industrial area.

Site 28 Questions

Question #1: What is the definition of surface water, (how is it collected)?

Response #1: Surface water was collected by dipping a bottle into the very top of the water column. A sediment sample was taken at 0 to 6" and from 6 to 12".

Question #2: What is the source of thallium (in surface water)? Is it radioactive? Did it come from hospital wastes?

Response #2: We really do not know what the source of thallium. We have not encountered it before (previous sampling). We have an isolated hit.

Question #3: How high was the mercury in the fish samples?

Response #3: The human health risk assessment found no risk associated with the fish ingestion or to aquatic communities. The only risk noted was for child receptors residents drinking the groundwater.

(Brief discussion of proposed action plan).

Question #4: How soon do you start monitoring?

Response #4: Generally within one year after the final ROD is signed.

The public meeting ended at 9:00 pm, the closing time of the Onslow County Library. Consequently, Site 30 was not discussed during the meeting.

The public comment period ended on November 5, 1995. There were no public or regulatory comments issued within the comment period.
### TABLE 1

**SUMMARY OF RI RESULTS**

**SITE 1, FRENCH CREEK LIQUIDS DISPOSAL AREA**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Fraction</th>
<th>Constituents</th>
<th>ARAR</th>
<th>Background</th>
<th>Detected</th>
<th>Min.</th>
<th>Max.</th>
<th>Detected</th>
<th>Frequency</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td>0/14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td>NA</td>
<td>4.3 J</td>
<td>4.3 J</td>
<td>1/14</td>
<td>central northern</td>
<td></td>
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<td></td>
<td></td>
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<td>NA</td>
<td>2.2 J</td>
<td>4.9</td>
<td>2/14</td>
<td>central northern and southern</td>
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<td>3/14</td>
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<td>NA</td>
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<td>3.9 NJ</td>
<td>1/14</td>
<td>central northern</td>
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<td>490 J</td>
<td>1/110</td>
<td>southern</td>
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<td>3 J</td>
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<td>0.19</td>
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<td>1 exceeds BB, southern</td>
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<tr>
<td></td>
<td>Cadmium</td>
<td>NA</td>
<td>0.18-0.58</td>
<td>0.62</td>
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<td>2.0</td>
<td>3/14</td>
<td>3 exceed BB, southern</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
<td>NA</td>
<td>0.3-12.5</td>
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<td>Copper</td>
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<td>0.5-87.2</td>
<td>1.6</td>
<td>4.9</td>
<td>4.9</td>
<td>6/14</td>
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<td>Lead</td>
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<td></td>
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<td>NA</td>
<td>74 J</td>
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<td></td>
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<td>NA</td>
<td>110 J</td>
<td>110 J</td>
<td>1/110</td>
<td>north of Building FC-120</td>
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<td></td>
<td></td>
<td>Pyrene (PAH)</td>
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<td>NA</td>
<td>86 J</td>
<td>86 J</td>
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<td></td>
<td></td>
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</tbody>
</table>

**Note:** ARAR = Adequate Reference Attributable Risk, BB = Background Baseline.
### TABLE 1 (Continued)

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Subsurface Soil Pesticides</th>
<th>Environmental Medium</th>
<th>Metals (1)</th>
<th>Groundwater Volatiles (2)</th>
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<td>Concentration</td>
<td>Detection</td>
<td>Detection</td>
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<td>Base</td>
<td>Detected</td>
<td>Distribution</td>
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<td>Concentration</td>
<td>Frequency</td>
<td>Distribution</td>
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<td>Constituents ARAR</td>
<td>Background</td>
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<td>18 J</td>
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<td>Aroclor 1260</td>
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<td>6.1 J</td>
<td>7.8 J</td>
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<td>17.5</td>
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<td>Copper</td>
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<td>1.1</td>
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<td>Lead</td>
<td>NA</td>
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<td>60.4 J</td>
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<td>Mercury</td>
<td>NA</td>
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<td>0.06</td>
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<td>Nickel</td>
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<td>4.4</td>
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<td>0.81</td>
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<td>1 J</td>
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<td>Vinyl Chloride</td>
<td>NCWQS-0.015</td>
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<td>1,1-Dichloroethene</td>
<td>MCL-7</td>
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<td>2 J</td>
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<td>21</td>
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### TABLE 1 (Continued)

#### SUMMARY OF RI RESULTS

**SITE 1, FRENCH CREEK LIQUIDS DISPOSAL AREA**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Min.</th>
<th>Max.</th>
<th>Detection</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Base</td>
<td>Concentration</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Detected</td>
<td>ARAR</td>
<td>Background</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td><strong>Constituents</strong></td>
<td><strong>Concentration</strong></td>
<td><strong>Detected</strong></td>
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<td>Groundwater</td>
<td>Semi-volatile</td>
<td>Phenol</td>
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<td></td>
<td>Diethylphthalate</td>
<td>NCWQS-5000</td>
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<td>Groundwater</td>
<td>Diethylphthalate</td>
<td>NCWQS-5,000</td>
<td>NA</td>
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<td>Groundwater</td>
<td>Pesticides</td>
<td>ND</td>
<td>MCL/NCWQS</td>
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<td>Groundwater</td>
<td>PCBs</td>
<td>ND</td>
<td>NA</td>
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<td>Iron</td>
<td>NCWQS-300</td>
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<td>Groundwater</td>
<td>Total Metals (3)</td>
<td>Manganese</td>
<td>NCWQS-50</td>
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Notes: - Concentrations are presented in g/L for liquid and g/kg for solids (ppb), metal concentrations for solids and sediments are presented in mg/kg (ppm).

1. Metals in both surface and subsurface soils were compared to the range of base background positive detections for priority pollutant metals only (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc).

2. Additional groundwater samples were collected from wells which exhibited concentrations of volatile and semi-volatile compounds during the initial round.

3. Total metals in groundwater samples were compared to the range of positive detections in upgradient wells throughout MCB, Camp Lejeune.

ARAR - Applicable or Relevant and Appropriate Requirements

BB - Base Background (Refer to Appendix M)

BEHP - Bis(2-ethylhexyl)phthalate

NA - Not Applicable

NCWQS - North Carolina Water Quality Standard

ND - Not Detected

MCL - Federal Maximum Contaminant Level

PAN - Polynuclear Aromatic Hydrocarbon

TCA - Tetrachloroethane

J - Estimated Quantity
### Table 2

**SUMMARY OF RI RESULTS**

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Fraction</th>
<th>Detected Constituents</th>
<th>Min. Detection</th>
<th>Max. Detection</th>
<th>Detection Frequency</th>
<th>Distribution</th>
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<td>Volatiles</td>
<td>1,1,1-Trichloroethane</td>
<td>NA</td>
<td>NA</td>
<td>2 J</td>
<td>2 J</td>
<td>1/40</td>
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<td>Semi-Volatiles</td>
<td>bis(2-chloroethyl)ether</td>
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<td>NA</td>
<td>69 J</td>
<td>69 J</td>
<td>1/40</td>
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<tr>
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<td>Naphthalene (PAH)</td>
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<td>NA</td>
<td>69 J</td>
<td>69 J</td>
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<td>Acenaphthene (PAH)</td>
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<td>NA</td>
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<td>Phenanthrene (PAH)</td>
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<td>NA</td>
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<tr>
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<td>120 J</td>
<td>240 J</td>
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<tr>
<td></td>
<td>Carbazole</td>
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<td>NA</td>
<td>69 J</td>
<td>170 J</td>
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<tr>
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<td>di-n-Butylphthalate</td>
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<td>NA</td>
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<td>70 J</td>
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<td>Fluoranthe (PAH)</td>
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<td>NA</td>
<td>43 J</td>
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<td>88 J</td>
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<td>B(A)anthracene (PAH)</td>
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<td>NA</td>
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<td>10/40</td>
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<td>B(g,h,i)perylene (PAH)</td>
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<td>49 J</td>
<td>1,700</td>
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TABLE 2 (Continued)

SUMMARY OF RI RESULTS
SITE 28, HADNOT POINT BURN DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Comparison Criteria</th>
<th>Min.</th>
<th>Max.</th>
<th>Frequency</th>
<th>Distribution</th>
</tr>
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<tbody>
<tr>
<td><strong>Surface Soil Pesticides</strong></td>
<td></td>
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<tr>
<td>Heptachlor epoxide</td>
<td>NA</td>
<td>8 J</td>
<td>43 J</td>
<td>3/40</td>
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<tr>
<td>Dieldrin</td>
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<td>7.1 J</td>
<td>7.1 J</td>
<td>1/40</td>
</tr>
<tr>
<td>4,4’-DDE</td>
<td>NA</td>
<td>4.4 NJ</td>
<td>1,300</td>
<td>25/40</td>
</tr>
<tr>
<td>Endrin</td>
<td>NA</td>
<td>35 J</td>
<td>35 J</td>
<td>1/40</td>
</tr>
<tr>
<td>4,4’-DDD</td>
<td>NA</td>
<td>0.91 NJ</td>
<td>320 J</td>
<td>17/40</td>
</tr>
<tr>
<td>Endosulfan Sulfate</td>
<td>NA</td>
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<td>41 J</td>
<td>1/40</td>
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<tr>
<td>4,4’-DDT</td>
<td>NA</td>
<td>2.7 J</td>
<td>1,400</td>
<td>20/40</td>
</tr>
<tr>
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<td>NA</td>
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<td>7.1 J</td>
<td>1/40</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>NA</td>
<td>1.9 NJ</td>
<td>160 NJ</td>
<td>15/40</td>
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<tr>
<td>gamma-Chlordane</td>
<td>NA</td>
<td>1.9 NJ</td>
<td>96 J</td>
<td>9/40</td>
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<td><strong>PCBs</strong></td>
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<td></td>
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<tr>
<td>Aroclor 1254</td>
<td>NA</td>
<td>47 J</td>
<td>58 J</td>
<td>2/40</td>
</tr>
<tr>
<td>Aroclor 1260</td>
<td>NA</td>
<td>44 J</td>
<td>44 J</td>
<td>1/40</td>
</tr>
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<td><strong>Metals (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>NA</td>
<td>0.3-8.0</td>
<td>28 J</td>
<td>6/43</td>
</tr>
<tr>
<td>Arsenic</td>
<td>NA</td>
<td>0.2-1.8</td>
<td>16</td>
<td>25/43</td>
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<tr>
<td>Cadmium</td>
<td>NA</td>
<td>0.18-0.58</td>
<td>12.5</td>
<td>13/43</td>
</tr>
<tr>
<td>Chromium</td>
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<td>0.3-12.5</td>
<td>26</td>
<td>42/43</td>
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<tr>
<td>Copper</td>
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<td>0.5-87.2</td>
<td>4,260 J</td>
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<td>551</td>
<td>43/43</td>
</tr>
<tr>
<td>Mercury</td>
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<td>0.01-0.08</td>
<td>1.1</td>
<td>28/43</td>
</tr>
<tr>
<td>Nickel</td>
<td>NA</td>
<td>0.6-3.6</td>
<td>36</td>
<td>25/43</td>
</tr>
<tr>
<td>Selenium</td>
<td>NA</td>
<td>0.27-0.94</td>
<td>10 J</td>
<td>2/43</td>
</tr>
<tr>
<td>Silver</td>
<td>NA</td>
<td>0.04-4.30</td>
<td>6 J</td>
<td>7/43</td>
</tr>
<tr>
<td>Thallium</td>
<td>NA</td>
<td>0.11-0.56</td>
<td>2.5</td>
<td>3/43</td>
</tr>
<tr>
<td>Zinc</td>
<td>NA</td>
<td>0.3-28.3</td>
<td>23,100</td>
<td>41/43</td>
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</tbody>
</table>

ARAR: Above Groundwater Resources Advisory. BB: Background Baseline.
### TABLE 2 (Continued)

**SUMMARY OF RI RESULTS**

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Fraction</th>
<th>Detected Constituents</th>
<th>ARAR</th>
<th>Background</th>
<th>Min. Concentration</th>
<th>Max. Concentration</th>
<th>Detection Frequency</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsurface Volatiles</td>
<td>Benzene</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>2 J</td>
<td>2 J</td>
<td>1/32</td>
<td>western</td>
</tr>
<tr>
<td></td>
<td>Tetrachloroethene</td>
<td>NA</td>
<td>NA</td>
<td>5 J</td>
<td>5 J</td>
<td>1/32</td>
<td>western</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>1,4-Dichlorobenzene</td>
<td>NA</td>
<td>NA</td>
<td>44 J</td>
<td>140 J</td>
<td>2/32</td>
<td>western</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-Methylphenol</td>
<td>NA</td>
<td>NA</td>
<td>250 J</td>
<td>250 J</td>
<td>1/32</td>
<td>western</td>
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<tr>
<td></td>
<td>Naphthalene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>39 J</td>
<td>2,600</td>
<td>6/32</td>
<td>western</td>
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<tr>
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<td>2-Methylnaphthalene</td>
<td>NA</td>
<td>NA</td>
<td>82 J</td>
<td>89 J</td>
<td>2/32</td>
<td>western</td>
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</tr>
<tr>
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<td>Dimethyl phthalate</td>
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<td>NA</td>
<td>79 J</td>
<td>220 J</td>
<td>2/32</td>
<td>western</td>
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<tr>
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<td>Acenaphthene (PAH)</td>
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<td>NA</td>
<td>510 J</td>
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<td>2/32</td>
<td>western</td>
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<tr>
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<td>Fluorene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>78 J</td>
<td>2,600 J</td>
<td>4/32</td>
<td>western</td>
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<tr>
<td></td>
<td>Phenanthrene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>38 J</td>
<td>27,000</td>
<td>9/32</td>
<td>western</td>
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<tr>
<td></td>
<td>Anthracene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>330 J</td>
<td>8,600</td>
<td>2/32</td>
<td>western</td>
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</tr>
<tr>
<td></td>
<td>Carbazole</td>
<td>NA</td>
<td>NA</td>
<td>94 J</td>
<td>4,700</td>
<td>2/32</td>
<td>western</td>
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<tr>
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<td>Fluoranthene (PAH)</td>
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<td>NA</td>
<td>40 J</td>
<td>2,700</td>
<td>9/32</td>
<td>primarily western</td>
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</tr>
<tr>
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<td>Pyrene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>51 J</td>
<td>2,600</td>
<td>6/32</td>
<td>western</td>
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<tr>
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<td>B(a)anthracene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>120 J</td>
<td>24,000</td>
<td>3/32</td>
<td>western</td>
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<tr>
<td></td>
<td>Chrysene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>46 J</td>
<td>22,000</td>
<td>5/32</td>
<td>western</td>
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<tr>
<td></td>
<td>BEHP</td>
<td>NA</td>
<td>NA</td>
<td>62 J</td>
<td>1,300</td>
<td>15/32</td>
<td>scattered, western</td>
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<tr>
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<td>B(b)fluoranthene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>38 J</td>
<td>21,000</td>
<td>6/32</td>
<td>western</td>
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<tr>
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<td>B(k)fluoranthene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>50 J</td>
<td>18,000</td>
<td>3/32</td>
<td>western</td>
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<td>Benzo(a)pyrene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>43 J</td>
<td>21,000</td>
<td>4/32</td>
<td>western</td>
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<tr>
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<td>1(1,2,3-cd)pyrene (PAH)</td>
<td>NA</td>
<td>NA</td>
<td>100 J</td>
<td>11,000</td>
<td>3/32</td>
<td>western</td>
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<td>D(a,h)anthracene (PAH)</td>
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<td>NA</td>
<td>110 J</td>
<td>2,800 J</td>
<td>2/32</td>
<td>western</td>
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<td>B(g,h,i)pyrene (PAH)</td>
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<td>NA</td>
<td>50 J</td>
<td>10,000</td>
<td>4/32</td>
<td>western</td>
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</tbody>
</table>

**Min.** = Minimum concentration detected, **Max.** = Maximum concentration detected.
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<th>Environmental Medium</th>
<th>Fraction</th>
<th>Detected Constituents</th>
<th>ARAR</th>
<th>Background</th>
<th>Min. Concentration</th>
<th>Max. Concentration</th>
<th>Detection Frequency</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsurface Pesticides</td>
<td>4,4'-DDDE</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>3.1 J</td>
<td>1,600</td>
<td>19/32</td>
<td>scattered</td>
</tr>
<tr>
<td>Soil</td>
<td>4,4'-DDD</td>
<td>NA</td>
<td>NA</td>
<td>6.2</td>
<td>880 NJ</td>
<td>17/32</td>
<td>scattered</td>
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<tr>
<td>(Continued)</td>
<td>4,4'-DDT</td>
<td>NA</td>
<td>NA</td>
<td>3 J</td>
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<td>13/32</td>
<td>scattered</td>
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<tr>
<td>alpha-Chlordane</td>
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<td>NA</td>
<td>2.7 J</td>
<td>65 J</td>
<td>3/32</td>
<td>western</td>
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<td>gamma-Chlordane</td>
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<td>NA</td>
<td>2.6 NJ</td>
<td>11 NJ</td>
<td>3/32</td>
<td>western</td>
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<td>140 J</td>
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<td>1/32</td>
<td>western</td>
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<td>25 J</td>
<td>77</td>
<td>2/32</td>
<td>western</td>
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<td>Metals (1)</td>
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<td>46.7 J</td>
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<tr>
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<td>1.1</td>
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<td>Cadmium</td>
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<td>0.17-1.20</td>
<td>0.77</td>
<td>15.6</td>
<td>22/51</td>
<td>22 exceed BB, scattered</td>
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<td>Chromium</td>
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<td>0.7-10.5</td>
<td>2 J</td>
<td>128</td>
<td>50/51</td>
<td>27 exceed BB, primarily western</td>
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<tr>
<td>Copper</td>
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<td>1.0 J</td>
<td>3,280</td>
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<td>23 exceed BB, western</td>
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<tr>
<td>Lead</td>
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<td>0.5-11.5</td>
<td>1.9 J</td>
<td>2,060 J</td>
<td>49/51</td>
<td>25 exceed BB, primarily western</td>
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<td>0.01-0.68</td>
<td>0.05</td>
<td>2.8</td>
<td>15/51</td>
<td>3 exceed BB, western</td>
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<tr>
<td>Nickel</td>
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<td>0.6-4.7</td>
<td>1.6</td>
<td>102 J</td>
<td>23/51</td>
<td>14 exceed BB, western</td>
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<td>Selenium</td>
<td>NA</td>
<td>0.12-0.55</td>
<td>6 J</td>
<td>6 J</td>
<td>1/51</td>
<td>1 exceeds BB, western</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td>NA</td>
<td>0.19-1.00</td>
<td>1.1 J</td>
<td>18.4 J</td>
<td>13/51</td>
<td>13 exceed BB, scattered</td>
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<td></td>
</tr>
<tr>
<td>Thallium</td>
<td>NA</td>
<td>0.12-0.50</td>
<td>1</td>
<td>1</td>
<td>1/51</td>
<td>1 exceeds BB, western</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>NA</td>
<td>0.3-11.6</td>
<td>0.95 J</td>
<td>4,330 J</td>
<td>43/51</td>
<td>24 exceed BB, primarily western</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TABLE 2 (Continued)**

**SUMMARY OF RI RESULTS**

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Fraction</th>
<th>Detection Criteria</th>
<th>Base Concentration</th>
<th>Min. Detected</th>
<th>Max Detected</th>
<th>Frequency</th>
<th>Distribution</th>
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</thead>
<tbody>
<tr>
<td>Groundwater</td>
<td>Volatiles</td>
<td>Chloroform</td>
<td>MCL-0.1</td>
<td>2</td>
<td>2</td>
<td>1/13</td>
<td>exceeds ARAR, central western</td>
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<td></td>
<td></td>
<td>Ethylbenzene</td>
<td>NCWQS-29</td>
<td>NA</td>
<td>5</td>
<td>1/13</td>
<td>does not exceed ARAR</td>
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<td></td>
<td></td>
<td>Xylenes (total)</td>
<td>NCWQS-530</td>
<td>NA</td>
<td>19</td>
<td>1/13</td>
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</tr>
<tr>
<td>Semivolatiles</td>
<td>2-Methylphenol</td>
<td>NA</td>
<td>NCWQS-29</td>
<td>1.3 J</td>
<td>1.3 J</td>
<td>1/13</td>
<td>central western</td>
</tr>
<tr>
<td></td>
<td>4-Methylphenol</td>
<td>NA</td>
<td>NCWQS-29</td>
<td>29</td>
<td>29</td>
<td>1/13</td>
<td>western</td>
</tr>
<tr>
<td></td>
<td>2,4-Dimethylphenol</td>
<td>NA</td>
<td>NCWQS-29</td>
<td>2.2 J</td>
<td>4.01</td>
<td>2/13</td>
<td>central western</td>
</tr>
<tr>
<td></td>
<td>2,4-Dichlorophenol</td>
<td>NA</td>
<td>NCWQS-29</td>
<td>1.6 J</td>
<td>1.6 J</td>
<td>1/13</td>
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</tr>
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<td></td>
<td>Naphthalene</td>
<td>NA</td>
<td>NCWQS-21</td>
<td>99</td>
<td>99</td>
<td>1/13</td>
<td>1 exceeds ARAR, central western</td>
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<td></td>
<td>2-Methylnaphthalene</td>
<td>NA</td>
<td>NCWQS-21</td>
<td>33</td>
<td>33</td>
<td>1/13</td>
<td>central western</td>
</tr>
<tr>
<td></td>
<td>Dimethylphthalate</td>
<td>NA</td>
<td>NCWQS-21</td>
<td>1 J</td>
<td>1 J</td>
<td>1/3</td>
<td>central western</td>
</tr>
<tr>
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<td>Acenaphthene (PAH)</td>
<td>NA</td>
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<td>31</td>
<td>2/13</td>
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<td>Dibenzofuran</td>
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<td>Fluorene (PAH)</td>
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<td>NA</td>
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<td>14</td>
<td>14</td>
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<td>NA</td>
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<td>2.6 J</td>
<td>1/13</td>
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<td>Carbazole</td>
<td>NA</td>
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<td>11</td>
<td>1/13</td>
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<td>NA</td>
<td>NCWQS-210</td>
<td>1 J</td>
<td>1 J</td>
<td>1/3</td>
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<td>NA</td>
<td>NCWQS-210</td>
<td>1.7 J</td>
<td>1.7 J</td>
<td>1/13</td>
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<td>NA</td>
<td>NCWQS-210</td>
<td>1 J</td>
<td>1 J</td>
<td>1/3</td>
<td>central western</td>
</tr>
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<td>Pesticides (2)</td>
<td>4,4’-DDE</td>
<td>NA</td>
<td>NCWQS-0.027</td>
<td>0.06 J</td>
<td>6.6 J</td>
<td>5/13</td>
<td>western</td>
</tr>
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<td>4,4’-DDD</td>
<td>NA</td>
<td>NCWQS-0.027</td>
<td>0.06 J</td>
<td>9</td>
<td>6/13</td>
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</tr>
<tr>
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<td>4,4’-DDT</td>
<td>NA</td>
<td>NCWQS-0.027</td>
<td>0.05 J</td>
<td>0.37 J</td>
<td>2/13</td>
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<td>gamma-Chlordane</td>
<td>NA</td>
<td>NCWQS-0.027</td>
<td>0.05 J</td>
<td>0.05 J</td>
<td>1/13</td>
<td>does not exceed ARAR western</td>
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<td>PCBs</td>
<td>ND</td>
<td>NCWQS-300</td>
<td>147 J</td>
<td>40,600</td>
<td>11/12</td>
<td>exceeds ARAR, none exceed BB</td>
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<td>Total</td>
<td>Iron</td>
<td>ND</td>
<td>NCWQS-300</td>
<td>882-55,300</td>
<td>147 J</td>
<td>11/12</td>
<td>exceeds ARAR, none exceed BB</td>
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<td>Metals (3)</td>
<td>Lead</td>
<td>NCWQS-15</td>
<td>3.0-78.8</td>
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<td>2/12</td>
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<td>Manganese</td>
<td>NCWQS-50</td>
<td>10-290</td>
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<td>exceeds ARAR, none exceed BB</td>
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<td>Environmental Medium</td>
<td>Fraction</td>
<td>Detected Constituents</td>
<td>ARAR</td>
<td>Base</td>
<td>Min. Concentration</td>
<td>Max. Concentration</td>
<td>Detection Frequency</td>
</tr>
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<tr>
<td>Orde Pond Volatiles</td>
<td>ND</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>NA</td>
<td>0/2</td>
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<tr>
<td>Surface Water</td>
<td>Semivolatiles</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>NA</td>
<td>0/2</td>
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<td>ND</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
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<td>PCBs</td>
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<td>NOAA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Metals (3)</td>
<td>Thallium</td>
<td>NOAA-4-0</td>
<td>ND</td>
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<td>4.7</td>
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<td>Cogdels Creek</td>
<td>Volatiles</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>NA</td>
<td>0/2</td>
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<tr>
<td>Surface Water</td>
<td>Semivolatiles</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>NA</td>
<td>0/7</td>
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<tr>
<td>Pesticides</td>
<td>ND</td>
<td>NOAA/NCWQS</td>
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<td>NA</td>
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<tr>
<td>PCBs</td>
<td>ND</td>
<td>NOAA</td>
<td>NA</td>
<td>NA</td>
<td>0/7</td>
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<td>Metals (3)</td>
<td>Lead</td>
<td>NOAA-1.32</td>
<td>1.2-10.4</td>
<td>1.9</td>
<td>1.9</td>
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<td>New River Volatiles</td>
<td>ND</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>NA</td>
<td>0/5</td>
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<tr>
<td>Surface Water</td>
<td>Semivolatiles</td>
<td>Phenanthrene (PAH)</td>
<td>NA</td>
<td>1.4 J</td>
<td>1.4 J</td>
<td>1/5</td>
<td>adjacent to study area</td>
</tr>
<tr>
<td>Pesticides</td>
<td>4,4’-DDE</td>
<td>NOAA-10.5</td>
<td>NA</td>
<td>0.04 J</td>
<td>0.04 J</td>
<td>1/5</td>
<td>does not exceed ARAR</td>
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<td></td>
<td>4,4’-DDD</td>
<td>NOAA-0.0064</td>
<td>NA</td>
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<td>0.05 J</td>
<td>1/5</td>
<td>1 exceeds ARAR</td>
</tr>
<tr>
<td>PCBs</td>
<td>ND</td>
<td>NOAA</td>
<td>NA</td>
<td>NA</td>
<td>0/5</td>
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<tr>
<td>Metals (3)</td>
<td>Copper</td>
<td>NOAA-6.5</td>
<td>4-129</td>
<td>6.6</td>
<td>18.1</td>
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<td>3 exceed ARAR, none exceed BB</td>
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<tr>
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<td>Lead</td>
<td>NOAA-1.12</td>
<td>1.2-10.4</td>
<td>1.7</td>
<td>23.4</td>
<td>3/5</td>
<td>3 exceed ARAR, 1 exceeds BB</td>
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<tr>
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<td>Thallium</td>
<td>NOAA-1.0</td>
<td>ND</td>
<td>5.6 J</td>
<td>5.6 J</td>
<td>1/5</td>
<td>1 exceeds ARAR and BB</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
<td>NOAA-58.9</td>
<td>18-111</td>
<td>10.4</td>
<td>363</td>
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<td>Orde Pond Sediment</td>
<td>Volatiles</td>
<td>NOAA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Semivolatiles</td>
<td>ND</td>
<td>NOAA</td>
<td>NA</td>
<td>NA</td>
<td>0/3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td>4,4’-DDD</td>
<td>NOAA-2</td>
<td>NA</td>
<td>8.3 J</td>
<td>8.3 J</td>
<td>1/3</td>
<td>1 exceeds ARAR</td>
</tr>
<tr>
<td>PCBs</td>
<td>ND</td>
<td>NOAA</td>
<td>NA</td>
<td>NA</td>
<td>0/3</td>
<td></td>
<td></td>
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<tr>
<td>Metals (3)</td>
<td>ND</td>
<td>NOAA</td>
<td>BB</td>
<td>NA</td>
<td>0/3</td>
<td></td>
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<td>Environmental Medium</td>
<td>Comparison Criteria</td>
<td>Detected Constituents</td>
<td>ARAR Background</td>
<td>Min. Base Concentration</td>
<td>Min. Detected Frequency</td>
<td>Max. Concentration Distribution</td>
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</tr>
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<td>-----------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-------------------------------</td>
<td></td>
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<tr>
<td>Cogdels Creek Volatiles</td>
<td>Carbon disulfide</td>
<td>NA</td>
<td>NA</td>
<td>9 J</td>
<td>260 J</td>
<td>2/14 maximum upstream of site</td>
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<td>Sediment Semivolatiles</td>
<td>Phenanthrene (PAH)</td>
<td>NOAA-225</td>
<td>NA</td>
<td>260 J</td>
<td>260 J</td>
<td>2/14 1 exceeds ARAR adjacent site</td>
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<tr>
<td></td>
<td>Anthracene (PAH)</td>
<td>NOAA-85</td>
<td>61 J</td>
<td>61 J</td>
<td>61 J</td>
<td>1/4 does not exceed ARAR adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluoranthene (PAH)</td>
<td>NOAA-600</td>
<td>77 J</td>
<td>340 J</td>
<td>340 J</td>
<td>3/4 none exceed ARAR adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pyrene (PAH)</td>
<td>NOAA-350</td>
<td>63 J</td>
<td>250 J</td>
<td>250 J</td>
<td>5/4 none exceed ARAR, scattered</td>
<td></td>
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<tr>
<td></td>
<td>Butyl benzyl phthalate</td>
<td>NA</td>
<td>410 J</td>
<td>410 J</td>
<td>410 J</td>
<td>1/4 adjacent to site</td>
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</tr>
<tr>
<td></td>
<td>3,3’-Dichlorobenzidine</td>
<td>NA</td>
<td>NA</td>
<td>410 J</td>
<td>410 J</td>
<td>1/4 adjacent to site</td>
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<tr>
<td></td>
<td>BA anthracene (PAH)</td>
<td>NOAA-230</td>
<td>56 J</td>
<td>140 J</td>
<td>140 J</td>
<td>1/2 neither exceed ARAR adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chrysene (PAH)</td>
<td>NOAA-400</td>
<td>58 J</td>
<td>160 J</td>
<td>160 J</td>
<td>2/4 neither exceed ARAR adjacent</td>
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<tr>
<td></td>
<td>BEHP</td>
<td>NA</td>
<td>100 J</td>
<td>1,700 J</td>
<td>1,700 J</td>
<td>13/4 scattered and downstream</td>
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</tr>
<tr>
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<td>4,4’-DDE</td>
<td>NOAA-2</td>
<td>6.4 J</td>
<td>200 J</td>
<td>200 J</td>
<td>9/4 9 exceed ARAR, scattered</td>
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<tr>
<td></td>
<td>4,4’-DDD</td>
<td>NOAA-2</td>
<td>4.3 J</td>
<td>450 J</td>
<td>450 J</td>
<td>7/4 7 exceed ARAR, scattered</td>
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</tr>
<tr>
<td></td>
<td>4,4’-DDT</td>
<td>NOAA-1</td>
<td>50 J</td>
<td>50 J</td>
<td>50 J</td>
<td>1/4 1 exceeds ARAR, upstream of site</td>
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<tr>
<td></td>
<td>alpha-chlordane</td>
<td>NOAA-0.5</td>
<td>2.6 NJ</td>
<td>5.9 NJ</td>
<td>5.9 NJ</td>
<td>2/4 2 exceed ARAR, upstream of site</td>
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<td>gamma-Chlordane</td>
<td>NOAA-0.5</td>
<td>6.1 J</td>
<td>8.4 J</td>
<td>8.4 J</td>
<td>2/4 2 exceed ARAR, upstream of site</td>
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<td>Metals (3)</td>
<td>Lead</td>
<td>NOAA-35</td>
<td>6.8 J</td>
<td>202 J</td>
<td>202 J</td>
<td>14/4 7 exceed ARAR, none exceed BB</td>
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<td>Mercury</td>
<td>NOAA-0.15</td>
<td>0.12</td>
<td>0.41</td>
<td>0.41</td>
<td>6/4 4 exceed ARAR, 6 exceed BB</td>
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<td>Silver</td>
<td>NOAA-1</td>
<td>7.3 J</td>
<td>2 J</td>
<td>2 J</td>
<td>1/4 1 exceeds ARAR, downstream</td>
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<td></td>
<td>Zinc</td>
<td>NOAA-120</td>
<td>9.3 J</td>
<td>303 J</td>
<td>303 J</td>
<td>14/4 2 exceed ARAR, none exceed BB</td>
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<td>Comparison Criteria</td>
<td>Min. Base</td>
<td>Min. Detected Concentration</td>
<td>Max. Concentration</td>
<td>Detection Frequency</td>
<td>Detection Distribution</td>
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<td>--------------------</td>
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<td></td>
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<tr>
<td>New River Volatiles</td>
<td>Acenaphthene</td>
<td>NOAA - 150</td>
<td>150 J</td>
<td>150 J</td>
<td>1/10</td>
<td>does not exceed ARAR, upstream</td>
<td></td>
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<tr>
<td></td>
<td>Dibenzo furan</td>
<td>NA</td>
<td>60 J</td>
<td>60 J</td>
<td>1/10</td>
<td>upstream</td>
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<td>Fluorene (PAH)</td>
<td>NOAA - 35</td>
<td>120 J</td>
<td>120 J</td>
<td>1/10</td>
<td>exceeds ARAR, upstream of site</td>
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<td>Phenanthrene (PAH)</td>
<td>NOAA - 225</td>
<td>47 J</td>
<td>1,200</td>
<td>4/10</td>
<td>2 exceed ARAR, max. upstream</td>
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<tr>
<td></td>
<td>Anthracene (PAH)</td>
<td>NOAA - 85</td>
<td>97 J</td>
<td>320 J</td>
<td>4/10</td>
<td>2 exceed ARAR, max. upstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carbazole</td>
<td>NA</td>
<td>57 J</td>
<td>160 J</td>
<td>3/10</td>
<td>maximum upstream of site</td>
<td></td>
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<tr>
<td></td>
<td>Fluoranthene (PAH)</td>
<td>NOAA - 600</td>
<td>80 J</td>
<td>1,600</td>
<td>6/10</td>
<td>3 exceed ARAR, max. upstream</td>
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</tr>
<tr>
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<td>Pyrene (PAH)</td>
<td>NOAA - 350</td>
<td>75 J</td>
<td>1,700</td>
<td>6/10</td>
<td>5 exceed ARAR, max. upstream</td>
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<td>B(a)anthracene (PAH)</td>
<td>NOAA - 230</td>
<td>150 J</td>
<td>1,500</td>
<td>5/10</td>
<td>4 exceed ARAR, max. downstream</td>
<td></td>
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<tr>
<td></td>
<td>Chrysene (PAH)</td>
<td>NOAA - 400</td>
<td>160 J</td>
<td>2,100</td>
<td>5/10</td>
<td>3 exceed ARAR, max. downstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BEHP</td>
<td>NA</td>
<td>580 J</td>
<td>2,400</td>
<td>3/10</td>
<td>scattered up and downstream</td>
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<tr>
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<td>B(b)fluoranthene (PAH)</td>
<td>NA</td>
<td>55 J</td>
<td>1,100</td>
<td>6/10</td>
<td>maximum upstream of site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B(k)fluoranthene (PAH)</td>
<td>NA</td>
<td>120 J</td>
<td>840 J</td>
<td>5/10</td>
<td>maximum downstream of site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Benzo(a)pyrene</td>
<td>NOAA - 400</td>
<td>130 J</td>
<td>710 J</td>
<td>5/10</td>
<td>3 exceed ARAR, max. upstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I(1,2,3-cd)pyrene (PAH)</td>
<td>NA</td>
<td>68 J</td>
<td>320 J</td>
<td>6/10</td>
<td>maximum downstream of site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D(a,h)anthracene (PAH)</td>
<td>NOAA - 60</td>
<td>47 J</td>
<td>47 J</td>
<td>1/10</td>
<td>does not exceed ARAR, adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B(g,h,i)perylene (PAH)</td>
<td>NA</td>
<td>65 J</td>
<td>320 J</td>
<td>5/10</td>
<td>maximum upstream of site</td>
<td></td>
</tr>
<tr>
<td>Sediment Semivolatiles</td>
<td>Fluorene (PAH)</td>
<td>NOAA - 35</td>
<td>120 J</td>
<td>120 J</td>
<td>1/10</td>
<td>upstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phenanthrene (PAH)</td>
<td>NOAA - 225</td>
<td>47 J</td>
<td>1,200</td>
<td>4/10</td>
<td>2 exceed ARAR, max. upstream</td>
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</tr>
<tr>
<td></td>
<td>Anthracene (PAH)</td>
<td>NOAA - 85</td>
<td>97 J</td>
<td>320 J</td>
<td>4/10</td>
<td>2 exceed ARAR, max. upstream</td>
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<tr>
<td></td>
<td>Carbazole</td>
<td>NA</td>
<td>57 J</td>
<td>160 J</td>
<td>3/10</td>
<td>maximum upstream of site</td>
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</tr>
<tr>
<td></td>
<td>Fluoranthene (PAH)</td>
<td>NOAA - 600</td>
<td>80 J</td>
<td>1,600</td>
<td>6/10</td>
<td>3 exceed ARAR, max. upstream</td>
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<tr>
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<td>Pyrene (PAH)</td>
<td>NOAA - 350</td>
<td>75 J</td>
<td>1,700</td>
<td>6/10</td>
<td>5 exceed ARAR, max. upstream</td>
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</tr>
<tr>
<td></td>
<td>B(a)anthracene (PAH)</td>
<td>NOAA - 230</td>
<td>150 J</td>
<td>1,500</td>
<td>5/10</td>
<td>4 exceed ARAR, max. downstream</td>
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<td>Chrysene (PAH)</td>
<td>NOAA - 400</td>
<td>160 J</td>
<td>2,100</td>
<td>5/10</td>
<td>3 exceed ARAR, max. downstream</td>
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<td></td>
<td>BEHP</td>
<td>NA</td>
<td>580 J</td>
<td>2,400</td>
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<td>scattered up and downstream</td>
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<td>B(b)fluoranthene (PAH)</td>
<td>NA</td>
<td>55 J</td>
<td>1,100</td>
<td>6/10</td>
<td>maximum upstream of site</td>
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</tr>
<tr>
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<td>B(k)fluoranthene (PAH)</td>
<td>NA</td>
<td>120 J</td>
<td>840 J</td>
<td>5/10</td>
<td>maximum downstream of site</td>
<td></td>
</tr>
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<td></td>
<td>Benzo(a)pyrene</td>
<td>NOAA - 400</td>
<td>130 J</td>
<td>710 J</td>
<td>5/10</td>
<td>3 exceed ARAR, max. upstream</td>
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<tr>
<td></td>
<td>I(1,2,3-cd)pyrene (PAH)</td>
<td>NA</td>
<td>68 J</td>
<td>320 J</td>
<td>6/10</td>
<td>maximum downstream of site</td>
<td></td>
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<td>D(a,h)anthracene (PAH)</td>
<td>NOAA - 60</td>
<td>47 J</td>
<td>47 J</td>
<td>1/10</td>
<td>does not exceed ARAR, adjacent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B(g,h,i)perylene (PAH)</td>
<td>NA</td>
<td>65 J</td>
<td>320 J</td>
<td>5/10</td>
<td>maximum upstream of site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4,4'-DDE</td>
<td>NOAA - 2</td>
<td>8.4 J</td>
<td>8.5 J</td>
<td>2/10</td>
<td>2 exceed ARAR, max. upstream</td>
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</tr>
<tr>
<td>Pesticides</td>
<td>4,4'-DDD</td>
<td>NOAA - 2</td>
<td>8.6 J</td>
<td>15 J</td>
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<td>3 exceed ARAR, max. upstream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4,4'-DDE</td>
<td>NOAA - 1</td>
<td>33 J</td>
<td>300 J</td>
<td>3/10</td>
<td>3 exceed ARAR, max. adjacent</td>
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</tr>
<tr>
<td></td>
<td>alpha-Chlordane</td>
<td>NOAA - 0.5</td>
<td>4.8 J</td>
<td>6.6 J</td>
<td>2/10</td>
<td>2 exceed ARAR, max. at Cogdels</td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NOAA - 0.5</td>
<td>3.1 J</td>
<td>4.6 J</td>
<td>2/10</td>
<td>2 exceed ARAR, max. at Cogdels</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2 (Continued)

#### SUMMARY OF RI RESULTS

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Fraction</th>
<th>Detected Constituents</th>
<th>ARAR Background</th>
<th>Concentration Detected Base</th>
<th>Concentration Detected Max.</th>
<th>Detection Frequency</th>
<th>Distribution</th>
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<tr>
<td>New River PCBs</td>
<td>ND</td>
<td>Antimony</td>
<td>NOAA - 2</td>
<td>ND</td>
<td>8.7 J</td>
<td>263</td>
<td>2/10</td>
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<tr>
<td></td>
<td></td>
<td>Copper</td>
<td>NOAA - 70</td>
<td>0.43 - 53,200</td>
<td>1.5</td>
<td>1,340</td>
<td>10/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lead</td>
<td>NOAA - 35</td>
<td>1 - 314</td>
<td>3.5 J</td>
<td>38,800</td>
<td>10/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silver</td>
<td>NOAA - 1</td>
<td>7.3</td>
<td>3.1 J</td>
<td>3.4 J</td>
<td>2/10</td>
</tr>
</tbody>
</table>

**Notes:**
- Concentrations are presented in mg/L for liquid and mg/Kg for solids (ppb), metal concentrations for solids and sediments are presented in mg/Kg (ppm).
- Metals in both surface and subsurface soils were compared to the range of Base background positive detections for priority pollutant metals only (i.e., antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc).
- Additional groundwater samples were collected from wells which exhibited concentrations of volatile and semivolatile compounds during the initial round.
- Total metals in groundwater samples were compared to the range of positive detections in upgradient wells throughout MCB, Camp Lejeune.

**ARAR** - Applicable or Relevant and Appropriate Requirements
- **BB** - Base Background (Refer to Appendix M)
- **BEHP** - Bis(2-ethylhexyl)phthalate
- **NA** - Not Applicable
- **NCWQS** - North Carolina Water Quality Standard
- **ND** - Not Detected
- **MCL** - Federal Maximum Contaminant Level
- **PAH** - Polynuclear Aromatic Hydrocarbon
- **TCA** - Tetrachloroethane
- **J** - Estimated Quantity
<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>Comparison Criteria</th>
<th>Min. Base Concentration</th>
<th>Max. Concentration</th>
<th>Detection Frequency</th>
<th>Detection Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Soil</strong></td>
<td>Volatiles</td>
<td>1,1,1-Trichloroethane</td>
<td>NA</td>
<td>NA</td>
<td>2 J</td>
</tr>
<tr>
<td></td>
<td>Semivolatiles</td>
<td>ND</td>
<td>NA</td>
<td>NA</td>
<td>0/11</td>
</tr>
<tr>
<td></td>
<td>Metals (1)</td>
<td>Chromium</td>
<td>NA</td>
<td>0.7-10.5</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Subsurface Soil</strong></td>
<td>Volatiles</td>
<td>1,1,1-Trichloroethane</td>
<td>NA</td>
<td>NA</td>
<td>2 J</td>
</tr>
<tr>
<td></td>
<td>Semivolatiles</td>
<td>ND</td>
<td>NA</td>
<td>NA</td>
<td>0/11</td>
</tr>
<tr>
<td></td>
<td>Metals (1)</td>
<td>Chromium</td>
<td>NA</td>
<td>0.7-10.5</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Groundwater</strong></td>
<td>Volatiles (2)</td>
<td>Chloroform</td>
<td>NCWQS - 1.9</td>
<td>NA</td>
<td>3 J</td>
</tr>
<tr>
<td></td>
<td>Semivolatiles</td>
<td>ND</td>
<td>NA</td>
<td>NA</td>
<td>0/3</td>
</tr>
<tr>
<td></td>
<td>Total Metals (3)</td>
<td>Iron</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>692</td>
</tr>
<tr>
<td><strong>Surface Water</strong></td>
<td>Volatiles</td>
<td>ND</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>0/3</td>
</tr>
<tr>
<td></td>
<td>Semivolatiles</td>
<td>ND</td>
<td>NOAA/NCWQS</td>
<td>NA</td>
<td>0/3</td>
</tr>
<tr>
<td></td>
<td>Metals (3)</td>
<td>Lead</td>
<td>NOAA - 1.32</td>
<td>1.2 - 10.4</td>
<td>2.3 J</td>
</tr>
<tr>
<td></td>
<td>Mercury</td>
<td>NCWQS - 0.012</td>
<td>0.52</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Sediment</strong></td>
<td>Volatiles</td>
<td>ND</td>
<td>NA</td>
<td>NA</td>
<td>0/6</td>
</tr>
<tr>
<td></td>
<td>Semivolatiles</td>
<td>BEHP</td>
<td>NA</td>
<td>NA</td>
<td>74 J</td>
</tr>
<tr>
<td></td>
<td>Metals</td>
<td>ND</td>
<td>NOAA</td>
<td>BB</td>
<td>0/6</td>
</tr>
</tbody>
</table>

Notes:
- Concentrations are presented in mg/L for liquid and mg/Kg for solids (ppb), metal concentrations for solids and sediments are presented in mg/Kg (ppm).
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TCA - Tetrachloroethane
J - Estimated Quantity
### TABLE 4
COPCs EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
SITE 1, FRENCH CREEK LIQUIDS DISPOSAL AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>COPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Soil</td>
<td>Aluminum, Antimony, Arsenic,</td>
</tr>
<tr>
<td></td>
<td>Cadmium, Chromium, Manganese,</td>
</tr>
<tr>
<td></td>
<td>Vanadium, Zinc, 4,4-DDE, 4,4'-DDT</td>
</tr>
<tr>
<td>Subsurface Soil</td>
<td>Aluminum, Arsenic, Barium,</td>
</tr>
<tr>
<td></td>
<td>Cadmium, Chromium, Cobalt,</td>
</tr>
<tr>
<td></td>
<td>Copper, Lead, Manganese,</td>
</tr>
<tr>
<td></td>
<td>Nickel, Vanadium, Zinc, BEHP</td>
</tr>
<tr>
<td>Shallow and Deep Groundwater</td>
<td>Arsenic, Barium, Manganese,</td>
</tr>
<tr>
<td></td>
<td>Mercury, 1,2-dichloroethene (total) (1,2-DCE), Trichloroethene (TCE)</td>
</tr>
</tbody>
</table>

Note:

COPC = Contaminant of Potential Concern
<table>
<thead>
<tr>
<th>Environmental Medium</th>
<th>COPC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surface Soil</strong></td>
<td>Aluminum</td>
</tr>
<tr>
<td></td>
<td>Antimony</td>
</tr>
<tr>
<td></td>
<td>Arsenic</td>
</tr>
<tr>
<td></td>
<td>Barium</td>
</tr>
<tr>
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<td>Cadmium</td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
</tr>
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<td>Cobalt</td>
</tr>
<tr>
<td></td>
<td>Copper</td>
</tr>
<tr>
<td></td>
<td>Lead</td>
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<td>Manganese</td>
</tr>
<tr>
<td></td>
<td>Mercury</td>
</tr>
<tr>
<td></td>
<td>Nickel</td>
</tr>
<tr>
<td></td>
<td>Silver</td>
</tr>
<tr>
<td></td>
<td>Thallium</td>
</tr>
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<td>Vanadium</td>
</tr>
<tr>
<td></td>
<td>Vanadium</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
</tr>
<tr>
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<td>Heptachlor epoxide</td>
</tr>
<tr>
<td></td>
<td>4, 4-DDE</td>
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<td>4, 4-DDE</td>
</tr>
<tr>
<td></td>
<td>4, 4’-DDT</td>
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<tr>
<td></td>
<td>Alpha-chlordane</td>
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<td>Gamma-chlordane</td>
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<td>Phenanthrene</td>
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<td>Anthracene</td>
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<tr>
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<td>Benzo(a)anthracene</td>
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<td>Benzo(b)fluoranthene</td>
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<td>Indeno(1,2,3-cd)pyrene</td>
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<td>Benzo(g, h, i)perylene</td>
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<td>Vanadium</td>
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<td>Zinc</td>
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<td>4, 4-DDE</td>
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<td>4, 4’-DDT</td>
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<td>Environmental Medium</td>
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<td>Chrysene</td>
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<td>Benzo(a)anthracene</td>
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<td>Benzo(b)fluoranthene</td>
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<td>Benzo(k)fluoranthene</td>
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<td>Indeno(1,2,3-cd)pyrene</td>
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<td>Lead</td>
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<td>Manganese</td>
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TABLE 6 (Continued)

COPCs EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT

SITE 28, RADNOT POINT BURN DUMP

MCB, CAMP LEJEUNE, NORTH CAROLINA

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TABLE 6 (Continued)

COPCs EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
SITE 28, HADNOT POINT BURN DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

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<td>Selenium</td>
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<td>Zinc</td>
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</table>

Note:

COPC = Contaminant of Potential Concern
<table>
<thead>
<tr>
<th>Receptor</th>
<th>Exposure Pathway</th>
</tr>
</thead>
</table>
| Current Military Personnel       | Surface soil ingestion, dermal contact and inhalation  
Surface water ingestion and dermal contact (Orde Pond)  
Sediment ingestion and dermal contact (Orde Pond)                                                                 |
| Current Residential Adult and Child | Surface soil ingestion, dermal contact and inhalation  
Surface water ingestion and dermal contact  
(New River and Cogdels Creek)  
Sediment ingestion and dermal contact  
(New River and Cogdels Creek)                                                                 |
| Fisherman                        | Surface water ingestion and dermal contact  
(New River and Orde Pond)  
Sediment ingestion and dermal contact  
(New River and Orde Pond)  
Fish ingestion (New River and Orde Pond)                                                                 |
| Future Construction Worker       | Subsurface soil ingestion and dermal contact                                                                                                                                 |
| Future Residential Adult and Child ingestion | Subsurface soil ingestion, dermal contact and inhalation  
Groundwater ingestion, dermal contact and inhalation  
Surface water ingestion and dermal contact  
(New River and Cogdels Creek)  
Sediment ingestion and dermal contact  
(New River and Cogdels Creek)                                                                 |
**TABLE 10**

**SUMMARY OF POTENTIAL HUMAN HEALTH RISKS FOR THE MILITARY, FISHERMAN, AND CONSTRUCTION WORKER RECEPTORS**

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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<th>Exposure Pathway</th>
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<th>Construction Worker</th>
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<td>CARC Risk</td>
<td>NC Risk</td>
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<td>1.5E-06</td>
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<td>1.3E-10</td>
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<td>total</td>
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<tr>
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<tr>
<td>total</td>
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<tr>
<td>Groundwater Ingestion</td>
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<td>Current Risk (New River)</td>
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<td>Future Risk (Orde Pond)</td>
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<td>Future Risk (New River)</td>
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</table>

Notes:

NC = Noncarcinogenic Risk (Shaded Areas Indicate HI > 1.0)
Carc = Carcinogenic Risk (Shaded Areas Indicate ICR > 1.0E-04)
NA = Not Applicable
### TABLE 11

**COPCs EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT**  
**SITE 28, HADNOT POINT BURN DUMP**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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TABLE 11 (Continued)
COPCs EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
SITE 28, HADNOT POINT BURN DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

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</table>
TABLE 11 (Continued)

COPCs EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
SITE 28, HADNOT POINT BURN DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

Environmental Medium                  COPC

Sediment
Cogdels Creek (continued)            Lead
                                                   Manganese
                                                   Mercury
                                                   Silver
                                                   Thallium
                                                   Vanadium
                                                   Zinc
                                                   Bis(2-ethylhexyl)phthalate
                                                   Carbon disulfide
                                                   4,4'-DDD
                                                   4,4'-DDE
                                                   Alpha-chlordane
                                                   Gamma-chlordane
                                                   Fluoranthene
                                                   Pyrene
                                                   Benzo(a)anthracene
                                                   Chrysene
                                                   Benzo(a)pyrene

Sediment
Orde Pond                             Aluminum
                                                   Arsenic
                                                   Beryllium
                                                   Chromium
                                                   Cobalt
                                                   Copper
                                                   Iron
                                                   Lead
                                                   Manganese
                                                   Nickel
                                                   Vanadium
                                                   4,4'-DDD

Fish Fillet Tissue
New River                             Antimony
                                                   Barium
                                                   Cobalt
                                                   Copper
                                                   Selenium
                                                   4,4'-DDD
                                                   4,4'-DDE
                                                   Alpha-chlordane

Fish Whole Body Tissue
New River                             Aluminum
                                                   Antimony
                                                   Arsenic
                                                   Barium
                                                   Cadmium
                                                   Chromium
                                                   Cobalt
                                                   Copper
                                                   Iron
                                                   Manganese
                                                   Mercury
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<th>COPC</th>
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<tr>
<td>Fish Whole Body Tissue</td>
<td>Selenium</td>
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<tr>
<td>New River (continued)</td>
<td>Silver</td>
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<td>Vanadium</td>
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<tr>
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<td>Zinc</td>
</tr>
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<td>4,4'-DDD</td>
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<tr>
<td></td>
<td>4,4'-DDE</td>
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<tr>
<td></td>
<td>Alpha-Chlordane</td>
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<tr>
<td>Fish Fillet Tissue</td>
<td>Barium</td>
</tr>
<tr>
<td>Orde Pond</td>
<td>Manganese</td>
</tr>
<tr>
<td></td>
<td>Selenium</td>
</tr>
<tr>
<td></td>
<td>Zinc</td>
</tr>
<tr>
<td>Fish Whole Body Tissue</td>
<td>Arsenic</td>
</tr>
<tr>
<td>Orde Pone</td>
<td>Barium</td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
</tr>
<tr>
<td></td>
<td>Cobalt</td>
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<td>4,4'-DDE</td>
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<td>Alpha-Chlordane</td>
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</table>

Note:

COPC = Contaminant of Potential Concern
<table>
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<tr>
<th>Environmental Medium</th>
<th>COPC</th>
</tr>
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<tbody>
<tr>
<td>Surface Soil</td>
<td>No COPCs were identified for Site 30 surface soil.</td>
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<tr>
<td>Subsurface Soil</td>
<td>Aluminum, Arsenic, Chromium, Cobalt, Copper, Manganese, Mercury, Nickel, Vanadium</td>
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<tr>
<td>Groundwater</td>
<td>No COPCs were identified for Site 30 groundwater.</td>
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<tr>
<td>Surface Water</td>
<td>Aluminum, Lead, Manganese, Mercury</td>
</tr>
<tr>
<td>Sediment</td>
<td>Aluminum, Chromium, Lead, Manganese, Nickel, Vanadium, Zinc</td>
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Note:

COPC - Contaminant of Potential Concern
<table>
<thead>
<tr>
<th>Input Parameter</th>
<th>Units</th>
<th>Child</th>
<th>Adult</th>
<th>Military</th>
<th>Construction</th>
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<tbody>
<tr>
<td><strong>Receptor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Personnel</strong></td>
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<tr>
<td><strong>Worker</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Soil (mg/kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ingestion Rate, IR</td>
<td>mg/d</td>
<td>200</td>
<td>100</td>
<td>100</td>
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<tr>
<td>Fraction Ingested, FI</td>
<td>unitless</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Exposure Frequency, EF</td>
<td>d/y</td>
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<td>350</td>
<td>250</td>
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<tr>
<td>Exposure Duration, ED</td>
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<tr>
<td>Surface Area, SA</td>
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<td>5800</td>
<td>4300</td>
<td>4300</td>
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<tr>
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<td>mg/cm 3</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
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<td>d</td>
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<td>1,460</td>
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<td>kg</td>
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<td>70</td>
<td>70</td>
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<tr>
<td>Conversion Factor, CF</td>
<td>kg/mg</td>
<td>1x10^{-6}</td>
<td>1x10^{-6}</td>
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<td>Sediment (mg/kg)</td>
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<tr>
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<td>mg/d</td>
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<td>100</td>
<td>NA</td>
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<tr>
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<td>NA</td>
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<tr>
<td>Exposure Frequency, EF</td>
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<td>4</td>
<td>NA</td>
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<td>Surface Area, SA</td>
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<td>5800</td>
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<tr>
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<td>10,950</td>
<td>1,460</td>
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<tr>
<td>Averaging Time, Carc., ATcarc</td>
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<td>NA</td>
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<tr>
<td>Conversion Factor, CF</td>
<td>kg/mg</td>
<td>1x10^{-6}</td>
<td>1x10^{-6}</td>
<td>1x10^{-6}</td>
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<td>Surface Water (mg/L)</td>
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<td>5800</td>
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<td>1,460</td>
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<td>Adult</td>
<td>Military</td>
<td>Construction</td>
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<td><em>Air (mg/m³)</em></td>
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<td>Outdoor Air</td>
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<td>Body Weight, BW</td>
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</table>

References:

- USEPA Region IV Guidance for Soil Absorbance. (USEPA, 1992d)
## Table 14

**Summary of Potential Human Health Risks**

**Site 30, Sneads Ferry Road Fuel Tank Sludge Area**

**MCB, Camp Lejeune, North Carolina**

<table>
<thead>
<tr>
<th>Environmental Media</th>
<th>Exposure Pathway</th>
<th>Current Risk</th>
<th>Future Risk for the Military Receptor</th>
<th>Future Risk for the Child Receptor</th>
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<td></td>
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<td>Carc</td>
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<td>NC Carc</td>
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<td>Subsurface Soil</td>
<td>Ingestion</td>
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<td>7.8E-02</td>
<td>1.7E-06</td>
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<td>9.1E-07</td>
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<tr>
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<td>2.4E-03</td>
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<tr>
<td>Total</td>
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<td>1.8E-06</td>
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</tr>
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<tr>
<td>Total</td>
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<td>NA</td>
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<tr>
<td>Total</td>
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<td>9.9E-03</td>
<td>8.3E-02</td>
<td>1.8E-06</td>
<td>1.1E-02</td>
<td>1.2E-06</td>
</tr>
</tbody>
</table>

**Notes:**

NC = Noncarcinogenic Risk (Shaded Areas Indicate HI>1.0)

Carc = Carcinogenic Risk (Shaded Areas Indicate ICR>1.0E-04)

NA = Not Applicable
GLOSSARY OF EVALUATION CRITERIA

- Overall Protection of Human Health and Environment - addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

- Compliance with ARARs/TBCs - addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements (ARARs), other criteria to be considered (TBCs), or other federal and state environmental statues and/or provide grounds for invoking a waiver.

- Long-Term Effectiveness and Permanence - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- Reduction of Toxicity, Mobility, or Volume Through Treatment - refers to the anticipated performance of the treatment options that may be employed in an alternative.

- Short-Term Effectiveness - refers to the speed with which the alternative achieves protection, as well as the alternative's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.

- Implementability - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the chosen solution.

- Cost - includes capital and operation and maintenance (O&M) costs. For comparative purposes, presents net present worth (NPW) values.
## TABLE 16
SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES
SITE 1, FRENCH CREEK LIQUIDS DISPOSAL AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
<th>RAA No. 3</th>
<th>RAA No. 4</th>
<th>RAA No. 5</th>
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<tbody>
<tr>
<td></td>
<td>No Action</td>
<td>Institutional Controls</td>
<td>Extraction On-Site</td>
<td>In-Well Aeration and Off-Gas Carbon Adsorption</td>
<td>Extraction and Off-Site</td>
</tr>
<tr>
<td>OVERALL PROTECTIVENESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Human Health</td>
<td>No reduction in Potential human health risks, except through natural attenuation of the contaminated groundwater.</td>
<td>Institutional controls and natural attenuation will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and in-well aeration will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential human health risks.</td>
</tr>
<tr>
<td>D Environmental Protection</td>
<td>No reduction in potential risks to ecological receptors, except through natural attenuation of the contaminated groundwater.</td>
<td>Institutional controls, natural attenuation will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and in-well aeration will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential risks to ecological receptors.</td>
</tr>
<tr>
<td>COMPLIANCE WITH ARARs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Chemical-Specific ARARs</td>
<td>No active effort made to reduce COPC levels to below federal or state ARARs. However, COPCs are expected to meet ARARs via natural attenuation processes.</td>
<td>No active effort made to reduce COPC levels to below federal or state ARARs. However, COPCs are expected to meet ARARs via natural attenuation processes.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
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<td>D Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Can be designed to meet location-specific ARARs.</td>
<td>Can be designed to meet location-specific ARARs.</td>
<td>Can be designed to meet location-specific ARARs.</td>
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<tr>
<td>D Action-Specific ARARs</td>
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<td>Not applicable.</td>
<td>Can be designed to meet</td>
<td>Can be designed to meet</td>
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<td>No Action</td>
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<td>Extraction On-Site Treatment</td>
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<td>Extraction and Off-Site Treatment</td>
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<td><strong>OVERALL</strong></td>
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</tr>
<tr>
<td>Human Health</td>
<td>No reduction in Potential human health risks, except through natural attenuation of the contaminated groundwater.</td>
<td>Institutional controls and natural attenuation will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential human health risks.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential human health risks.</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>No reduction in potential risks to ecological receptors, except through natural attenuation of the contaminated groundwater.</td>
<td>Institutional controls and natural attenuation will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential risks to ecological receptors.</td>
<td>Institutional controls, natural attenuation, and the groundwater extraction/treatment system will reduce potential risks to ecological receptors.</td>
</tr>
<tr>
<td><strong>COMPLIANCE WITH ARARS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical-Specific ARARs</td>
<td>No active effort made to reduce COPC levels to below federal or state ARARs. However, COPCs are expected to meet ARARs via natural attenuation processes.</td>
<td>No active effort made to reduce COPC levels to below federal or state ARARs. However, COPCs are expected to meet ARARs via natural attenuation processes.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
<td>COPCs within the wells' radii of influence are expected to meet chemical-specific ARARs.</td>
</tr>
<tr>
<td>Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Can be designed to meet location-specific ARARs.</td>
<td>Can be designed to meet location-specific ARARs.</td>
<td>Can be designed to meet location-specific ARARs.</td>
</tr>
<tr>
<td>Action-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
<td>Can be designed to meet action-specific ARARs.</td>
<td>Can be designed to meet action-specific ARARs.</td>
<td>Can be designed to meet action-specific ARARs.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
<td>RAA No. 5</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>LONG-TERM EFFECTIVENESS AND PERMANENCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnitude of Residual Risk</td>
<td>No Action</td>
<td>Institutional Controls</td>
<td>No Action</td>
<td>No Action</td>
<td>No Action</td>
</tr>
<tr>
<td>Risk</td>
<td>The residual risk from untreated COPCs will be minimal; natural attenuation will mitigate any residual risk that may exist.</td>
<td>The proposed monitoring plan is adequate and reliable for determining the alternative's effectiveness; aquifer-use and deed restrictions are adequate and reliable for preventing human health exposure.</td>
<td>The residual risk from untreated COPCs will be minimal; institutional controls and natural attenuation will mitigate any residual risk that may exist.</td>
<td>The proposed monitoring plan is adequate and reliable for determining the alternative's effectiveness; aquifer-use and deed restrictions are adequate and reliable for preventing human health exposure until remediation levels are met.</td>
<td>The residual risk from untreated COPCs will be minimal; institutional controls and the extraction/in-well aeration system will mitigate any residual risk that may exist.</td>
</tr>
<tr>
<td>Adequacy and Reliability of Controls</td>
<td>No controls</td>
<td>No active treatment process applied</td>
<td>No active treatment process applied</td>
<td>No active treatment process applied</td>
<td>No active treatment process applied</td>
</tr>
<tr>
<td>Need for 5-year Review</td>
<td>Review will be required to ensure adequate protection of human health and the environment.</td>
<td>Review will be required to ensure adequate protection of human health and the environment.</td>
<td>Until remediation levels are met, review will be required to ensure adequate protection of human health and the environment.</td>
<td>Until remediation levels are met, review will be required to ensure adequate protection of human health and the environment.</td>
<td>Until remediation levels are met, review will be required to ensure adequate protection of human health and the environment.</td>
</tr>
<tr>
<td><strong>REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Process Used</td>
<td>No active treatment process applied.</td>
<td>No active treatment process applied.</td>
<td>The treatment process includes air stripping for VOC removal and neutralization, precipitation, flocculation, sedimentation, and filtration as pretreatment for the air stripper.</td>
<td>The treatment process includes in-well air stripping and off-gas carbon adsorption for VOC removal.</td>
<td>The treatment processes include air stripping and carbon adsorption on for VOC removal; also, flocculation and sedimentation for metals removal.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
<td>RAA No. 3</td>
<td>RAA No. 4</td>
<td>RAA No. 5</td>
</tr>
<tr>
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<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Environmental Impact</strong></td>
<td>No additional environmental impacts.</td>
<td>No additional environmental impacts.</td>
<td>No additional environmental impacts if aquifer drawdown does not affect surrounding water bodies.</td>
<td>No additional environmental impacts.</td>
<td>No additional environmental impacts if aquifer drawdown does not affect surrounding water bodies.</td>
</tr>
<tr>
<td><strong>Time Until Action is Complete</strong></td>
<td>Unknown.</td>
<td>Thirty years was used to estimate NPW costs. The exact time for completion of remediation is unknown.</td>
<td>Thirty years was used to estimate in-well aeration costs; 30 years was used to estimate monitoring costs. The exact time for completion of remediation is unknown.</td>
<td>Three years was used to estimate in-well aeration costs; 30 years was used to estimate monitoring costs. The exact time for completion of remediation is unknown.</td>
<td></td>
</tr>
</tbody>
</table>

**IMPLEMENTABILITY**

<p>| <strong>Ability to Construct and Activities</strong> | No construction or operation activities. | No construction or operation activities; institutional controls has been easily implemented in the past. | The infrastructure within a developed area like Site 1 poses some minor construction problems. O&amp;M may be difficult because groundwater must be lifted above ground surface for treatment, and metals precipitation could clog well screens. | The technology has been commercially applied, but it is still relatively new. The infrastructure within a developed area like Site 1 poses some minor construction problems also, metals precipitation could clog well screens. | The infrastructure within a developed area like Site 1 poses some minor construction problems. Also, metals precipitation could clog well screens. |
| <strong>Ability to Monitor Effectiveness</strong> | No proposed monitoring plan; failure to detect contamination could result in potential ingestion of groundwater. | Proposed monitoring plan will detect contaminants before significant exposure can occur; O&amp;M checks will provide notice of a system failure. | Proposed monitoring plan will detect contaminants before significant exposure can occur; O&amp;M checks will provide notice of a system failure. | Proposed monitoring plan will detect contaminants before significant exposure can occur; O&amp;M checks will provide notice of a system failure. | Proposed monitoring plan will detect contaminants before significant exposure can occur; O&amp;M checks will provide notice of a system failure. |
| <strong>Availability of Services and Capacities</strong> | No services or equipment required. | No special services or equipment required. | Services and equipment are readily available. | The patented technology is exclusively licensed to a single vendor. | Services and equipment are readily available. |</p>
<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA No. 1: No Action</th>
<th>RAA No. 2: Institutional Controls</th>
<th>RAA No. 3: Extraction and On-Site Treatment</th>
<th>RAA No. 4: In-Well Aeration and Off-Gas Carbon Adsorption</th>
<th>RAA No. 5: Extraction and Off-Site Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Requirements for Agency Coordination</td>
<td>None required.</td>
<td>Must submit semiannual reports to document sampling.</td>
<td>The substantive requirements of air and water discharge permits must be met.</td>
<td>The substantive requirements of air and water discharge permits must be met.</td>
<td>Air and water discharge permits may be required if existing permits are not adequate for the additional groundwater load.</td>
</tr>
<tr>
<td>Cost (Net Present Worth)</td>
<td>$0</td>
<td>$600,000</td>
<td>$2,100,000</td>
<td>$1,300,000</td>
<td>$1,400,000</td>
</tr>
</tbody>
</table>
# TABLE 17

**SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES**

**SITE 28, HADNOT POINT BURN DUMP**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>RAA No. 1</th>
<th>RAA No. 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>No Action</strong></td>
<td><strong>Institutional Controls</strong></td>
</tr>
<tr>
<td><strong>OVERALL PROTECTIVENESS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D Human Health</strong></td>
<td>No reduction in potential human health risks.</td>
<td>Institutional controls reduce potential human health risks.</td>
</tr>
<tr>
<td><strong>D Environmental Protection</strong></td>
<td>No reduction in potential risks to ecological receptors.</td>
<td>Institutional controls reduce potential risks to ecological receptors.</td>
</tr>
<tr>
<td><strong>COMPLIANCE WITH ARARS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D Chemical-Specific ARARs</strong></td>
<td>Manganese is expected to exceed chemical - specific ARARs, but it appears to naturally exceed ARARs in groundwater throughout MCB, Camp Lejeune. Lead is believed to be the result of suspended solids so it is not expected to exceed ARARs.</td>
<td>Manganese is expected to exceed chemical - specific ARARs, but it appears to naturally exceed ARARs in groundwater throughout MCB, Camp Lejeune. Lead is believed to be the result of suspended solids so it is not expected to exceed ARARs.</td>
</tr>
<tr>
<td>D Location-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>D Action-Specific ARARs</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

**LONG-TERM EFFECTIVENESS AND PERMANENCE**

<table>
<thead>
<tr>
<th>D Magnitude of Residual Risk</th>
<th>The residual risk from untreated lead and manganese will be minimal.</th>
<th>The residual risk from untreated lead and manganese will be minimal; institutional controls will mitigate any residual risk that may exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Adequacy and Reliability of Controls</td>
<td>Not applicable-no controls.</td>
<td>The monitoring plan is adequate and reliable for determining effectiveness; aquifer-use and deed restrictions are adequate and reliable for preventing human health exposure.</td>
</tr>
<tr>
<td>D Need for 5-year Review</td>
<td>Review will be required to ensure adequate protection of human health and the environment.</td>
<td>Review will be required to ensure adequate protection of human health and the environment.</td>
</tr>
</tbody>
</table>

**REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT**

<table>
<thead>
<tr>
<th>D Treatment Process Used</th>
<th>No treatment process.</th>
<th>No treatment process.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Amount Destroyed or Treated</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>D Reduction of Toxicity, Mobility, or Volume</td>
<td>None.</td>
<td>None.</td>
</tr>
<tr>
<td>D Residuals Remaining After Treatment</td>
<td>Not applicable-no treatment.</td>
<td>Not applicable-no treatment.</td>
</tr>
</tbody>
</table>

**SHORT-TERM EFFECTIVENESS**

<table>
<thead>
<tr>
<th>D Community Protection</th>
<th>Potential risks to the community will not be increased.</th>
<th>Potential risks to the community will not be increased.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Worker Protection</td>
<td>No risks to workers.</td>
<td>No significant risks to workers.</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>RAA No. 1</td>
<td>RAA No. 2</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>D Environmental Impact</strong></td>
<td>No Action</td>
<td>Institutional Controls</td>
</tr>
<tr>
<td>Current impacts will continue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D Time Until Action is Complete</strong></td>
<td>Not applicable.</td>
<td>Estimated 30 years.</td>
</tr>
<tr>
<td><strong>IMPLEMENTABILITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>D Ability to Construct and Operate</strong></td>
<td>No construction or operation activities.</td>
<td>No construction or operation activities; institutional controls have been easily implemented in the past.</td>
</tr>
<tr>
<td><strong>D Ability to Monitor Effectiveness</strong></td>
<td>No monitoring plan; failure to detect increases in COPC levels could result in potential ingestion of groundwater.</td>
<td>Proposed monitoring plan will detect increases in COPC levels before significant exposure can occur.</td>
</tr>
<tr>
<td><strong>D Availability of Services and Capacities; Equipment</strong></td>
<td>No services or equipment required.</td>
<td>No special services or equipment required.</td>
</tr>
<tr>
<td><strong>D Requirements for Agency Coordinations</strong></td>
<td>None required.</td>
<td>Must submit semiannual reports to document sampling.</td>
</tr>
<tr>
<td><strong>COST (Net Present Worth)</strong></td>
<td>$0</td>
<td>$800,000</td>
</tr>
</tbody>
</table>
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC
EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL (SITE 5)
USMC/ CHEM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 05/15/1997
Operable Unit: 12
ROD ID: EPA/ROD/R04-97/211

Media: Soil.

Contaminant: Polychlorinated hydrocarbons (PAHs) such as benzene.
Abstract: USMC Camp Lejeune is a training base used for the United States Marine Corps (USMC) and is located in Onslow County, North Carolina. The base covers approximately 236 square miles and includes 14 miles of coast line. Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the base. Operable Unit 12 (OU 12) is one of 18 OUs located within the base. OU 12 contains only one site, Site 3, which is otherwise known as the Old Creosote Plant. Site 3 is located in the north-central portion of the base. The old creosote plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the base railroad. Reportedly, an on-site sawmill was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment procedures that were used are not known, records show that preservatives (i.e., creosote) were stored for reuse in a railroad tank car. The main treatment area at Site 3 was most likely located within and immediately surrounding the dirt path loop in the southern portion of the site. This area contains an abandoned chimney that was probably associated with creosote heating/thinning activities. The 240-foot long concrete pad encircled by the dirt path loop was probably used as a drip track for pressure cylinder chambers or treated wood ties. The concrete pad does not contain visual evidence of contamination but an area south of the pad is thought to have had rail lines used for transportation of the treated wood ties. Several investigations were conducted at the site in 1991, 1994, and 1995.

Remedy: The selected remedy for OU 12 (Site 3) includes excavation of contaminated soil; treatment of the contaminated soil using aerobic, solid-phase biological treatment at a biocell; land-use restrictions; aquifer-use restrictions; and groundwater monitoring.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 12
ONSLOW COUNTY, NC
05/15/1997
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 the Remedial Action at Site 3. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

The selected remedy consists of excavation and biological treatment of PAH-contaminated subsurface soils and institutional controls designed to prevent future potential exposure. The controls include restricting potable well installation, restrictions for future land use and a groundwater monitoring plan. 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.
This letter serves as notification of a misprint in the final Record of Decision (ROD) for Operable Unit No. 12 (Site 3) dated January 6, 1997. In the Declaration, under the third subject heading the Description of Selected Remedy reads "No Action". This heading should have read "Source Removal with Biological Treatment". This ROD was signed by MCB, Camp Lejeune on April 3, 1997.

This notification has been submitted to MCB, Camp Lejeune, the United States Environmental Protection Agency (USEPA) Region IV, and North Carolina Department of Environmental and Natural Resources (NC DENR). This notification should be filed with the original ROD submittal to indicate that misprint has been rectified. USEPA and NC DENR representatives have indicated that resubmittal of this document is not required. Should you have any questions regarding this correspondence, please contact me at (412) 269-2053.

Sincerely,

MDB/rw

cc: Ms. Lee Anne Rapp, P.E. Code 18312
Ms. Beth Collier, Code 02115
Mr. Neal Paul, MCB Camp Lejeune
Ms. Gena Townsend, USEPA Region IV
Mr. David Lown, NC DENR
FINAL

RECORD OF DECISION
OPERABLE UNIT NO. 12 (SITE 3)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0274

JANUARY 6, 1997

Prepared For:

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

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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<td>7</td>
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<td>9</td>
</tr>
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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR applicable or relevant and appropriate requirement
Baker Baker Environmental, Inc.
bgs below ground surface

CERCLA Comprehensive Environmental Response, Compensation and Liability Act COPC contaminant of potential concern
CP Concrete Pad Area
DoN Department of the Navy
DW deep well

ELISA enzyme linked immunosorbent assay
FS Feasibility Study

HI hazard index

ICR incremental lifetime cancer risk
IW intermediate well

|g/L microgram per liter
|g/kg microgram per kilogram
MCB Marine Corps Base
MCL Maximum Contaminant Level
MW monitoring well

NA Northern Area
NC DEHNR North Carolina Department of Environment, Health, and Natural Resources NCP
NCWQS National Oil and Hazardous Substances Pollution Contingency Plan NCWQS
ND non detect
NPW net present worth

O&M operation and maintenance
OU Operable Unit

PAH polynuclear aromatic hydrocarbon
ppb parts per billion
ppm parts per million
PRAP Proposed Remedial Action Plan
psi pounds per square inch

QI quotient index

RA risk assessment
RAA remedial action alternative
RCRA Resource Conservation and Recovery Act
RI Remedial Investigation
ROD Record of Decision
RS Rail Spur Area

SARA Superfund Amendments and Reauthorization Act
SB soil boring
SD sediment
SSSV surface soil screening value
SVOC semivolatile organic compound
<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>TA</td>
<td>Treatment Area</td>
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<tr>
<td>TAL</td>
<td>target analyte list</td>
</tr>
<tr>
<td>TBC</td>
<td>to be considered criteria</td>
</tr>
<tr>
<td>TCL</td>
<td>target compound list</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>VOC</td>
<td>volatile organic compound</td>
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Site Name and Location

Operable Unit No. 12 (Site 3 - the Old Creosote Plant)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit (OU) No. 12 (Site 3) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for OU No. 12 (Site 3).

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy. Description of the Selected Remedy: No Action

The selected remedy for OU No. 12 (Site 3) includes excavation of contaminated soil; treatment of the contaminated soil using aerobic, solid-phase biological treatment at a biocell; land use restrictions; aquifer use restrictions; and groundwater monitoring. More specifically, the selected remedy includes:

- Excavating the subsurface soil area of concern to a depth of nine feet below ground surface (bgs) or to just above the water table.

- Confirmatory soil sampling in the excavation area to ensure that contaminated soil has been removed to acceptable levels.

- Treating the excavated soil (approximately 2,000 cubic yards) using aerobic, solid-phase biological treatment in a biocell.

- Backfilling the excavation area with "clean" soil.

- Implementing land use restrictions that will limit future land development/use at the site until the soil remediation has been completed.

- Quarterly sampling of groundwater from monitoring wells 03-MW02, 03-MW02IW, 03-MW02DW, 03-MW06, 03-MW07, 03-MW08, and 03-MW11IW; analyzing the samples for target compound list (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). If the groundwater quality improves, the sampling frequency may be reduced from quarterly to semiannual.

- Implementing aquifer use restrictions via the Base Master Plan to prohibit future use of the shallow and Castle Hayne aquifers, within a 100 foot radius of Site 3, as potable water sources.

The selected remedy addresses the principal threat - PAH contaminants in subsurface soil and the shallow groundwater aquifer - at OU No. 12 (Site 3).
Statutory Determinations

The selected remedy is protective of human health and the environment and is cost-effective. Although no chemical-specific applicable or relevant and appropriate requirements (ARARs) apply to the soil at Site 3, the remedy does comply with the to-be-considered criteria (TBCs) established for soil (i.e., federal soil screening levels established for the protection of groundwater). The remedy, however, does not comply with the chemical-specific ARARs identified for groundwater (i.e., federal and state groundwater criteria). Because contaminant concentrations exceeding the ARARs will remain untreated in the groundwater, a waiver of the ARARs may be required before the remedy can be implemented. The remedy will satisfy the statutory preference for treatment of soil but not for treatment of groundwater. The remedy will require five-year reviews by the lead agency.

<IMG SRC 97211E>
This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 12 (Site 3) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The environmental media at this site were investigated as part of a Remedial Investigation (RI), and remedial action alternatives were developed and evaluated as part of a Feasibility Study (FS), conducted for OU No. 12 (Site 3). Based on the results of the RI and FS, preferred remedial action alternatives were identified in a Proposed Remedial Action Plan (PRAP) document. Then, the public was given the opportunity to comment on the RI, FS, and PRAP. Based on comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for OU No. 12 (Site 3). This ROD document presents the final selected remedy along with a summary of the remedy selection process.

The ROD is organized into 12 main sections. Section 1.0 presents an introduction, and Section 2.0 presents the site name and location, and a brief description of the site layout. Section 3.0 presents a history of the site and previous investigations/enforcement activities conducted there. Section 4.0 highlights community participation events that have occurred during the development of this ROD. Section 5.0 describes the scope and role of the response action developed to address the site contamination, and Section 6.0 summarizes the nature and extent of this site contamination (i.e., the site characteristics). Section 7.0 summarizes the site risks as determined by human health and ecological risk assessments. Section 8.0 describes the remedial action alternatives developed for soil and groundwater, while Section 9.0 summarizes the comparative analysis of these alternatives. Finally, Section 10.0 presents the final remedy selected for OU No. 12 (Site 3), Section 11.0 evaluates the selected remedy with respect to the statutory determinations, and Section 12.0 presents a responsiveness summary.

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB, Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

OU No. 12 is one of 18 OUs located within MCB, Camp Lejeune. Operable units were developed at the Base to combine one or more individual sites that share a common element. OU No. 12 contains only one site, Site 3, which is otherwise known as the Old Creosote Plant. Figure 1 depicts the location of OU No. 12 (Site 3) within MCB, Camp Lejeune. Figure 2 presents a map of OU No. 12 (Site 3). Located within the Mainside Supply and Storage areas at MCB, Camp Lejeune, Site 3 encompasses an area of approximately five acres and is generally flat and unpaved. Open Storage Lots 201 and 203 (i.e., Site 6) are located nearby along Holcomb Boulevard approximately 1-1/2 miles from Site 3. However, Site 3 itself is not currently used for open storage.

As shown in Figure 2, the site is intersected by two roadways: a dirt path that runs north-south and forms a loop in the southern portion of the site, and a gravel road that runs east-west and leads directly to Holcomb Boulevard. Access to the site via these roadways is currently unrestricted. In addition, the Camp Lejeune Railroad line runs parallel to the site’s western edge and intersects an old railroad spur line at the site’s southern extreme. The intersection of these two lines creates a spike formation that points south. Wooded areas lie north and east of the site.

The old creosote plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Base railroad. Reportedly, an on site sawmill, located in the northern portion of the site, was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment procedures that were used are not known, records show that preservatives (i.e., creosote) were stored for reuse in a railroad tank car. In typical pressure treatment processes, wood ties are placed inside cylindrical chambers which are filled with wood-treating preservatives. Then, hydrostatic or
pneumatic pressures, ranging from 50 to 200 pounds per square inch (psi), are applied within the treatment chamber until the wood absorbs the desired amount of preservatives. When the treatment process is complete, a pump removes the excess preservative from the chamber and sends it to a storage vessel for reuse. Excess preservative is then removed from the wood by applying a vacuum, or by allowing the wood to drip dry. In the past, treated wood lay in open areas for several days, allowing preservative to drip. Today, treated wood is typically placed on lined and covered drip pads to collect excess preservative. The main treatment area at Site 3 was most likely located within and immediately surrounding the dirt path loop in the southern portion of the site. This area contains an abandoned chimney that was probably associated with creosote heating/thinning activities. (Creosote is heated and mixed with fuel oil to create a less viscous consistency.) The 240 foot long concrete pad encircled by the dirt path loop was probably used as a drip track for pressure cylinder chambers or treated wood ties. However, the concrete pad does not contain visual evidence of contamination. South of the pad, evidence of rail lines was observed indicating that a railroad connection may have been located in this area. The railroad connection may have transported creosote or ties to and from the treatment area.

3.2 Previous Investigations/Enforcement Activities

Previous investigations conducted at Site 3 include a Site Inspection (1991) and a Remedial Investigation (1994-95). More detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker, 1996).

3.2.1 Site Inspection, 1991

In June 1991, Halliburton/NUS conducted a Site Inspection that included soil, groundwater, and sediment investigations. Figure 3 identifies the sampling locations associated with these investigations.

Table 1 presents the analytical results for soil. The surficial soil samples collected from 0 to 2 feet below ground surface (bgs) contained semivolatile organic compounds (SVOCs), particularly polynuclear aromatic hydrocarbons (PAHs), which were detected at concentrations ranging from 260 microgram per kilogram (µg/kg) for benzo(g,h,i)perylene to 2,200 µg/kg for benzo(b)fluoranthene. Several PAHs, including chrysene, benzo(k)fluoranthene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene, were detected in the surficial soil at concentrations exceeding 1,000 µg/kg. PAHs were not detected in the shallow subsurface soil samples collected from three to five feet bgs. However, a deep subsurface soil sample from boring 03-MW02 (15 to 17 feet bgs) contained elevated PAH concentrations. In this sample, several PAHs, including acenaphthene, fluoranthene, fluorene, naphthalene, and phenanthrene, were detected at concentrations exceeding 35,000 µg/kg; dibenzofuran was detected at 35,000 µg/kg. Based on the sample depth and sampling logs, this deep subsurface soil sample may have been collected from the saturated zone. Table 2 presents the analytical results for groundwater. Of the three groundwater samples collected, only the sample from well 03-MW02 contained SVOCs. Several PAHs, including acenaphthene, 2-methylnaphthalene, naphthalene, and phenanthrene, were detected at concentrations exceeding 1,000 microgram per liter (µg/L). Other detected PAHs included anthracene (260 µg/L), chrysene (96 µg/L), fluoranthene (640 µg/L), fluorene (890 µg/L), and pyrene (460 µg/L). In addition, dibenzofuran was detected at a concentration of 1,100 µg/L. In sediment, the SVOC bis(2-ethylhexyl)phthalate was detected at a concentration of 750 µg/kg. However, this constituent is a common laboratory contaminant so its presence is most likely not site-related. No other SVOCs were detected in the sediment during the Site Inspection.

3.2.2 Remedial Investigation, 1994-95

From 1994 through 1995, Baker Environmental, Inc. (Baker) conducted field activities for an RI at Site 3. These field activities, which included soil and groundwater investigations, were conducted in three phases. Phase 1, conducted in September 1994, consisted of a surface soil investigation using enzyme linked immunosorbent assay (ELISA) field screening (i.e., surface soil samples were collected and immediately analyzed for PAHS in the field using an ELISA field test kit). A total of 84 surface soil samples were collected and analyzed in the field. Thirty-seven of the 84 samples were sent to a laboratory for confirmatory analyses. The results of the Phase 1 surface soil investigation assisted in locating soil borings and monitoring wells at Site 3 during Phases 2 and 3 of the RI. Phase 2, conducted from October through December 1994, included surface soil, subsurface soil, and groundwater investigations. During this second phase, five shallow monitoring wells and one intermediate monitoring well (i.e., a well screened at the top of the Castle Hayne aquifer) were installed. Phase 3, conducted in June
1995, included surface soil, subsurface soil, and groundwater investigations. During this third phase, five additional shallow monitoring wells, one additional intermediate monitoring, and one deep monitoring well (i.e., a well screened in the middle of the Castle Hayne aquifer) were installed. In addition to these three RI phases, monitoring well 03-MW02DW was resampled a third time in January 1996.

Figures 4, 5, and 6 identify the soil sampling locations associated with the RI. Figure 4 identifies the sampling locations in the site's northern area (NA), Figure 5 identifies the sampling locations in the treatment area (TA)/concrete pad area (CP), and Figure 6 identifies the sampling locations in the railroad spur area (RS). Figure 7 identifies the groundwater sampling locations associated with the RI. In addition, Tables 3 and 4 present soil and groundwater sampling summaries, respectively. Tables 5, 6, and 7 summarize the analytical results from the surface soil, subsurface soil, and groundwater investigations associated with the RI. Table 5 summarizes the surface soil results, Table 6 summarizes the subsurface soil results, and Table 7 summarizes the groundwater results. These tables present concentration ranges for positively detected chemical constituents, and a comparison of constituent concentrations to relevant comparison criteria (i.e., federal, state, and/or local standards; background concentrations; or risk-based concentrations). As the analytical results indicate, the most frequently detected organic contaminants were PAHs, which exhibited the highest concentrations in both soil and groundwater. Because creosote is made up of PAH compounds, the PAHs detected at Site 3 are believed to be associated with operations at the former creosote plant. The highest PAH concentrations in soil occurred in the treatment area of the site (i.e., the area encircled by the dirt path loop). Fuel constituents, such as ethylbenzene and xylene, were also detected in surface and subsurface soil at the former treatment area. In the shallow aquifer, benzene was detected above federal and/or state standards in the central portion of the treatment area during the first and third groundwater sampling rounds, but not during the second round. Several PAHs, including naphthalene, phenanthrene, benzo(a)anthracene, chrysene, and benzo(a)pyrene, were detected above federal and/or state standards during the first sampling round. However, naphthalene was the only PAH that was detected above standards during the subsequent sampling rounds. Naphthalene was detected in the treatment area and in the rail spur area, but the locations and concentrations of detections were not consistent between the three groundwater sampling rounds.

In the Castle Hayne aquifer, volatile organic compounds (VOCs) (in particular, fuel constituents) and SVOCs (in particular, PAHs and phenols) were detected during all three sampling rounds. Benzene, chloroform, naphthalene, and phenol were the only organic contaminants detected above federal and/or state standards. Benzene was detected above standards in intermediate well 03-MW02IW during the first sampling round. During the second sampling round, benzene, phenol, and naphthalene were detected above standards in deep well 03-MW02DW (located in the treatment area). During the third sampling round, no contaminants were detected above federal and state standards in the Castle Hayne aquifer. When 03-MW02DW was resampled a third time (in January 1996) no contaminants were detected above federal and state standards.

4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI, FS, and PRAP documents for OU No. 12 (Site 3) were released to the public on November 6, 1996. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 12 (Site 3) mailing list will be sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP, RI, and FS documents was published in the "Jacksonville Daily News" on November 3, 1996. A public comment period was held from November 6, 1996 to December 6, 1996. In addition, a public meeting was held on November 6, 1996 to respond to questions and to accept public comments on the PRAP for OU No. 12 (Site 3). The public meeting minutes were transcribed and a copy of the transcript is presented in Appendix A of this ROD document. A copy of the transcript is also made available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this ROD, MCB, Camp Lejeune and the Department of the Navy (DoN) will publish a notice of availability for the ROD in the local newspaper, and place this ROD in the information repositories.

5.0 SCOPE AND ROLE OF THE RESPONSE ACTION
The scope of the response action for Site 3 includes two environmental media of concern: 1) subsurface soil, and 2) groundwater in the shallow aquifer. Based on the results of human health and ecological risk assessments, groundwater was the only environmental medium that generated unacceptable risk values (unacceptable human health risk values were generated under the future residential land use scenario – see Section 7.0 of this ROD). To address these unacceptable risk values, it was necessary to develop a response action for groundwater. Although subsurface soil did not generate unacceptable risk values, the subsurface soil was suspected to be contributing to the groundwater contamination by leaching PAHs. To address the potential for leaching contaminants, it was necessary to develop a response action for subsurface soil. Thus, two sets of remedial action alternatives were developed – one set for subsurface soil and one set for groundwater. A complete response action for Site 3 will combine one subsurface soil alternative and one groundwater alternative.

The response action for Site 3 focuses on specific areas of concern located within the subsurface soil and groundwater. Figure 8 depicts these areas of concern. The subsurface soil area of concern was defined based on SVOC concentrations that exceeded federal soil screening levels established to protect groundwater, and the depth of the water table. This area of concern extends from approximately three feet bgs to nine feet bgs (just above the water table). The total volume of soil within this area of concern is approximately 1,340 cubic yards. [Note: The soil area of concern does not include PAH contamination detected below the water table. This is because it is impractical to remediate this saturated soil. Continued groundwater monitoring, however, may be proposed to address this contamination.] The groundwater areas of concern were defined based on SVOC concentrations in the shallow aquifer that exceeded federal and/or state standards, or risk-based criteria. As shown in Figure 8, one groundwater area of concern is centered around well 03-MW02, and one groundwater area of concern is centered around well 03-MW06. In the vicinity of 03-MW02, the subsurface soil area of concern is suspected to be the main source of groundwater contamination. Leaching PAHs from the subsurface soil most likely contaminated the groundwater in this area. Thus, the subsurface soil area of concern is considered a "source area" of contamination. The groundwater area of concern centered around 03-MW06 contains PAH concentrations, but at lower levels than the groundwater area of concern centered around 03-MW02. In the vicinity of 03-MW06, there does not appear to be a source area of contaminated soil.

6.0 SUMMARY OF SITE CHARACTERISTICS

Based on the results of a previous investigation and the RI, the most frequently detected organic contaminants at Site 3 were PAHs. Because creosote is made up of PAH compounds, the PAHs detected at Site 3 are believed to be associated with operations at the former creosote plant. Soil and groundwater (both shallow and deep) contained the highest levels of PAH compounds. In soil, the maximum PAH concentrations occurred in the treatment area of the site. In groundwater, the maximum PAH concentrations occurred in the treatment area and in the southern rail spike area. In addition to PAHs, fuel constituents, including benzene, were detected in soil and groundwater (both shallow and deep) at Site 3. The maximum concentrations of these fuel constituents, however, were scattered sporadically across the site.

7.0 SUMMARY OF SITE RISKS

As part of the RI, a human health risk assessment (RA) and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 3. The following subsections briefly summarize the findings of the human health and ecological RAs.

7.1 Human Health Risk Assessment

During the human health RA, contaminants of potential concern (COPCs) were selected for surface soil, subsurface soil, and groundwater, as shown in Table 8. The selection of COPCs was based on criteria provided in the U.S. Environmental Protection Agency (USEPA) Risk Assessment Guidance for Superfund.

For each COPC, incremental lifetime cancer risk (ICR) values and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. Table 9 presents the ICR and HI values for each environmental medium and receptor evaluated. (Receptors included current military personnel, future child and adult residents, and future construction workers.) Table 9 also presents total ICR and HI values which represent risks to all environmental media combined, for each receptor. A shaded block in Table 9 indicates an ICR
value that exceeds the USEPA acceptable limit of 1E-04 for carcinogens, or an HI value that exceeds the USEPA acceptable limit of 1.0 for noncarcinogens. As shown in Table 9, unacceptable risk values were generated for future child and adult residents upon exposure to groundwater. As shown in Tables 8 and 9, the COPCs and risk values for groundwater were generated under two approaches: 1) the evaluation of Round 2 groundwater data, and 2) the evaluation of Rounds 1, 2, and 3 groundwater data combined (referred to as the "Worst Case" approach). The latter approach is more conservative.

7.2 Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface soil as shown in Table 10. Then, the potential ecological impacts to terrestrial receptors were evaluated for each COPC. Several COPCs, including some SVOCs and the inorganic chromium, exceeded surface soil screening values (SSSVs) in open grass areas or along tree lines. However, most of the studies used to develop SSSVs do not take into account the soil type, which may have a large influence on the toxicity of contaminants. In addition, most of the SSSVs are based on one or two studies which limits their reliability for a wide range of site-specific circumstances. Overall, the SSSVs have a high degree of uncertainty associated with them and are not well-established. Consequently, potential ecological risks based on these SSSVs may not be completely accurate and most likely err on the conservative side. In addition, none of the quotient indices (QIs) generated for terrestrial receptors exceeded the acceptable limit of 1.0, so potential impacts to terrestrial mammals or birds are not expected. No threatened or endangered species are known to inhabit Site 3, and no wetlands were identified.

8.0 DESCRIPTION OF ALTERNATIVES

Based on the response action developed for Site 3, remedial action alternatives (RAAs) were developed and evaluated. Five alternatives were developed for subsurface soil:

- Soil RAA No. 1: No Action
- Soil RAA No. 2: Land Use Restrictions
- Soil RAA No. 3: Source Removal and Off Site Landfill Disposal
- Soil RAA No. 4: Source Removal and Off Site Incineration
- Soil RAA No. 5: Source Removal and Biological Treatment

Three alternatives were developed for groundwater:

- Groundwater RAA No. 1: No Action
- Groundwater RAA No. 2: Aquifer Use Restrictions and Monitoring
- Groundwater RAA No. 3: Extraction and On Site Carbon Adsorption Treatment

The following paragraphs describe these soil and groundwater alternatives.

8.1 Description of Soil Alternatives

8.1.1 Soil RAA No. 1: No Action

Capital Cost: $0
Annual Operation and Maintenance (O&M) Cost: $0
Net Present Worth (NPW): $0
Years to Implement: None

Under Soil RAA No. 1, no remedial actions will be implemented to address the subsurface soil area of concern. The no action alternative is required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as a baseline for comparison with other remedial action alternatives that provide a greater level of response. Under this alternative, contaminants will remain untreated in the subsurface soil. As a result, the lead agency will be required to review the effects of this alternative at least once every five years.
8.1.2 Soil RAA No. 2: Land Use Restrictions

Capital Cost: $0
Annual O&M Cost: $0
NPW: $0
Years to Implement: Less Than One Month

Under Soil RAA No. 2, land use restrictions will be implemented to limit future development and use of the site, and to avoid future exposure to the subsurface soil contaminants. Because the subsurface soil area of concern will not receive active treatment, the lead agency will be required to review the effects of the alternative at least once every five years.

8.1.3 Soil RAA No. 3: Source Removal and Off Site Landfill Disposal

Capital Cost: $920,000
Annual O&M Cost: $0
NPW: $920,000
Years to Implement: Less Than One Month

Under Soil RAA No. 3, the subsurface soil area of concern, which is considered a source of groundwater contamination at Site 3, will be excavated to a depth of nine feet bgs. Confirmatory soil samples will be collected from the excavation area to ensure that contaminated soil above the water table has been removed to acceptable limits. The excavated soil located from 0 to 9 feet bgs (approximately 2,000 cubic yards) will be sent off site to a Resource Conservation and Recovery Act (RCRA) permitted Subtitle C facility for disposal. Finally, the excavation area will be backfilled with clean fill from an on Base borrow pit. In addition to source removal and landfill disposal, Soil RAA No. 3 includes land use restrictions until the soil remediation is complete. Although the subsurface soil area of concern will be removed, a 5-year review by the lead agency may still be required for contaminated groundwater remaining at the site.

8.1.4 Soil RAA No. 4: Source Removal and Off Site Incineration

Capital Cost: $3,150,000
Annual O&M Cost: $0
NPW: $3,150,000
Years to Implement: Less Than One Month

Under Soil RAA No. 4, the subsurface soil area of concern will be excavated to a depth of nine feet bgs. Confirmatory soil samples will be collected from the excavation area to ensure that contaminated soil above the water table has been removed to acceptable limits. The excavated soil located from 0 to 9 feet bgs (approximately 2,000 cubic yards) will be sent off site for thermal treatment at a permitted incineration facility. Finally, the excavation area will be backfilled with clean fill from an on Base borrow pit. In addition to source removal and incineration, Soil RAA No. 4 includes land use restrictions until the soil remediation is complete. Although the subsurface soil area of concern will be removed, a 5-year review by the lead agency may be required for contaminated groundwater remaining at the site.

8.1.5 Soil RAA No. 5: Source Removal and Biological Treatment

Capital Cost: $362,000
Annual O&M Cost: $35,000
NPW: $514,000
Years to Implement: Assumed to be 5 years

Under Soil RAA No. 5, the subsurface soil area of concern will be excavated to a depth of nine feet bgs. Confirmatory soil samples will be collected from the excavation area to ensure that contaminated soil above the water table has been removed to acceptable limits. The excavated soil located from 0 to 9 feet bgs (approximately 2,000 cubic yards) will undergo aerobic, solid-phase biological treatment at one of two locations: 1) the existing Lot 203 biocell at MCB, Camp Lejeune, or 2) a biocell constructed at Site 3. The treatment location will depend on the availability of the Lot 203 biocell which is currently being used to treat petroleum, oil, and lubricant (POL)-contaminated soil from other sites at MCB, Camp Lejeune. In addition, the treatment location will depend on the ability to modify the permit for the Lot 203 biocell so that is can accept PAH-contaminated soil. Prior to implementation, a pilot-scale treatability study will be conducted at Site 3 to further determine the effectiveness of this alternative. The treatability study is currently scheduled to begin in the Spring of 1997.
treatment will be conducted using landfarming technology within a controlled unit (the "biocell"). The contaminated soil will be placed in a 12 inch lift underlain by a 24 inch lift of coarse sand, a high density polyethylene geomembrane liner, and a non-woven geotextile fabric. Leachate will be collected by a leachate collection line and sump, and periodically resprayed back onto the contaminated soil. Maintenance of the biocell will consist of periodic leachate collection and respraying, soil tilling, nutrient and fertilizer addition, and soil sampling. Soil RAA No. 5 also includes land use restrictions until the soil remediation is complete. Although the subsurface soil area of concern will be removed and treated, a 5-year review by the lead agency will be required until the remediation levels for soil are achieved.

8.2 Description of Groundwater Alternatives

8.2.1 Groundwater RAA No. 1: No Action

Capital Cost: $0
Annual O&M Cost: $0
NPW: $0
Years to Implement: None

Under Groundwater RAA No. 1, no remedial actions will be implemented to address the groundwater areas of concern. The no action alternative is required by the NCP as a baseline for comparison with other remedial action alternatives that provide a greater level of response. Under this alternative, contaminants will remain untreated in the groundwater. As a result, the NCP requires the lead agency to review the effects of this alternative at least once every five years.

8.2.2 Groundwater RAA No. 2: Aquifer Use Restrictions, and Monitoring

Capital Cost: $0
Annual O&M Cost (Years 1–5): $64,000
Annual O&M Cost (Years 6–30): $33,000
NPW: $643,000
Years to Implement: 30 Years of Groundwater Monitoring

Under Groundwater RAA No. 2, aquifer use restrictions and a groundwater monitoring program will be implemented. The aquifer use restrictions will prohibit future use of the shallow and Castle Hayne aquifers, within a 1000 foot radius of Site 3, as potable water sources. The monitoring program will include quarterly groundwater sampling and analysis at four shallow monitoring wells (03–MW02, 03–MW06, 03–MW07, and 03–MW08), two intermediate monitoring wells (03–MW02IW and 03–MW11IW), and one deep monitoring well (03–MW02DW). If the groundwater quality improves, the sampling frequency may be reduced from quarterly to semiannual. The samples will be analyzed for TCL VOCs and SVOCs to monitor contaminant concentrations in the shallow and Castle Hayne aquifers over time. For cost estimating purposes, quarterly sampling was assumed for years 1–5, and semiannual sampling was assumed for years 6–30. Additional wells may be added to the monitoring program if necessary. Under Groundwater RAA No. 2, the groundwater areas of concern will not receive active treatment so the lead agency will be required to review the effects of this alternative at least once every five years.

8.2.3 Groundwater RAA No. 3: Extraction and On Site Carbon Adsorption Treatment

Capital Cost: $422,000
Annual O&M Cost (Years 1–5): $64,000
Annual O&M Cost (Years 6–30): $33,000
Annual O&M Cost (Treatment System Years 1–3): $85,000
NPW: $2,370,000
Years to Implement: 30 Years of Treatment Plant O&M;
30 Years of Groundwater Monitoring

Under Groundwater RAA No. 3, a groundwater extraction and treatment system (i.e., a pump and treat system) will be installed at Site 3. Two extraction wells will be installed within the shallow aquifer at depths of approximately 20 feet bgs. One extraction well will be located near existing well 03–MW02, and one extraction well will be located near existing well 03–MW06. The wells pumping rates will allow their cones of influence to intercept the groundwater areas of concern. (For cost estimating purposes, it is assumed that each well will pump at 5 gallons per minute and generate a 220 foot radius of influence). Once extracted, the contaminated groundwater will be transported via pipeline to an on site treatment plant located between
existing wells 03-MW02 and 03-MW06. At the treatment plant, the groundwater will undergo pretreatment via oil/water separation, neutralization, precipitation, filtration, flocculation, and sedimentation. Then the groundwater will undergo liquid-phase carbon adsorption treatment. The treated groundwater will be discharged by pipeline to the nearest sanitary sewer line for subsequent discharge to a Base sewage treatment plant. In addition to groundwater extraction and treatment, Groundwater RAA No. 3 includes land use and aquifer use restrictions and a groundwater monitoring program. (See Groundwater RAA No. 2 for a description of the restrictions and monitoring program included under Groundwater RAA No. 3.) Because the contaminated groundwater will remain on site indefinitely, 5-year reviews by the lead agency will be required.

9.0 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the comparative analysis of alternatives that was conducted for the soil and groundwater RAAs. During the analysis, the RAAs were comparatively evaluated using seven USEPA evaluation criteria: overall protection of human health and the environment; compliance with applicable and relevant or appropriate requirements (ARARs)/to-be-considered criteria (TBCs); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Table 11 presents definitions of these evaluation criteria.

9.1 Analysis of Soil Alternatives

9.1.1 Overall Protection of Human Health and the Environment

Under Soil RAA No. 1 (No Action) and Soil RAA No. 2 (Land Use Restrictions), no remediation actions will be implemented to remove or treat the area of concern containing contaminated subsurface soil. Because the contaminated soil will be left as is, it will continue to be a potential source of groundwater contamination (via contaminant leaching). As such, the contaminated soil will be contributing to the unacceptable human health risks associated with groundwater. (These risks were generated under the future residential land use scenario.) Soil RAA No. 1 provides no means for reducing these potential risks. Soil RAA No. 2, on the other hand, includes land use restrictions that will reduce some of the potential risks. Regardless, under both Soil RAA Nos. 1 and 2, contaminants may continue to leach from the subsurface soil to the groundwater. Compared to Soil RAA Nos. 1 and 2, Soil RAA No. 3 (Source Removal and Off Site Landfill Disposal), Soil RAA No. 4 (Source Removal and Off Site Incineration), and Soil RAA No. 5 (Source Removal and Biological Treatment) will significantly reduce the human health risks associated with groundwater by completely removing a major source of the groundwater contamination – the subsurface soil area of concern above the water table. Because Soil RAA Nos. 3, 4, and 5 are source removal alternatives, they will prevent the further leaching of PAH contaminants from the subsurface soil (at 3 to 9 feet bgs) to the groundwater. Thus, Soil RAA No. 1 provides no additional protection of human health, Soil RAA No. 2 provides some additional protection, and Soil RAA Nos. 3, 4, and 5 provide significant protection.

Because ecological risks were determined to be insignificant, conditions at Site 3 are already considered to be protective of the environment. As a result, all five soil RAAs will provide overall protection of the environment. The biocell included under Soil RAA No. 5 could potentially present risks to terrestrial receptors. However, if the biocell is properly controlled (with a cover and a surrounding earthen berm), these ecological risks will be insignificant.

9.1.2 Compliance with ARARs/TBCs

Under Soil RAA Nos. 1 and 2, contaminants will remain in the subsurface soil at concentrations that exceed chemical-specific TBCs (i.e., the federal soil screening levels developed for USEPA Region III; no chemical-specific ARARs were identified for soil). Thus, soil conditions at the site will not meet chemical-specific TBCs. Under Soil RAA Nos. 3, 4, and 5, soil contaminants that exceed the federal soil screening levels will be removed from the subsurface. Thus, soil conditions at the site will meet chemical-specific TBCs.

Soil RAA Nos. 3, 4, and 5 can be designed to meet all of the location- and action-specific ARARs/TBCs that apply to them. No location- or action-specific ARARs/TBCs apply to Soil RAA Nos. 1 and 2.
9.1.3 Long-Term Effectiveness and Permanence

Soil RAA No. 1 does not provide long-term effectiveness and permanence. This is because Soil RAA No. 1 allows a source of groundwater contamination, the subsurface soil area of concern, to remain in place and untreated. In addition, Soil RAA No. 1 does not provide controls to manage the remaining soil contaminants. Like Soil RAA No. 1, Soil RAA No. 2 allows the subsurface soil area of concern to remain in place and untreated. However, Soil RAA No. 2 includes land use restrictions to manage the remaining soil contaminants. Therefore, Soil RAA No. 2 provides a greater level of long-term effectiveness and permanence than Soil RAA No. 1. The restrictions will effectively prevent human exposure to the PAH contaminants. However, under Soil RAA No. 2, the contaminants will continue to leach from the subsurface soil to the groundwater. Compared to Soil RAA Nos. 1 and 2, Soil RAA Nos. 3, 4, and 5 provide high levels of long-term effectiveness and permanence. Under Soil RAA Nos. 3, 4, and 5, the subsurface soil area of concern will be completely removed, preventing contaminants from leaching into the groundwater. Soil RAA Nos. 3, 4, and 5 also include land use restrictions which provide additional long-term effectiveness and permanence.

9.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Soil RAA Nos. 1 and 2 do not involve source removal or treatment processes, so these alternatives will not reduce toxicity, mobility, or volume of the soil contaminants. Soil RAA Nos. 3, 4, and 5, however, involve soil removal and treatment and/or disposal so these alternatives will result in toxicity, mobility, and volume reduction. Most importantly, Soil RAA Nos. 3, 4, and 5 will eliminate the mobility of PAH contaminants by preventing them from leaching into the groundwater. Soil RAA Nos. 1, 2, and 3 do not satisfy the statutory preference for treatment. Soil RAA Nos. 4 and 5 do satisfy the statutory preference.

9.1.5 Short-Term Effectiveness

Implementation of Soil RAA Nos. 1 and 2 does not increase risks to the community or to workers because these alternatives include no actions other than administrative efforts. Soil RAA Nos. 3, 4, and 5, however, will present risks during soil excavation and backfilling activities. In addition, Soil RAA Nos. 3 and 4 will present risks during transportation of the contaminated soil to the treatment/disposal facility associated with each alternative. Soil RAA No. 4 will present additional risks by creating incinerator off-gas that may escape to the atmosphere. Soil RAA No. 5 will present risks during the initial placement of the contaminated soil, and during the treatment O&M. Under RAAs Nos. 3 through 5, the following measures will be taken to provide adequate community and worker protection: proper materials handling procedures, personal protective equipment, and construction safety fencing. Air pollution control equipment at the incineration facility will also reduce the risks associated with off-gases under Soil RAA No. 4. In addition, a cover/liner system and periodic maintenance checks will provide additional protection for the treatment cell associated with Soil RAA No. 5. None of the RAAs will present significant environmental impacts.

9.1.6 Implementability

Soil RAA No. 1 is the most implementable, if not the most effective, alternative. Soil RAA No. 2 is the next most implementable alternative because the only activity it involves is ordinance procurement. The remaining RAAs (Soil RAA Nos. 3, 4, and 5) are similar in that they include the excavation of subsurface soil. Soil RAA Nos. 3 and 4 both include transportation of contaminated soil to a treatment/disposal facility. This transportation will require appropriate materials handling procedures. Compared to Soil RAA Nos. 3 and 4, however, Soil RAA No. 5 will be less easy to implement because it involves mixing of the excavated soil with bulking agents and additives, and long-term O&M of the biocell. In addition, Soil RAA No. 5 requires a treatability study.

9.1.7 Cost

In terms of NPW, the no action alternative (Soil RAA No. 1) and the land use restrictions alternative (Soil RAA No. 2) will be the least expensive to implement, followed by Soil RAA No. 5, Soil RAA No. 3, and Soil RAA No. 4. The estimated NPW values, in increasing order, are
9.2 Analysis of Groundwater Alternatives

9.2.1 Overall Protection of Human Health and the Environment

Groundwater RAA No. 1 (No Action) will not reduce the human health risks associated with groundwater. On the other hand, Groundwater RAA No. 2 (Aquifer Use Restrictions and Monitoring) and Groundwater RAA No. 3 (Extraction and On Site Carbon Adsorption Treatment) will reduce human health risks because both alternatives include restrictions and monitoring programs. The restrictions will prevent human receptors from ingesting, dermally contacting, or inhaling groundwater contaminants. Monitoring will provide a warning system against contaminants that have migrated to unsafe locations, and contaminant concentrations that have increased to unsafe levels, so that human exposure can be avoided. Thus, Groundwater RAA Nos. 2 and 3 will prevent the potential for direct exposure to contaminated groundwater, but Groundwater RAA No. 1 will not. In addition, Groundwater RAA Nos. 2 and 3 will provide overall protection of human health and the environment, but Groundwater RAA No. 1 will not.

Compared to Groundwater RAA Nos. 1 and 2, Groundwater RAA No. 3 provides some additional protection of human health and the environment by collecting the groundwater contaminants and actively treating them at an on site treatment plant. However, this additional protection is not necessary to prevent future human exposure to the groundwater contaminants. PAHs exhibit low volatility and low aqueous solubility. Due to their hydrophobic nature, PAHS tend to adsorb onto soils and sediment. As a result, the PAH contaminants at Site 3 will have a low migration potential so it is unlikely that they will horizontally or vertically migrate to the nearest current receptors.

9.2.2 Compliance with ARARs/TBCs

Groundwater RAA Nos. 1 and 2 will allow contaminant levels exceeding chemical-specific ARARs (i.e., federal and state standards, and risk-based criteria) to remain in groundwater at the site. Because of this, Groundwater RAA Nos. 1 and 2 may require a waiver of the chemical-specific ARARs before these alternatives can be implemented. Groundwater RAA No. 3 could potentially remediate the groundwater to chemical-specific ARARs, but most likely the pump and treat system will not be capable of achieving such stringent cleanup standards. Groundwater contaminants, especially PAHs, may sorb to solid particles or escape into subsurface pore spaces or fissures where they become difficult to extract. Most likely, extraction wells will only collect a portion of the PAH contamination; the remaining PAH contamination will remain in the aquifer. Therefore, a pump and treat system may not be able to achieve chemical-specific ARARs. No location- or action-specific ARARs/TBCs apply to Groundwater RAA Nos. 1 and 2. Groundwater RAA No. 3 can be designed to meet all of the location- and action-specific ARARs/TBCs that apply to it.

9.2.3 Long-Term Effectiveness and Permanence

Groundwater RAA No. 3 will provide long-term effectiveness and permanence because it involves collection and treatment of the contaminated groundwater. Although Groundwater RAA No. 2 will allow contaminants to remain untreated at the site, this alternative will also provide long-term effectiveness and permanence. Based on the hydrophobic nature of PAH contaminants, and the results of a two-dimensional flow model conducted for the FS, leaving PAH contaminants untreated at the site will not affect the nearest, current receptor (a potable water supply well located approximately 700 feet west of Site 3). It may affect future receptors occurring in the vicinity of Site 3, but Groundwater RAA No. 2 includes aquifer use restrictions and monitoring that will effectively prevent future human exposure. Groundwater RAA No. 1, on the other hand, provides no means for preventing future human exposure so this alternative will not provide long-term effectiveness and permanence.

The pump and treat system included under Groundwater RAA No. 3 will only be adequate and reliable to a certain extent. Technologies for completely extracting contaminants from
groundwater are not proven. Contaminants, especially PAHs, may adsorb to solid particles or escape into subsurface pore spaces or fissures where they become difficult to extract. Also, contaminants may continue to leach from solid particles into the groundwater. As a result, extraction wells may not be completely reliable for removing PAH contaminants from the shallow aquifer. All three groundwater alternatives will require 5-year reviews by the lead agency to ensure that adequate protection of human health and the environment is maintained.

9.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Groundwater RAA No. 3 will reduce the toxicity, mobility, and volume of contaminated groundwater that is collected by the extraction wells. However, some of the contaminated groundwater will not be collected so it will not receive treatment. This is because PAH contaminants may adsorb to soils and sediments and escape in pore spaces and fissures. Unlike Groundwater RAA No. 3, Groundwater RAA Nos. 1 and 2 do not involve groundwater extraction or active treatment processes. Therefore, Groundwater RAA Nos. 1 and 2 will not reduce the toxicity, mobility, or volume of groundwater contamination. Unlike Groundwater RAA Nos. 1 and 2, Groundwater RAA No. 3 will create treatment residuals. The residuals associated with Groundwater RAA No. 3 (sludge, separated oil, exhausted carbon, and treated groundwater) will be voluminous and will require proper treatment and/or disposal. Groundwater RAA No. 3 satisfies the statutory preference for treatment; Groundwater RAA Nos. 1 and 2 do not.

9.2.5 Short-Term Effectiveness

Implementation of Groundwater RAA Nos. 1 and 2 does not pose substantial risks to the community or to workers. Implementation of Groundwater RAA No. 3 does pose risks because it involves construction of extraction wells, underground pipelines, and a treatment facility. During pipeline construction, special care must be taken to avoid underground utilities. In addition, construction safety fencing and dust minimization procedures should provide adequate protection to the community and to workers. Groundwater RAA No. 3 also involves long-term operation and maintenance of an extraction well system and an on site treatment facility. The treatment facility will generate residual waste streams that must be properly treated and/or disposed. The use of personal protective equipment and proper materials handling procedures should provide adequate protection during operation and maintenance. Because it creates aquifer drawdown, Groundwater RAA No. 3 is the only alternative that could potentially create environmental impacts. Under all three groundwater alternatives, the time for the action to be complete is unknown. Thirty years of groundwater monitoring was assumed for Groundwater RAA No. 2, and 30 years of groundwater monitoring and treatment system O&M was assumed for Groundwater RAA No. 3.

9.2.6 Implementability

Groundwater RAA No. 1 is the easiest alternative to implement, if not the most effective. Groundwater RAA No. 2 is the next most implementable alternative followed by Groundwater RAA No. 3. Groundwater RAA No. 1 requires no operation or maintenance. Groundwater RAA No. 2 requires minimal operation and maintenance (groundwater samples will be collected and wells will be replaced periodically). Groundwater RAA No. 3, however, requires extensive operation and maintenance. Under all three alternatives, additional remedial actions could easily be implemented. Groundwater RAA Nos. 2 and 3 involve conventional equipment and services that should be readily available. Compared to Groundwater RAA No. 2, Groundwater RAA No. 3 will require more extensive coordination with the Base Public Works/Planning department. Unlike Groundwater RAA No. 1, Groundwater RAA Nos. 2 and 3 will require semiannual submission of reports that document sampling results. Unlike Groundwater RAA No. 3, Groundwater RAA Nos. 1 and 2 may require a waiver of ARARs since groundwater contaminants will be left untreated at the site.

9.2.7 Cost

In terms of NPW, the no action alternative (Groundwater RAA No. 1) will be the least expensive alternative to implement, followed by Groundwater RAA No. 2, then Groundwater RAA No. 3. The estimated NPW values in increasing order are
10.0 THE SELECTED REMEDY

This section of the ROD presents the selected remedy for OU No. 12 (Site 3) which is a combination of the separate remedies selected for soil and groundwater. The following information is presented: a remedy description, which includes the rationale behind the remedy selection; the costs estimated to implement the remedy; and the remediation levels to be attained at the conclusion of the remedy.

10.1 Remedy Description

The selected remedy for OU No. 12 (Site 3) is a combination of Soil RAA No. 5 - Source Removal and Biological Treatment, and Groundwater RAA No. 2 - Aquifer Use Restrictions, and Monitoring. Thus, the selected remedy includes the following:

- Excavating the subsurface soil area of concern to a depth of nine feet bgs or to just above the water table.
- Confirmatory soil sampling in the excavation area to ensure that contaminated soil has been removed to acceptable levels.
- Treating the excavated soil (approximately 2,000 cubic yards) with aerobic, solid-phase biological treatment in a biocell.
- Backfilling the excavation area with "clean" soil.
- Implementing land use restrictions that will limit future land development use at the site until the soil remediation has been completed.
- Quarterly sampling of groundwater from monitoring wells 03-MW02, 03-MW02IW, 03-MW02DW, 03-MW06, 03-MW07, 03-MW08, and 03-MW11IW; analyzing the samples for TCL VOCs and SVOCs. If groundwater quality improves, the sampling frequency may be reduced from quarterly to semiannual.
- Implementing aquifer use restrictions via the Base Master Plan to prohibit future use of the shallow and Castle Hayne aquifers, within a 1000 foot radius of Site 3, as potable water sources.

10.1.1 The Selection of Soil RAA No. 5 - Source Removal and Biological Treatment

At Site 3, the subsurface soil area of concern appears to be the main source of groundwater contamination (via contaminant leaching). As a result, source removal alternatives (i.e., Soil RAA Nos. 3, 4, and 5) were considered to be more appropriate than alternatives that leave the soil in situ and untreated (i.e., Soil RAA Nos. 1 and 2). This is because source removal alternatives eliminate the potential for soil contaminants to leach into the groundwater. Under the source removal alternatives, contaminants that could potentially leach will be removed from the subsurface and treated and/or disposed. Because Soil RAA Nos. 1 and 2 allow a source area of contamination to remain in situ and untreated, these alternatives do not provide adequate protection of human health.

Compared to Soil RAA Nos. 3 and 4, Soil RAA No. 5 is the most cost effective source removal alternative. Although the NPW of Soil RAA No. 5 ($514,000) is similar to the NPW of Soil RAA No. 3 ($920,000), Soil RAA No. 5 includes an extra advantage. Under Soil RAA No. 5, the contaminated soil will be treated then reused at the Base as general backfill material. Under Soil RAA No. 3, the contaminated soil will be landfilled. Thus, Soil RAA No. 5 allows for the beneficial reuse of the contaminated soil.

10.1.2 The Selection of Groundwater RAA No. 2 - Aquifer Use Restrictions and Monitoring

The groundwater contamination at Site 3 mainly consists of PAH compounds. Because PAHs exhibit
low water solubility, they tend to adsorb to soil and sediment making them relatively immobile contaminants. As a result, the PAH-contaminated groundwater, if left untreated, is not likely to migrate beyond the limits identified in Figure 8. To reinforce this theory, a two-dimensional horizontal flow model was conducted during the FS. The results of the model indicated that untreated PAH-contaminated groundwater will not pose unacceptable risks to the nearest receptor (a potable water supply well) that is currently located on Base. However, future potential receptors located in the vicinity of Site 3 could be affected by the PAH-contaminated groundwater. Thus, a no action plan (i.e., Groundwater RAA No. 1) will not maintain adequate protection of human health. Groundwater RAA No. 2, on the other hand, will maintain adequate protection. Groundwater RAA No. 2 provides aquifer use restrictions that will prohibit the future use of the aquifer, thus protecting any future receptors. In addition, Groundwater RAA No. 2 includes a groundwater monitoring program that will provide a warning system in case contaminant concentrations increase to unsafe levels. This monitoring program provides additional protection of human health.

Compared to Groundwater RAA No. 2, Groundwater RAA No. 3 is not a cost effective alternative. The NPW of Groundwater RAA No. 2 is $643,000 and the NPW of Groundwater RAA No. 3 is $2,370,000. Although Groundwater No. 3 includes extraction and treatment of the contaminated groundwater, the ability of a pump and treat system to effectively extract groundwater contamination is not proven. Contaminants, especially PAHs, will sorb to soil particles and become trapped in subsurface fissures and pores where they are difficult, if not impossible, to extract. Thus, Groundwater RAA No. 3 may only have limited effectiveness. Groundwater RAA No. 2, on the other hand, will have proven effectiveness (aquifer use restrictions and groundwater monitoring are conventional and well-demonstrated). As long as the source of the contamination is removed (i.e., the subsurface soil area of concern), the PAHs in groundwater are expected to remain in the same general vicinity and naturally attenuate over time.

10.2 Estimated Costs

The following costs were estimated for the remedies selected for soil and groundwater remedies:

- **Source Removal and Biological Treatment**
  - Capital Cost: $362,000
  - Annual O&M: $35,000
  - NPW: $514,000

- **Aquifer Use Restrictions, and Monitoring**
  - Capital Cost: $0
  - Annual O&M (Years 1-5): $64,000
  - Annual O&M (Years 6-30): $33,000
  - NPW: $643,000

The following total cost was estimated for the complete OU No. 12 (Site 3) remedy (addressing both soil and groundwater):

- **Total Costs**
  - Capital Cost: $362,000
  - Annual O&M (Years 1-5): $99,000
  - Annual O&M (Years 6-30): $68,000
  - NPW: $1,157,000

10.3 Remediation Levels

Tables 12 and 13 present the remediation levels developed for soil and groundwater, respectively. The soil remediation levels are based on federal soil screening levels that were established to estimate the concentration at which soil contaminants may leach and create unsafe groundwater conditions. The groundwater remediation levels are either state standards, federal standards, or risk-based concentrations calculated specifically for Site 3.

11.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 121 which include: (1) protect human health and the environment; (2) comply with ARARs; (3) achieve
cost-effectiveness; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The following paragraphs evaluate the selected remedy for OU No. 12 (Site 3) with respect to these requirements.

11.1 Protection of Human Health

Source Removal and Biological Treatment will protect human health by removing the source area of contamination (i.e., the subsurface soil area of concern) from the site. When this source area is removed, PAH contaminants will no longer leach from the soil to the groundwater. As a result, subsurface soil will no longer be contributing to unacceptable human health risks associated with groundwater.

Aquifer Use Restrictions and Monitoring will protect human health by preventing future human exposure to potential contaminants in the groundwater. Aquifer use restrictions will prevent future human exposure by prohibiting the use of the shallow and Castle Hayne aquifers, within a 100 foot radius of Site 3, as potable water sources. The groundwater monitoring program will prevent future human exposure by providing a warning system against contaminant concentrations that have increased to unsafe levels.

Because ecological risks were determined to be insignificant, conditions at Site 3 are already considered to be protective of the environment, regardless of any remedy that is implemented. The selected remedy will not provide any additional protection of the environment.

11.2 Compliance with Applicable or Relevant and Appropriate Requirements

Although there were no chemical-specific ARARs identified for soil at Site 3, the federal soil screening levels were identified as chemical-specific TBCs. Because soil with contaminant levels exceeding these screening levels will be excavated and treated, the selected remedy will achieve the soil TBCs.

Federal standards, state standards, and risk-based concentrations were identified as chemical-specific ARARs for groundwater. Because groundwater will be left untreated, the selected remedy will not achieve these ARARs. Before implementing the selected remedy, a waiver of the chemical-specific ARARs may be required. Regardless, the remedy provides adequate controls, in the form of land use restrictions, aquifer use restrictions, and monitoring, to effectively manage the untreated groundwater that will remain on site.

The selected remedy can be designed to meet all of the location- and action-specific ARARs that apply to it.

11.3 Cost-Effectiveness

Compared to the other soil alternatives that were considered, Source Removal and Biological Treatment was the most cost effective remedy capable of providing adequate protection to human health and the environment. Land use and aquifer use restrictions provide a cost-effective remedy since there are no significant costs, other than administrative-type efforts, associated with their implementation. Compared to the groundwater extraction/treatment alternative, Aquifer Use Restrictions and Monitoring is the most cost effective remedy for groundwater because it provides adequate protection of human health and the environment at a reasonable cost.

11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy will provide a permanent, long-term solution since the source area of contaminated soil will be removed and treated. In addition, the provision and enforcement of aquifer use restrictions will provide a permanent, long-term solution. The selected remedy also employs an innovative alternative treatment technology - a biocell.

11.5 Preference for Treatment as a Principal Element

For soil, the selected remedy satisfies the statutory preference for treatment. However, this statutory preference is not satisfied for groundwater. Regardless, the selected remedy is
capable of providing adequate protection to human health and the environment.

12.0 RESPONSIVENESS SUMMARY

12.1 Overview

The selected remedy for OU No. 12 (Site 3) is Source Removal and Biological Treatment, Aquifer Use Restrictions, and Monitoring.

Based on the comments received during the public comment period, the public appears to support the selected remedy. In addition, the USEPA Region IV and the NC DEHNR are in support of the selected remedy outlined herein.

12.2 Background on Community Involvement

A record review of the MCB, Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and Base/community clubs. The file search did not locate written Installation Restoration Program concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Site 3). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to the Base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including Base personnel, residents, local officials, and off-Base residents.

- Prepared a Community Relations Plan, September 1990.

- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-Base residents, military and civilian interests.


- Established two information repositories.

- Established the Administrative Record for all of the sites at the Base.

- Formed Restoration Advisory Board (RAB) in May 1996.

- Released PRAP for public review in repositories, November 6, 1996.

- Released public notice announcing public comment and document availability of the PRAP, November 3, 1996.

- Held Restoration Advisory Board (RAB) meeting, November 6, 1996, to review PRAP and solicit comments.

- Held public meeting on November 6, 1996, to solicit comments and provide information. Approximately 16 people attended. The public meeting transcript is available in Appendix A of this ROD document, and in the information repositories.

12.3 Summary of Comments Received During the Public Comment Period and Agency Responses

A public meeting was held on November 6, 1996 in the Onslow County Library in Jacksonville, North Carolina. Representatives from LANTDIV, MCB, Camp Lejeune, USEPA Region IV, NC DEHNR, and...
OHM Corporation attended the meeting. The transcript for the public meeting is provided in Appendix A. The USEPA Region IV offered no comments. The NC DEHNR requested a more detailed explanation of the reason for not addressing contaminated soil below the water table. The State also requested that the groundwater sampling frequency be adjusted to a quarterly basis.
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Notes:

Concentrations expressed in µg/kg (microgram per kilogram)

bgs = Below ground surface

ND = Not detected

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## TABLE 3 (Continued)

### SOIL SAMPLING SUMMARY

**OPERABLE UNIT NO. 12 (SITE 3)**  
MCB CAMP LEJEUNE, NORTH CAROLINA

**REMEDIATION INVESTIGATION, 1994-95**

### MCB CAMP LEJEUNE, NORTH CAROLINA

#### OPERABLE UNIT NO. 12 (SITE 3)

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## TABLE 3 (Continued)

### SOIL SAMPLING SUMMARY
**REMEDIAL INVESTIGATION, 1994-95**
**OPERABLE UNIT NO. 12 (SITE 3)**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

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### TABLE 3 (Continued)

**SOIL SAMPLING SUMMARY**  
**REMEDIATION INVESTIGATION, 1994-95**  
**OPERABLE UNIT NO. 12 (SITE 3)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

#### Sample Analyses

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<th>Depth of Morehole Interval (feet, bgs)</th>
<th>Sampling Interval (PAH RISC (R))</th>
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### TABLE 3 (Continued)

**SOIL SAMPLING SUMMARY**

**REMEDIAL INVESTIGATION, 1994-95**

**OPERABLE UNIT NO. 12 (SITE 3)**

**MCB CAMP LEJEUNE, NORTH CAROLINA**

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**EnSys Background**

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### TABLE 3 (Continued)

**SOIL SAMPLING SUMMARY**  
**REMEDIATION INVESTIGATION, 1994-95**  
**OPERABLE UNIT NO. 12 (SITE 3)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

#### Sample Analyses

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| 3-BB-SB03 (4) | 00 | 1.0 | 0.0-1.0 | X | | | | |
| | 03 | 7.0 | 5.0-7.0 | X | | | | |
| Monitoring Wells | | | | | | | | |
| 3-MW02IW (4) | 00 | 1.0 | 0.0-1.0 | X | X | X | X | X | X |
| | 03 | 7.0 | 5.0-7.0 | X | X | X | X | X | X |
| | 09 | 19.0 | 17.0-19.0 | X | | | | |
| 3-MW02DW (5) | 00 | 1.0 | 0.0-1.0 | X | X | | | | |
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| 3-MW04 (4) | 00 | 1.0 | 0.0-1.0 | X | | | | |
## TABLE 3 (Continued)

**SOIL SAMPLING SUMMARY**  
**REMEDIAL INVESTIGATION, 1994-95**  
**OPERABLE UNIT NO. 12 (SITE 3)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

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### TABLE 3 (Continued)

**SOIL SAMPLING SUMMARY**  
**REMEDIAL INVESTIGATION, 1994-95**  
**OPERABLE UNIT NO. 12 (SITE 3)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

#### Sample Analyses

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**Notes:**

1. Sample was collected during the first phase of the soil investigation (September 19 through September 22, 1994)
2. EnSys confirmation sample
3. Engineering Parameters includes Particle Size, Atterberg limits, and TOC
4. Sample was collected during the second phase of the soil investigation (November 15 through November 22, 1994)
5. Sample was collected during the third phase of the soil investigation (June 13 through June 20, 1995)
6. Duplicate samples were collected for both PAH RISC (R) and TCL Semivolatiles

## TABLE 4

**GROUNDWATER SAMPLING SUMMARY**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**  
**REMEDIAL INVESTIGATION, 1994-95**  
**OPERABLE UNIT NO. 12 (SITE 3)**

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Note:

(1) Engineering Parameters include (BOD, COD, TDS, TSS, and TOC)

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</tbody>
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X = Selected as a COPC for human health risk assessment.
## TABLE 10

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)**

**MB Camp Lejeune, North Carolina**

Contaminant of Potential Concern in Surface Soil

<table>
<thead>
<tr>
<th>Inorganics</th>
<th>Chromium</th>
<th>Zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semivolatiles</td>
<td>Acenaphthylene</td>
<td>Anthracene</td>
</tr>
<tr>
<td></td>
<td>Benzo(a)anthracene</td>
<td>Benzo(b)fluoranthene</td>
</tr>
<tr>
<td></td>
<td>Benzo(k)fluoranthene</td>
<td>Benzo(g,h,i)perylene</td>
</tr>
<tr>
<td></td>
<td>Benzo(a)pyrene</td>
<td>Bis(2-ethylhexyl)phthalate</td>
</tr>
<tr>
<td></td>
<td>Carbazole</td>
<td>Chrysene</td>
</tr>
<tr>
<td></td>
<td>Dibenz(a,h)anthracene</td>
<td>Di-n-butylphthalate</td>
</tr>
<tr>
<td></td>
<td>Fluoranthene</td>
<td>Fluorene</td>
</tr>
<tr>
<td></td>
<td>Indeno(1,2,3-cd)pyrene</td>
<td>Phenanthrene</td>
</tr>
<tr>
<td></td>
<td>Pyrene</td>
<td>Volatiles</td>
</tr>
<tr>
<td></td>
<td>Ethylbenzene</td>
<td>Toluene</td>
</tr>
<tr>
<td></td>
<td>Toluene</td>
<td>Xylenes</td>
</tr>
</tbody>
</table>
Overall Protection of Human Health and the Environment - addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

Compliance with ARARs/TBCs - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs), criteria to-be-considered (TBCs), and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.

Long-Term Effectiveness and Permanence - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

Reduction of Toxicity, Mobility, or Volume Through Treatment - refers to the anticipated performance of the treatment options that may be employed within an alternative.

Short-Term Effectiveness - refers to the speed with which the alternative achieves protection, as well as the remedy’s potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.

Implementability - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.

Cost - includes capital and operation and maintenance costs. For comparative purposes, present worth values are provided.
<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>RL</th>
<th>Basis of Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>30,000</td>
<td>SSL</td>
</tr>
<tr>
<td>2-Methylnaphthalene</td>
<td>30,000</td>
<td>SSL</td>
</tr>
<tr>
<td>Carbazole</td>
<td>500</td>
<td>SSL</td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
<td>700</td>
<td>SSL</td>
</tr>
<tr>
<td>Chrysene</td>
<td>1,000</td>
<td>SSL</td>
</tr>
</tbody>
</table>

Notes:

- RL = Remediation Level in microgram per kilogram (µg/kg)
- SSL = USEPA Region III Soil Screening Level (USEPA, 1995)
<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>RL</th>
<th>Basis of Goal</th>
<th>Corresponding Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>1</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>300</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>2-Methylphenol</td>
<td>78</td>
<td>Groundwater Ingestion</td>
<td>HI = 0.1</td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
<td>31</td>
<td>Groundwater Ingestion</td>
<td>HI = 0.1</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>21</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>2-Methylnaphthalene</td>
<td>63</td>
<td>Groundwater Ingestion</td>
<td>HI = 0.1</td>
</tr>
<tr>
<td>Dibenzofuran</td>
<td>6</td>
<td>Groundwater Ingestion</td>
<td>HI = 0.1</td>
</tr>
<tr>
<td>Phenanthrene</td>
<td>210</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
<td>0.05</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>Chrysene</td>
<td>5</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>Chloroform</td>
<td>0.19</td>
<td>Groundwater Ingestion</td>
<td>ICR = 1 x 10^{-6}</td>
</tr>
<tr>
<td>Carbazole</td>
<td>4</td>
<td>Groundwater Ingestion</td>
<td>ICR = 1 x 10^{-6}</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>0.12</td>
<td>Groundwater Ingestion</td>
<td>ICR = 1 x 10^{-6}</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
<td>1</td>
<td>MCL</td>
<td></td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td>2</td>
<td>MCL</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>300</td>
<td>NCWQS</td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>50</td>
<td>SMCL</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

RL = Remediation Level in microgram per liter (ppb)
NCWQS = North Carolina Water Quality Standard
MCL = Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
HI = Hazard Index
ICR = Incremental Cancer Risk
RESTORATION ADVISORY BOARD MEETING

Proposed Remedial Action Plan

Operable Unit No. 12 (Site 3)
Operable Unit No. 13 (Site 63)

November 6, 1996.
Onslow Public Library,

Jacksonville, North Carolina

Reported by:

EDNA POLLOCK, CVR
207 Moores Landing Extension
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* Copy *
WEDNESDAY EVENING SESSION

November 6, 1996

The Slide Presentation of the Proposed Remedial Action Plan for Operable Units 12 and 13 by Baker Environmental, Inc. during the Restoration Advisory Board Meeting, convened at 8:00 o'clock p.m. in the Conference Room of Onslow Public Library, 58 Doris Avenue East, Jacksonville, North Carolina.

MR. THOMAS TREBILCOCK: We'll go ahead with the slide presentation.

Some of these figures that are going to be in here are in the Proposed Remedial Action Plan that we have there.

We apologize for getting that out so late, but I guess this has been on sort of a particular track.

But, anyway, my name is Tom Trebilcock with Baker Environmental to speak to you tonight about Operable Unit No. 13, Site 63.

During the presentation, I would welcome any questions that you have and if you don't mind, if you don't object, just state your name before your question so our Court Reporter can just get a record of where the
questions are from and that will help us when we go to
address these questions with a response summary that will
be provided later.

As Matt talked about earlier, as he went through
each of the operable units, there are 18 operable units.
Some of those operable units are comprised of more than
one site.

It just so happens that Operable Unit 13 is
comprised of only one site and that's Site 63, the Verona
Loop Dump.

A sense of where the site is located, it's in
the western part of the facility over here, about two
miles south of the Marine Corps Air Station.

The next slide has a little bit better regional
location of it.

It's about a mile east of Highway 17 for Verona
and it's about a mile-and-a-half west of the New River.

MR. CARRAWAY: That's the one we did not see on
our field trip.

MR. MORRIS: We went there, but there were trees
down across the entrance.

MR. TREBILCOCK: Yes.
Yeah, it got some storm damage in both hurricanes.

Site 63 is approximately a five acre site which is comprised of mixed hardwood and pine forest. It's located on sort of a topographic high or saddle between two drainages.

So it's sort of on top of a hill.

It's reported to have received what's called "bivouac" waste and I have a picture following this that shows some of what that might include, although the "bivouac" was never really described or defined in any historical documents.

There were no known hazardous waste disposed of at Site 63 also.

Same picture.

Okay, this is a photograph of Site 63 showing the site from an access road that comes off of Verona Loop Road which is what the site is named for.

Looking into the site looking north right here, you can see it's sort of a fairly wooded area. Actually, it's pretty thickly wooded.

Okay, the area is primarily used now as a
training area.

    This is one that the personnel trenched out, a sort of foxhole that they've dug out there.

    This area and the site are also used for hunting and recreational hunting, but primarily for exercises, training exercises, things like that.

    Let me get this in a little better focus.

    But, this shows some of the things that were observed out at the site and this is what--there are a few mounds of the same type of--it looks like construction material, but it's concrete, some metal, scrap metal and in some of the other piles, there have been derelict vehicles, vehicle parts, tires, wheel covers and things like that.

    So, you know, although we don't have a definition of "bivouac" waste, from these piles out there we could see the concrete and other--looks like construction material.

    There's a small tributary to Mill Run on this side of the Base and it runs right--abuts sort of the site itself.

    This creek tends to dry up in the summer but
it's about two to three feet across right here.

And, that's the way most of it is all along beside Site 63.

This is - in case you're wondering - is a statement, just shows where a sample was taken, in this case the surface water and sediment sample.

The investigation at that particular site, the site was originally identified in an initial assessment study in 1983 as a potential dump area.

In 1991, the first samples were collected at Site 63 and that's part of the site investigation.

The findings from that site investigation prompted the next step, the remedial investigation.

Part of the site investigation was recommending further study of the site because only a limited amount of soil samples and groundwater samples were collected.

As part of the remedial investigation that we conducted in 1995, a total of 96 soil samples were collected and 11 shallow groundwater samples were collected from eight temporary wells and three existing shallow wells.

And, also, five surface water and five sediment
samples were collected.

The findings from the soil investigation indicated that among the 96 soil samples that were collected, 20 of those samples had - let me get this in focus - 20 of those samples had detectable levels of pesticides.

Now it's sliding away. This slide projector is living up to its name - sliding.

Twenty of those samples had pesticides, detectable levels of pesticides in them.

Nineteen of the samples had detectable levels of semi-volatile organic compounds in them.

And, then two of the ninety some samples had polychlorinated biphenyls or what's commonly referred to as PCBS.

And, then, finally, one sample had detectable levels of volatile organic compounds.

Now, the concentrations of these compounds with the exception of the semi-volatile organic compounds were below one hundred parts per billion.

Now, only a few, actually one semi-volatile organic compound was detected above that and it was
detected more than once.

This slide shows exactly where these soil samples were collected throughout the site.

This shows what was thought to be, or still remains to be what we think is the approximate site boundary and this is the gravel road that we saw the picture before.

Now, a lot of the sampling would basically extend out beyond the boundary of the site just in case, you know, this area wasn't well, and it hasn't been well defined in the records.

Okay, the findings from the groundwater investigation indicated that no organic compound was detected among the 11 groundwater samples that were collected.

Iron, manganese and zinc were however detected at concentrations which exceeded the North Carolina Groundwater Quality Standard.

But, those concentrations were detected at concentrations that are typical of natural site conditions in the Coastal Plain in North Carolina.

Next slide.
If there are any questions—[laughter]—I'm kind of rolling through this.

MS. ELEANOR WOOD: I have one in looking at this chart and it talks about chlordane and it compares some criteria of stream sediment and there is no chlordane and I was curious about that.

MR. TREBILCOCK: That's right, for soil.

MS. WOOD: For soil.

MR. TREBILCOCK: Yes, that's right.

For some of the pesticides there are standards and they're related to how and what concentration in soil would a contaminant potentially impact groundwater.

And, for chlordane, for example, does not—

MS. WOOD: You don't have to deal with soil.

MR. TREBILCOCK: Well, it doesn't have a standard.

I'm sure there probably is a concentration of it that would impact groundwater, but I guess it hasn't been established.

I don't know.

Are there any other questions?

[No response]
This figure here shows the location of each of the samples, the groundwater sample locations. There are five within the known site boundary, or six within the known site boundary and five that extend outward from there.

There were, as I mentioned before, five surface water and five sediment samples collected.

There were also no organic compounds detected in the surface water samples and there were only two of the five samples that had detectable levels of pesticides in them.

MR. JAMES SWARTZENBERG: Excuse me, Jim Swartzenberg.

Is there a pattern to where these particular samples were taken from?

MR. TREBILCOCK: Where they were taken?

MR. SWARTZENBERG: Yes.

MR. TREBILCOCK: Yeah, actually--

MR. SWARTZENBERG: Found.

MR. TREBILCOCK: Oh, found.

MR. SWARTZENBERG: Where you found some pesticide and stuff.
MR. TREBILCOCK: It pretty much follows what we've seen in other sites, you know. It gets back I think not too long ago, actually '57 or sixties or fifties, pesticides were fairly commonly used around the Base.

And, when we do find them, they're pretty scattered throughout the Base.

MR. SWARTZENBERG: The same is true for the heavy metals and PCB's and all that.

MR. TREBILCOCK: Yeah, there were no particular--
MR. SWARTZENBERG: Next to where the concrete was?

MR. TREBILCOCK: Well, yeah, there were higher metals detected where we had--where we did observe some in the main part of the site there.

Visually, you could see metals in the sample like rusted iron so in those samples we have a higher concentration of iron.

But, that's where we had buried material mostly. There were only a few places.

But, it usually did correlate.

Pesticides in sediment at least, they tend to adhere to particles so where the surface water flows
across soil, it may pick up the particles in the sediment. So, we see a lot of water pollution in sediments because they sort of adhere to particles and they collect in these drainage basins.

Yes!

MR. CARAWAY: Eric Caraway!

I was noticing on the map itself of the samples, was there any particular reasoning why they were going more towards 17 and none of them were taken across the creek, or the little small branch?

MR. TREBILCOCK: Well, because it's in a sort of a topographic high, the thinking was that if there were sites and we weren't so sure where that site was, if the only thing we had to indicate where the site was, was that gravel road and also some of these debris piles, but the thinking was that if there were a disposal area, it would be on that kind of flat area at the top.

The site actually slopes pretty steeply down to that creek that's to the east.

Maybe if I can flash that, flip forward and show you the surface water sample locations--

MR. CARAWAY: My experience with landfills, you
fill in a low area.

MR. TREBILCOCK: Well, it's not a landfill.

MR. CARAWAY: Well, I know, but it was a dump site.

MR. TREBILCOCK: A dump site.

MR. CARAWAY: Yeah, okay, dump site, landfill, there's a definition now. Back then there wasn't.

If you have a low area you want to fill it in, you start in the lowest part of the area and work your way up.

So my question is not being able to see the area--

MR. TREBILCOCK: Right.

MR. CARAWAY: --Was the ridge part of the waste area, or was there a ridge and it was put on top and the things filtered down?

MR. TREBILCOCK: It looks like that just this area within the site boundary had the evidence of, you know, that construction debris.

And, I think those are what originally indicated where the site might be, the location of those debris piles.
Now, you know, we dug down in the ground over 46 spots and only two of those spots did we find any evidence of something buried and that was within this area here, within this same--

MR. CARAWAY: Well, that was part of my question was--

MR. TREBILCOCK: Yeah.

MR. CARAWAY: --That if we start by the creek and work our way towards and the further we got towards and then we worked towards 17 we're getting more samples, we're getting our information toward the 17 side versus the creek side.

MR. TREBILCOCK: Yeah.

MR. CARAWAY: Okay.

MR. TREBILCOCK: Yeah, I follow you.

And, actually, this out here had no evidence of much of anything. In fact, it looks like they're following the scenario that you described.

They were beginning to fill in or dump things down towards the creek from the top, you know, down.

MR. CARAWAY: Yeah.

MR. TREBILCOCK: You know, like pull up a truck
and dump it down towards in the direction of the creek.

But, it's sort of like that, but I don't think they buried much and if they did, it was just in--because we had the place pretty well peppered--

MR. CARAWAY: Right.

MR. TREBILCOCK: --With the soil locations.

MR. CARAWAY: Thank you.

MR. TREBILCOCK: Sure.

Okay, which brings us to I guess the goal of the Remedial Investigation is to provide some indication of these sites, do they pose a human health hazard?

A human health risk assessment was performed and for these different potential receptors:

Current military personnel.

A current trespasser.

An adult trespasser.

A child trespasser.

A future construction worker.

A future adult resident.

A future child resident.

Now, the Environmental Protection Agency has established guidelines to determine at what level do
carcinogenic or cancer risks, at what level and at what number do they pose a threat.

And, that number is below this number up here.

And, for non-carcinogenic or non-cancerous risk, the number is less than one.

Well, after going through exposure scenarios for the various potential receptors we had, we came up with a potential non-carcinogenic risk to future adult residents and future child residents.

And, those numbers are based on the ingestion of groundwater from the site.

Now, if you remember, we didn't see any indication of organic contaminants in groundwater, but we saw indications of metals, high metal concentrations in the groundwater samples.

So, these two scenarios assume that for the future adult resident and future child resident that groundwater that we collected would be their primary source of potable water, or drinking water.

So, that's how those are and so it's a very conservative number that represents based on what we are doing.
Based on the next slide, which we can come back to this one, but based on the no further remedial action which is the proposed remedy for Site 63, based on this criteria the site will remain in its current state, with no further environmental investigation.

And, also, there will be an aquifer for use restriction placed on the site.

The potential for residents to ingest the groundwater will be eliminated because that will be prohibited from future development.

Are there any other questions about any of the slides or about anything?

MR. SWARTZENBERG: Jim Swartzenberg!

So, you're not proposing that they even go in and clean up--

MR. TREBILCOCK: The surface debris?

MR. SWARTZENBERG: --The surface debris and stuff like that?

MR. TREBILCOCK: No, that's right.

Just leave it there.

MR. SWARTZENBERG: Is it your opinion that that wouldn't do any good?
MR. TREBILCOCK: Well, I think maybe Neal might have a better handle on that.

I think in the past we've sort of just said instead of suggesting, you know, if you say, well, we're going to clean up the site from the aesthetic point of view, you might indicate that, well, you think there might be something there that could cause future contamination.

Right now, we don't think that, you know, concrete or the scrap metal or whatever else is going to cause anything.

But, that's pretty much just a housecleaning thing that I don't know whether Camp Lejeune--

MR. SWARTZENBERG: That's not the problem in other words.

MR. TREBILCOCK: No.

MR. NEAL PAUL: No, that's not the problem.

MS. KATHERINE IANDMAN: It's not a problem of contaminated site.

You might consider it an eyesore--

MR. TREBILCOCK: Yeah.

MS. LANDMAN: --But, you know, at such time as
the Marine Corps wants to do that is something else. They might decide not to remove it.

    MR. PAUL: It's a pretty remote area which we
don't have any plans to use, or any planned use or any way
to go in there.

    On the other hand, you take lot 2 or 3, you
know, I think you guys got to see that site and all the
debris that was at that site. That's a site where we have
a lot of debris that's not contributing to contamination
of the site, but we are going to remove it because we want
to turn it over to a future industrial land use.

    So, if there's a land use plan, then yeah we
would go in to remove the debris.

    But, here, we don't have any planned land use.

    MR. MORRIS: This site can be used or can be
pointed out to the Marine Corps for their Operation Clean
Sweep, which every spring they go through and pick up
debris.

    We can identify this as one of the sites that
they could go ahead and clean up.

    MR. PAUL: That's a good point, Tom.

    MR. TREBILCOCK: Were there any other questions
about the site itself?

MR. SWARTZENBERG: If they did do the Clean Sweep thing - I don't want to run his over--

MR. TREBILCOCK: Oh, no, no.

MR. SWARTZENBERG: If you did do the Clean Sweep though, from what you said it wouldn't change your figures at all?

MR. TREBILCOCK: No, no.

MR. SWARTZENBERG: It would just make it look a little better.

MR. PAUL: It would make it look a little better.
MR. CARAWAY: Wouldn't it change the figures ten years down the road if that metal continues to deteriorate?

Is the metal above the ground?

MR. TREBILCOCK: Well, it could, but, you know, once again, it would be iron and things that really wouldn't be hazardous to people or to the environment.

I mean, it could become more unsightly, you know, if you have iron oxidizing and you're going to have a stain or whatever on your ground, but not from a hazard standpoint.
MS. TRACEY DeBOW: So, actually what we have at this site was a couple of examples which had semi-volatile organics so that somewhere between 43 and 80 micrograms per millimeter of water or per liter.

And, that would really be, what, parts per million or parts per billion?

MR. TREBILCOCK: Parts per billion.

MS. DeBOW: Parts per billion ratio, so it's more than likely by the time we did anything to remove those organics, they of themselves would dissociate--

MR. TREBILCOCK: Right.

MS. DeBOW: --And, not be worth the price--

MR. TREBILCOCK: Well, it would be very difficult to remediate or to remove it.

MS. DeBOW: Since it's such a small amount.

MR. TREBILCOCK: Yeah.

MS. DeBOW: And, we don't have any real risk of it getting in the creek?

MR. TREBILCOCK: No.

MS. DeBOW: Because I don't see any--

MR. TREBILCOCK: There is a chance for the pesticide, for example. In my opinion, the pesticides are
probably migrating from the site into the sediment in the form of particulates or, you know, tiny pieces absorbed have washed into the creek and are now at the bottom of the creek so when you collect a sediment sample, well, you're going to see pesticides on that particle absorbed.

MS. DeBOW: Yes.

MR. TREBILCOCK: Now it has become a piece of sediment, but it had been just a piece of regular surface water.

MS. DeBOW: But, from what I saw, the pesticides were below State minimum acceptable limits.

MR. TREBILCOCK: Yes.

MS. DeBOW: Yeah, okay.

MR. TREBILCOCK: In fact, this is one of the-- this site is probably at lower levels of pesticides than what we typically see.

And, fewer in number too.

MS. WOOD: And, the same would apply to the naphtha?

MR. TREBILCOCK: Yeah, it had two detections in the soil and they were both under one hundred parts per billion, so, yeah, the same thing would apply to those
also.

MR. PAUL: And, Tom, correct me if I'm wrong, but as a general rule, pesticides are pretty much in the soil, they're not going to be a mobile contaminant.

MR. TREBILCOCK: No, no. They're going to adhere to the soil.

The bottom line really at this site it's going to be controlled through time by the Marine Corps, but right now there's no further remedial action indicated.

MR. BARTMAN: If you look at the regulations, the regulations that are involved here, you know, federal and state governments set of qualitative regulations and then you go through them and we do qualitative assessment and we determine we may have levels in the media that are above our regulatory levels, but we determine that the concentration and the specifics of the contaminant were not posing a human health risk, it won't go anywhere.

MS. DeBOW: We won't go anywhere.

MR. BARTMAN: We won't go in there, exactly.

No exposures, no receptors.

MR. TREBILCOCK: Well, if there aren't any more questions, of if you'd like I'll be around after the
meeting if you want to talk to me about any specifics about the site, but I'll turn it over to Matt.

We're sort of going in backwards order. I talked about Operable Unit 13 and Matt Bartman's going to talk about Operable Unit 12.

MR. BARTMAN: The discussion that I'll be dealing with is Operable Unit 12, Site 3, which is also referred to as the old Creosote Plant.

I know these pictures are difficult to see.

But, the old creosote plant, I'm going to pass around this photo.

This is an aerial photo from 1949.

The old creosote plant is also referred to, like I said, to Operable Unit 12, Site 3, and it's located on Holcomb Boulevard, about a half-mile off of Holcomb Boulevard, the main side of the Base.

It's also referred to as Lot 204 and that's the big chimney, if anyone's going to the site you'll be able to see this site.

This is from the entrance coming from Holcomb Boulevard to the site.

And, this is what we refer to as the northern
area during our investigation.

This area will be referred to as the treatment area, but then there's also the southern portion of the site.

This is the side of the chimney for those of you who were on the site may be familiar with the area.

Just to get everyone in here - see the reason I passed around the aerial photo from 1949, this plant was in operation from 1951 to 1952 and basically the operation of the plant was to treat lumber for the construction of the Base railroad.

And, as you can see in that aerial photo, the Base railroad has not been constructed yet.

There's no indication of subsurface creosote disposal however until we did our investigation.

However, like Site 63, there was a site inspection completed here where subsurface contamination in the form of creosote or PAH, polyaromatic hydrocarbon contamination was indicated, therefore turning it into the remedial investigation site.

Currently, the area is currently used to construct a staging area for the removal of downed trees.
That's all taken place in the northern area of the site from the hurricane that's taken place.

Now you can see the north area is the staging area for all the downed trees.

This is a very quick slide of the layout of the site.

Again we have the northern area where the downed trees are now staged.

This is what we refer to as the treatment area and then the railroad spike or the southern portion of the site.

Mainly all the creosote treating operations were conducted in this area. Again, the reason the chimney is located here.

A dirt track and the railroad spike area which not only comes to about here, but you can see remnants of it where they used the pumps where they appeared to derive water.

Field Investigation Summary.

What Baker Environmental did here, we had a multi-phase field program which was conducted from September 1994 to September 1996.
And, I say multi-phase because unlike Tom's investigation, we found contamination and had to keep delineating our contamination both in groundwater and in soil.

In September of 1994, we came out here and collected approximately 84 surface soil samples and those surface soil samples were analyzed in the field using a kit that's an immunoassay kit, bacterial testing kit, to determine where PAHs - again polyaromatic hydrocarbons which we knew are our known contaminants given our source which was the creosote.

So, we came out here and we had to delineate the site using surface soil samples.

We had to kind of focus our investigation in the area where we think creosote contamination was going to be a problem.

We came out in November of 1994 using the information that we collected in September and were able to focus our surface and subsurface soil investigation in a specific area where we knew we had contamination.

As a follow-up, we had to come back out in June of '95 to take additional samples because we were able to
locate through subsurface soil contamination in '94 that we had additional problems.

This is again the treatment area and this is just to give you an indication of how many samples we collected out here.

The pink being the ENSYS investigation.

The green being the different phases of the investigation we did in November of '94 and June of '95.

And, this does not even show the northern area where we had several soil samples taken and also the railroad spike area.

The multi-phase investigation also included groundwater investigation.

In December of 1994 we put in seven shallow and one intermediate monitoring well.

And, then due to the contamination we found there, we came back out and had to put in eight. We sampled the eight existing shallow monitoring wells.

We installed five new shallow monitoring wells.

One intermediate well and one deep well.

The shallow wells being roughly 25 to 30 feet.

Intermediate depth, 40 to 60 feet below ground
And, the deep well 140 feet below ground surface.

MS. WOOD: How many deep wells?

I'm sorry, I got confused reading this.

The deep wells were going in to Castle Hayne?

MR. BARTMAN: Yeah.

MS. WOOD: But not the intermediate?

MR. BARTMAN: No. The intermediate would be upper portion of Castle Hayne.

MS. WOOD: Right, okay.

MR. BARTMAN: And, the reason we had to do this intermediate and deep wells in multi-phase so we could go out there, we investigate the shallow for particle contamination.

We go down vertically to see if the intermediates are contaminated. If the intermediates are contaminated, we focus in and keep going deeper until we can find the particle extent of the contamination.

In order to confirm our findings from the June of 1995 investigation, we came back out in September and did another full round of sampling to confirm the presence
or absence of contamination.

That was again by September of 1995.

Through the findings of September of 1995, we
kind of have suspected misleading information between July
of '95 and September of '95 and wanted to confirm that and
that was in the deep well.

We only put in one deep well.

So, we had contamination in '95. We did see the
contamination in September of '95 and we came back out in
January of '96 and sampled that water and confirmed that
there was an absence of contamination deep.

Had we found contamination, we would've had to
go deeper.

But, given the nature of the contaminants which
again the majority of them are PAHs, again the
contaminants don't travel or migrate very readily in soil.

Usually you don't see them in the groundwater
because they don't have a high mobility, or high
leachability into the groundwater.

But, unfortunately, given the levels of creosote
in our soil, we saw them in groundwater.

This figure indicates the areas where our
groundwater monitoring wells were placed.

I apologize for the figures.

Again, the pink indicates the shallow monitoring wells.

The blue are the intermediate wells.

And, the purple is the deep well.

You see we have wells on the north area, the treatment area and the southern portions of the site.

Due to contamination we had here in this intermediate well, in the second phase, we decided to put in this intermediate well.

And, then go back and due to the contamination put in this deep well.

What we found in all these phases of investigations was that a majority of our contamination both in soil and in groundwater, as we suspected but had to confirm, was all of our contamination was in what we were thinking would be the treatment area.

The chimney area used to heat the creosote.

If you don't know what creosote is, I could explain it, but I think everybody knows what it is.

But, at first, it's a very tarry material that
needs to be cut using fuel related materials.

They heat it and then they treat the lumber.

So, we could tell that this was all where the treatment took place.

And, we found in the northern area and in the southern portion of the area we found isolated detections of creosote contamination, apart from the drippings but no known disposal.

So, we did have contamination in other portions of the site, but concentrated mainly again in this treatment area.

Like Tom's site, we had to go through the human health risks.

Fortunately, for us we had limited receptors.

We only had the future residential child, future residential adult.

The third, military personnel that could be exposed.

We think at that site in the future construction workers.

As you can see, the risks obviously to the future residential child and would be the residential
adult, both carcinogenic and non-carcinogenic risks.

And, this is from the ingestion of groundwater.

However, shallow groundwater in this area is no
even used as a potable water supply.

However, we still have to consider it as a
potential exposure to future adult, to future residents.

Given that we don't have a risk to subsurface
soils, which the construction worker is the only exposed
receptor to subsurface soil.

However, we knew that that was part of our
readings and our findings or detections, we knew that
subsurface soil was where our contamination was. However,
there's no risk.

That puts us in a Catch-22 because we have
contamination but it's not causing risk, so what do you do
with it?

So, we knew that our sources was the soil. Our
groundwater was causing our contamination and causing our
risks.

So, we had to remove the source and that's what
we plan on doing as part of our proposed remedial action.

We went through five different alternatives.
The alternatives have been selected for treatability studies at this phase, Number 5, which was the source removal and biological treatment.

For those of you who did visit Lot 203, saw two water treatment plants, for the pump and treat plant, there's a biocell constructed there, we'll be doing a similar biological treatment.

This biological treatment will be for PAH contamination where that one at Lot 203 is for POL waste.

We'll be doing a treatability study hopefully beginning in March to test out whether this technology will be feasible to remediate this contamination.

We'll be excavating for subsurface soil contamination down to roughly nine feet, where we know we have known contamination.

Placing it into the biocell, mixing it with several different types of bugs, nutrients, having it aerated, water applied to it to see if the bugs, the nutrients are able to degrade or decompose this contamination.

As for groundwater, we know we have contamination in our groundwater.
We know it exceeds regulatory levels.
We know that it poses a potential risk.
However, we feel that the source is really the soil, so therefore we remove the soil.
All we want to do here is monitor the groundwater.
Apparently, it's not posing a risk.
So, what we want to do is, again, monitor the groundwater, see if once we remove the source what happens to the concentrations in the groundwater?
Do they remain the same?
Do they increase?
Is there another source out there?
So, this monitoring will be conducted over a 30 year period, probably on a semi-annual basis and will be up for a five year review by the regulators.
So, that's roughly what's going to be happening at Site 3.

MS. WOOD: It says here the clinical phase, this is because it is impractical to remediate the saturated soil, which earlier it states is detectable for PAH contamination because of water--[inaudible].
So, it is saturated soil below the water table.

MR. BARTMAN: Uh-huh.

MS. GOOD: Okay, and it is the PAHs are not going to migrate.

MR. BARTMAN: No, they don't migrate readily into the water.

Think of it this way, a piece of tar, take a beaker and put some sand in it, drop the piece of tar into that and that's what you have.

MS. GOOD: Okay.

And, they aren't going to break down into any other--

MR. BARTMAN: They don't biodegrade. They're not like chlorinated solvents.

MS. GOOD: All right.

MR. BARTMAN: No biodegradability. They don't migrate readily even in presoils or groundwater.

That's why we don't see--we had this known source inside this, I guess when I said take a beaker of sand or a fish tank. Throw a piece of asphalt in there and you have the water flowing back and forth, you don't see the migration.
And, that's exactly what's happened in this case.

MS. GOOD: Thank you.

MR. JOE BARNETT: You said the risk looks like is higher for children, or I didn't understand that statistic.

It looked like it was less for children.

MR. BARTMAN: Can't remember.

MS. DeBOW: It was ten to the minus three.

MR. BARTMAN: Ten to the minus three.

It's actually less for children, higher for an adult.

MR. BARNETT: Does that mean for the adult, because it started as a child and there's--

MR. BARTMAN: Basically--

MR. BARNETT: --A cumulative effect over your lifetime for carcinogenic effect?

MR. BARTMAN: Exactly.

MR. BARNETT: Okay.

MR. BARNETT: Also, exposure, the amount ingested is higher for an adult. Exposure period's longer, so you're at a higher risk.
There's usually a flip-flop or non-carcinogenic. Usually the child is at higher risk, the adult is at lower risk.

MR. SWARTZENBERG: What's the land use plan for that area? Is there any?

MR. BARTMAN: Neal!

MR. PAUL: I don't think so. Tom!

MR. MORRIS: As a matter of fact, I was contacted this afternoon about that treatment site.

They want to build a storage area into that particular area.

MR. BARTMAN: Into the southern portion, or into the treatment area?

MR. MORRIS: Into the southern portion of the southern portion.

MR. BARTMAN: Okay.

MR. MORRIS: In other words, it's going to start down the road a bit and extend up into the southern portion of--

MS. WOOD: The railroad spur.

MR. MORRIS: --The railroad spur, right.

MR. BARTMAN: All right.
MR. PAUL: This is high performance storage facility is POLs?

MR. MORRIS: Yes, PLOs.

MR. BARTMAN: It probably wouldn't be a problem from our standpoint if it's that treatment area.

The southern portion, there's a monitoring well on W06 which I believe is the most downgraded shallow well.

It's going to be one of the wells that we're going to need to monitor because, for some reason, we found contamination of subsurface soil and in that groundwater as well.

So, as far as, I mean, as long as they don't disturb any of the wells that we'll be using for longterm monitoring, we're probably in good shape.

MR. PAUL: Is that an old site or new site?

MR. MORRIS: For?

MR. PAUL: What you talked about.

MR. BARTMAN: That is not the existing site that we've been planning on--

MR. MORRIS: This is the one that NEPA is still doing documentation on.
MR. PAUL: The only problem I see with it, this facility is going to be only a hazardous waste storage facility to the south?

MR. MORRIS: Uh-huh.

MR. PAUL: And, if we have contamination already in the area, I don't know.

MS. LANDMAN: My response to that would be they would need to stay around the area and need to monitor.

MR. PAUL: Yeah, right.

I don't want it to get that the current use facility is contributing to the contamination and then builds into--[inaudible].

MR. MORRIS: I only brought that up because they are still looking in that area as far as doing additional development.

MR. BARTMAN: One of the things during the investigation, I talked about PAHs in the creosote contamination, this is not like water. We kind of knew going in what contaminants we were looking for.

Now, the regulators still require that we did full scan - I say full scan, that means we looked at all the organics, semi-volatile organics, pesticide PCBS and
metals, as well as on select samples of soil and groundwater, we ran full scan.

And, we did find trace levels of detections in fish which was the volatile contaminants and in groundwater and in soil.

So, that's when we go back to this multi-phase groundwater samples to find out where that contamination was coming from.

So, I just want to let everybody know that we didn't just blow off certain chemical parameters. We did examine other things.

The PAHs are driving our risks and our contamination problems, so that's what our remedial effort goes out to.

MR. PAUL: What units will be discussed after our meeting will be more than likely--

MR. BARTMAN: Will be eleven which is Site 7, Tarawa Terrace and also Site 80 which is the Paradise Point Golf Course.

If there's any questions on that now, what's going on with those sites, what's happened at those sites, I can answer those also.
MS. WOOD: I did have a question on 80. When did the dumping and cleaning of the pesticides stop?

MR. BARTMAN: The time critical for--

MS. GOOD: No, no, when did they start cleaning up. I wasn't sure on that.

MR. BARTMAN: Okay.

MR. DUNN: There was no dumping.

MS. GOOD: Just washing it out, but--

MR. BARTMAN: It's a discharging unit.

MS. GOOD: Right, well, when did they start doing that? When you all came in, were they doing it, or had it stopped fifteen years ago, or what was the length of time?

MR. BARTMAN: Well, it's still a pesticide mixing area.

MS. GOOD: Oh, they're still, but they're not washing it?

MR. BARTMAN: It's registered pesticides.

MS. GOOD: Okay.

MR. BARTMAN: It's not the DDDs, the DDEs.
Unregulated pesticides are not being used.

MS. GOOD: Yeah, okay.

MR. DUNN: The area is still a maintenance area for the golf course.

They still apply pesticides to the golf course, but they're not the hazardous pesticides that we used in the past.

MS. WOOD: Okay, so the hazardous pesticides were stopped around '78?

MR. DUNN: I believe that's right.

MS. GOOD: DDT?

MR. DUNN: The DDT earlier, but the chlordane I think was in '78.

MR. BARTMAN: Yeah, the Chlordane

MS. LANDMAN: The highest concentration area in that particular site was probably due to a single event spill rather than--I mean, there were other trace areas that may have been due to washout or overspill to poor mixing practices.

But, the one main area was most likely due to one single incident spill in time which, you know, we wouldn't know.
That's what the results appear to be.

MR. BARTMAN: If there's any questions regarding these sites as you read through the documents, the fact sheets of the Proposed Remedial Action Plan, feel free to give Peter or Neal a call, or Tom or I at Baker Environmental and we'll be able to answer questions relating to the site.

[Whereupon the proceedings concluded at 8:50 o'clock p.m.]
Site Information:

**Site Name:** CAMP LEJEUNE MILITARY RES. (USNAVY)  
**Address:** ONSLOW COUNTY, NC  
**EPA ID:** NC6170022580  
**EPA Region:** 04

Site Alias Name(s):

- USMC CAMP LEJEUNE MILITARY RESERVATION
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)
- USMC/BLDGS TP452 & TP451 (SITE 10)
- USMC/HADNOT POINT BURN DUMP (SITE 3)
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
- USMC/STORAGE LOTS 201 & 203 (SITE 12)
- USMC/CAMP GEIGER DUMP (SITE 4)
- USMC/BASE SAN LDFL (SITE 5)
- USMC/CHEM LDFL (SITE 1)
- USMC/BLDG PT 37 (SITE 6)
- USMC/K-326 RANGE (SITE 8)
- USMC/G4A RANGE (SITE 9)
- USMC CAMP LEJEUNE

Record of Decision (ROD):

**ROD Date:** 05/15/1997  
**Operable Unit:** 13  
**ROD ID:** EPA/ROD/R04-97/212

**Media:** Surface water, soils, subsurface soil, shallow wells, groundwater

**Contaminant:** Volatile Organic Compounds (VOCs), toluene, xylene, Semi Volatile Organic Compounds (SVOCs), di-n-butylphthalate, benzoic acid, 4,4-DDE, 4,4-DDT, carbon disulfide, benzoic acid, bis(2-ethylhexyl)phthalate, aluminum, barium, chromium, lead, iron, manganese, arsenic, copper, nickel and zinc
Abstract: Marine Corps Base (MCB) Camp Lejeune is located in Onslow County, North Carolina. MCB Camp Lejeune is located approximately 45 miles south of New Bern, North Carolina and 47 miles north of Wilmington, North Carolina. The facility encompasses approximately 236 square miles and includes 14 miles of coastline. MCB Camp Lejeune was placed on the National Priorities List (NPL) in 1989. There are currently 42 Installation Restoration (IR) sites at MCB Camp Lejeune that have been grouped into 18 Operable Units (OUs). OU 13 consists of only one IR site; Site 63 is also referred to as the Verona Loop Dump. Very little information is available regarding the history or occurrence of waste management practices at Site 63. The study area reportedly received wastes generated during training exercises. The type of materials generated during these exercises are described only as "bivouac" wastes. Additional information suggests that no hazardous wastes were disposed of at Site 63. The years during which disposal activities may have taken place are also not known. In 1983, an initial assessment study (IAS) was conducted at MCB Camp Lejeune by Water and Air Research, Inc. The IAS evaluated potential hazards at various sites throughout MCB Camp Lejuene, including Site 63. The IAS was based upon review of historical records, aerial photographs, a site visit, and personnel interviews. The IAS concluded that waste quantities at Site 63, regardless of their nature, were of a volume that did not require further investigation; therefore, additional investigations were not recommended for the study area at that time.

Remedy: The selected remedy for Operable Unit OU 13 is no further action with institutional controls. The selected remedy, as the name implies, involves taking no further action at the site and leaving the environmental media as they currently exist. In addition, aquifer use restrictions will prohibit the installation of water supply wells within 1,000 feet of OU 13. In the event that unforeseen hazards posed by conditions at the site occur in the future, monitoring to verify that no unacceptable exposures have occurred may be authorized.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 13
ONSLOW COUNTY, NC
05/15/1997
SUBJ: Record of Decision
   Operable Unit 13, Site 63
   MCB Camp Lejeune NPL Site
   Jacksonville, North Carolina

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 the Remedial Action at Site 63. This remedy is supported by the previously completed Remedial Investigation and Baseline Risk Assessment Reports.

The selected remedial alternative is no further action. This involves taking no further remedial actions at the site and leaving the environmental media as they currently exist. 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.

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
    Neal Paul, Camp Lejeune
    Kate Landman, LANTDIV
    Dave Lown, NCDEHNR
RECORD OF DECISION
OPERABLE UNIT NO. 13 (SITE 63)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0340

JANUARY 21, 1997

Prepared For:

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

Under:

LANTDIV CLEAN Program
Contract N62470-89-D4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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<td>lg/kg</td>
<td>microgram per kilogram</td>
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<td>lg/L</td>
<td>microgram per liter</td>
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<td>CDI</td>
<td>Chronic Daily Intake</td>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
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<td>CLEAN</td>
<td>Comprehensive Long-Term Environmental Action Navy</td>
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<td>COFC</td>
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<td>DDD</td>
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INTRODUCTION

This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 13 (Site 63) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The Final ROD document presents the selected remedy along with a description of the selection process. Various environmental media at Site 63 were investigated as part of a Remedial Investigation (RI) conducted during November 1995. Based upon the results of the RI, a preferred remedial alternative was identified in the Proposed Remedial Action Plan (PRAP) document. The public was then given the opportunity to comment on both the RI and PRAP documents. Comments received during the public meeting, the public comment period, and new information that became available during the interim were used to select the final remedy for Site 63.

Document Organization

This ROD document has been divided into four main sections. The first section presents the introduction and report organization. The second section provides a formal declaration that identifies the selected remedy for Site 63. The declaration indicates that the remedy selection process was implemented in accordance with applicable statutory and regulatory requirements. The third section presents information pertaining to previous investigation activities conducted at Site 63. The third section also presents the background and setting of both MCB Camp Lejeune and Site 63; the highlights of community participation; the scope and role of the response action; site characteristics; and a summary of site risks determined by human health and ecological risk assessments. Finally, the fourth section provides the responsiveness summary that contains a synopsis of comments received during the public meeting and public comment period.
DECISION DECLARATION

Site Name and Location
Operable Unit No. 13
(Site 63 - Verona Loop Dump)
Marine Corps Base
Camp Lejeune, North Carolina

Decision Basis and Purpose
This Record of Decision document presents the selected remedy for Operable Unit (OU) No. 13 at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The remedy for OU No. 13 has been selected in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. The decision presented herein is based upon the collaborative effort of federal, state, and community participants and information contained within the Administrative Record for OU No. 13.

The Department of the Navy and the Marine Corps have obtained concurrence for the selected remedy from the North Carolina Department of Environment Health and Natural Resources and the United States Environmental Protection Agency Region IV. Prior to any future deviation from the specified remedy additional concurrence shall be obtained.

Description of the Selected Remedy
The selected remedy for OU No. 13 is No Future Action with Institutional Controls. The selected remedy, as the name implies, involves taking no further action at the site and leaving the environmental media as they currently exist. In addition, aquifer use restrictions in the Base Master Plan will prohibit the installation of water supply wells within 1,000 feet of OU No. 13. In the event that unforeseen hazard posed by conditions at the site occur in the future, monitoring to verify that no unacceptable exposures have occurred may be authorized.

Declaration Statement
No further action is required at OU No. 13 to ensure the continued protection of human health and the environment. Based upon risk assessment results and aquifer use restrictions implemented by MCB Camp Lejeune, site conditions at OU No. 13 appear to be protective of human health and environment both now and in the future.

<IMG SRC 97212C>
Background and Setting of MCB Camp Lejeune

MCB Camp Lejeune is located in Onslow County, North Carolina. Construction of the "World's Most Complete Amphibious Training Base" was begun in 1941 for the United States Marine Corps. MCB Camp Lejeune is located approximately 45 miles south of New Bern, North Carolina and 47 miles north of Wilmington, North Carolina. The facility encompasses approximately 236 square miles and includes 14 miles of coastline. The military reservation is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The Atlantic Ocean forms the eastern border of MCB Camp Lejeune; U.S. Route 17 and State Route 24 border the western and northwestern portions of MCB Camp Lejeune. The City of Jacksonville, North Carolina borders the facility to the north.

MCB Camp Lejeune was placed on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List effective October 4, 1989 (54 Federal Register 41015; October 4, 1989). The United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and Department of the Navy (DoN) entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities were thoroughly investigated and appropriate CERCLA response or Resource Conservation and Recovery Act (RCRA) corrective action alternatives were developed and implemented, as necessary, to protect public health and environment.

There are currently 42 Installation Restoration (IR) sites at MCB Camp Lejeune which have been grouped into 18 OUs. OUs are formed as an incremental step toward addressing individual site concerns. OUs may address geographical portions of a study area, site-specific problems or initial phases of an action, or may consist of any set of actions performed over time or any actions that may be concurrent but located in different parts of a site. OU No. 13 consists of only one IR site; Site 63 is also referred to as the Verona Loop Dump. As depicted on Figure 1, Site 63 is located within the western portion of the facility, to the south of Marine Corps Air Station (MCAS), New River. [Note: All tables and figures have been provided at the end of this document.]

Site Name, Location, and Setting

The Verona Loop Dump is comprised of approximately five acres and is located nearly two miles south of the MCAS, New River operations area. As depicted on Figure 2, the study area is located along Verona Loop Road approximately 1.25 miles east of U.S. Route 17. Site 63 is bordered to the south by Verona Loop Road, to the east by an unnamed tributary to Mill Run, and to the west by a gravel access road.

Site 63 is relatively flat, however, the eastern portion of the study area slopes toward an unnamed tributary; the unnamed tributary then discharges into Mill Run approximately 2,000 feet south of Site 63. Mill Run discharges into the Southwest Creek which eventually flows into the New River. A drainage ditch along Verona Loop Road receives surface water runoff from the extreme southern portion of the site and the asphalt road surface. Figure 3 depicts the topography and general arrangement of Site 63.

Much of the site is heavily vegetated with dense understory and trees greater than three inches in diameter. A partially improved gravel road provides access to the main portion of the study area; other unimproved paths extend outward from this road. Training exercises, maneuvers, and recreational hunting are frequently conducted in the area. Several personnel entrenchments, used during training exercises, have been excavated throughout the study area. Earthen berms and small to medium size trees have been felled to construct protective works around many of the entrenchments.

Site History

Very little information is available regarding the history or occurrence of waste management practices at Site 63. The study area reportedly received wastes generated during training exercises. The type of materials generated during these exercises are described only as "bivouac" wastes. Additional information suggests that no hazardous wastes were disposed of at
The years during which disposal activities may have taken place are also not known.

The following describes the previous investigation activities that have been conducted at Site 63. These investigations include an initial assessment study (IAS), a site inspection (SI), and an RI.

**Initial Assessment Study, 1983**

In 1983, an IAS was conducted at MCB Camp Lejeune by Water and Air Research, Inc. The IAS evaluated potential hazards at various sites throughout MCB Camp Lejeune, including Site 63. The IAS was based upon review of historical records, aerial photographs, a site visit, and personnel interviews. The IAS concluded that waste quantities at Site 63, regardless of their nature, were of a volume that did not require further investigation; therefore, additional investigations were not recommended for the study area at that time.

**Site Inspection, 1991**

In 1991, Baker Environmental, Inc. conducted an SI at Site 63 to confirm findings of the IAS. The SI consisted of the following field activities: the installation and sampling of three monitoring wells; the collection of two soil samples from each monitoring well pilot test boring (one sample obtained near the surface and the other obtained just above the water table); the collection of two soil samples from six additional soil test borings; and the collection of two surface water and two sediment samples from the adjacent tributary to Mill Run.

Upon visual inspection of the site, conclusive indications (e.g., distressed vegetation, denuded areas, etc.) of hazardous waste disposal were not apparent; however, reinforced concrete rubble, construction material, and various other inert debris was identified during the SI and subsequent site visits. The observed waste material was limited to a number of distinct piles or areas, rather than being strewn throughout the study area.

The following paragraphs briefly describe the results and conclusions of the SI at Site 63. Tables 1 through 4 present summaries of laboratory analytical results from analyses performed on the samples collected during the SI.

The volatile organic compounds (VOCs) toluene and xylene were detected at concentrations of 2 and 3 micrograms per kilogram (mg/kg) in a soil sample obtained from ground surface to a depth of one foot. No other volatile compounds were detected among any of the samples obtained from either surface or subsurface soils. As provided in Table 1, concentrations of semivolatile organic compounds (SVOCs) ranged from 43 \( \mu \text{g/kg} \) of di-n-butylphthalate to 280 \( \mu \text{g/kg} \) of benzoic acid.

The six soil samples obtained during installation of the three monitoring wells provided the only SVOC detections. The pesticides 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT were detected at low concentrations in one surface sample obtained from the eastern portion of the study area; no other pesticides were detected among the other soil samples. Aroclor-1254 was detected once at a concentration of 1,000 \( \mu \text{g/kg} \) in a surface sample obtained near the central portion of the study area; no other polychlorinated biphenyls (PCBs) were detected. Several metals were also detected among the soil samples obtained at Site 63. The concentrations of the detected metals were, for the most part, consistent with base-specific background levels. Table 1 presents positive detections of both organic and inorganic soil analytical results from the SI at Site 63.

Carbon disulfide, benzoic acid, and bis(2-ethylhexyl)phthalate were the only organic compounds detected among groundwater samples. Carbon disulfide was not detected in any other environmental media at Site 63. Total metal concentrations of aluminum, barium, chromium, lead, iron, and manganese exceeded either federal Maximum Contaminant Levels (MCLs) or North Carolina Water Quality Standards (NCWQSs). However, other studies conducted at several sites throughout MCB Camp Lejeune have also exhibited concentrations of total metals in excess of water quality standards. The analyses tend to reflect the presence of suspended material in groundwater samples resulting from sampling disturbance, rather than depict true groundwater conditions. Table 2 presents a summary of the groundwater analytical results from the SI conducted at Site 63.

No organic compounds were detected among the two surface water and two sediment samples.
obtained from the unnamed tributary. A number of metals were, however, detected in both the surface water and sediment samples. Iron was the only metal detected among the surface water samples at a concentration which exceeded applicable state or federal standards. Table 3 provides a summary of positive surface water detections.

Two sediment samples were also collected from the same surface water and sediment sampling stations along the unnamed tributary. Several metals were detected including arsenic, chromium, copper, lead, nickel, and zinc. Only one detection each of copper and lead exceeded federal screening values. The sediment comparison values were based upon a potential to adversely impact aquatic life. The concentrations of copper and lead were within the "probable" adverse effects to biota range. Table 4 presents sediment analytical results generated during the SI at Site 63.

Remedial Investigation, 1995

The RI field investigation of Site 63 was conducted during November 1995. The RI field program at Site 63 consisted of a site survey; a soil investigation, which involved direct-push sample collection; a groundwater investigation, which included temporary monitoring well installation, sampling, and aquifer testing; a surface water and sediment investigation; and a habitat evaluation. The following provides an overview of the various investigation activities carried out during the RI:

- Surface Soil Samples Collected: 46
- Subsurface Soil Samples Collected: 50
- Temporary Wells Installed and Sampled: 8
- Existing Shallow Wells Sampled: 3
- Surface Water Samples Collected: 5
- Sediment Samples Collected: 5

Findings from the RI are presented within a number of the sections which follow.

Summary of Site Characteristics

Various investigations were performed during the RI at Site 63 to assess the nature and extent of contamination that may have resulted from previous waste management practices or site activities; to assess the human health, ecological, and environmental risks associated with exposure to surface and subsurface soils; and to characterize the geologic and hydrogeologic setting of the study area. The following provides a brief summary regarding the extent of contamination at Site 63. This summary focuses upon primary site concerns and is not intended to address all analytical results. A summary of site contamination, by media, is provided in Table 5. Figure 4 depicts the various RI sampling locations at Site 63.

Soil

Styrene was detected in only one of the subsurface soil samples obtained at Site 63. Styrene was detected at a concentration of 41 lg/kg in a subsurface sample from location 63-SB15. No other VOCs were detected among the 96 soil samples retained for laboratory analyses. Given the limited extent of styrene and the lack corroborating evidence of volatile contamination, the presence of styrene is most likely the result of a single event rather than long-term disposal operations. Additionally, the single styrene detection did not exceed the applicable soil screening value of 2,000 lg/kg.

The presence of SVOCs in soil is most likely the result of either former operational activities at Site 63 or the decomposition of organic matter (e.g., leaves, pine needles, etc.). The concentration and infrequent detection of semivolatile compounds among soil samples is consistent with the historical use of Site 63; indicative of incidental spillage, or may be the result of ongoing maneuvers and training exercises. Semivolatile compounds were identified in both surface and subsurface soil samples obtained from the suspected disposal portion of the study area. Concentrations of SVOCs were limited to two surface and three subsurface sampling locations throughout the entire site. The positive SVOC results correspond directly to the visual identification of graded soil or construction debris observed during the field investigation. None of the positive SVOC detections exceeded applicable soil screening values for the protection of groundwater, nor do they suggest long-term disposal operations.
Positive detections of pesticides were observed among both surface and subsurface soil samples at Site 63. Pesticide concentrations were low (i.e., less than 100 \(\mu g/kg\)) and primarily limited to within and adjacent to the suspected disposal portion of the study area. The majority of pesticide detections were observed among surface soil samples. The frequency and overall concentration of pesticides in soil, nonetheless, does not suggest pesticide disposal activities. Much of the study area appears to have been graded during previous site operations; the reworked surface soil may have contained residual pesticides. The presence of pesticide compounds among soil samples obtained at Site 63 is most likely the result of routine base-wide application and use of pesticides.

As provided in Table 5, a number of samples submitted for analyses had target analyte list (TAL) metal concentrations which exceeded applicable soil screening values or base-specific background levels. Arsenic, barium, and nickel were detected at concentrations which exceeded soil screening values protective of groundwater among 1, 5, and 7 of the 96 soil samples submitted for analyses; however, the same 3 metals were not detected above NCWQSs among any of the groundwater samples obtained at Site 63.

The distribution of detected metals among both surface and subsurface samples followed no discernible pattern. In at least one case, however, findings from the analytical program were consistent with visual observations of buried debris and non-native surface material recorded during the field investigation. A total of 13 metals were detected above twice their average base-specific background levels; 9 of the 13 metals were detected at maximum concentrations in a subsurface sample obtained from location 63-SB23. Boring 63-SB23 is located within the central portion of the suspected disposal area and identified as having both surface and subsurface debris (refer to Figure 4). With the exception of boring 63-SB23, metals were observed at varying concentrations scattered throughout the study area.

Groundwater

Volatile, semivolatile, pesticide, and PCB organic compounds were not detected in any of the groundwater samples submitted for analyses from Site 63. As a result of those analyses, the extent of organic compounds in groundwater were not addressed.

Metals were detected in each of the 11 groundwater samples submitted for analyses from Site 63. Iron, manganese, and zinc were the only target analyte list (TAL) total metals detected at levels in excess of either federal MCL or NCWQS. Positive detections that exceeded applicable screening standards for both iron and manganese were distributed throughout the suspected disposal portion of the study area. The sample obtained from temporary well 63-TW07 exhibited the only positive detection of zinc; detected at a concentration of 17,100 micrograms per liter (\(\mu g/L\)) which exceeded the 2,100 \(\mu g/L\) screening standard. Subsurface soil samples collected from both the eastern and western portions of the study area had positive detections of zinc which exceeded background levels. Although the distribution of zinc among soil samples is not limited to the suspected disposal portion of the study area, temporary well 63-TW07 is located within one of the areas identified as having elevated concentrations of zinc in soil. The presence of zinc in soil, however, does not completely account for its elevated concentration in groundwater. If zinc disposal operations had taken place at Site 63 elevated concentrations of zinc would also be evident in the adjacent monitoring well 63-GW02 and at much higher concentrations among soil samples obtained from the suspected disposal area. Temporary monitoring well 63-TW07 is hydraulically downgradient from the suspected disposal portion of the study area and permanent well 63-GW02. The limited dispersion of zinc in sampling media suggests that its presence is not indicative of former or ongoing disposal activities.

Groundwater within the coastal plain region of North Carolina is naturally rich in iron and manganese. Groundwater concentrations of both iron and manganese at MCB Camp Lejeune often exceed the state standards of 300 and 50 \(\mu g/L\), respectively. Elevated levels of iron and manganese, at concentrations above the NCWQS, were reported in samples collected from a number of base potable water supply wells which were installed at depths greater than 162 feet below ground surface. Certain total metal concentrations in groundwater are due more to geologic conditions (i.e., naturally occurring concentrations and unconsolidated soils) and sample acquisition methods, than to mobile metal concentrations in the surficial aquifer.

Iron and manganese concentrations from a number of wells at Site 63 exceeded the NCWQS but fell within the range of concentrations for samples collected elsewhere at MCB Camp Lejeune.
Additionally, positive detections of both iron and manganese among groundwater samples retained from the upper-most portion of the surficial aquifer had no discernible pattern of distribution. The presence and concentrations of both iron and manganese in groundwater samples obtained at Site 63 appear to be indicative of natural site conditions rather than disposal activities.

Surface Water

No organic compounds were detected among any of the five surface water samples submitted for analyses from Site 63. As a result of those analyses, the extent of organic compounds in surface water were not addressed within the RI report.

Aluminum was the only TAL total metal identified among each of the five surface water samples obtained from the unnamed tributary that exceeded state or federal chronic screening values. Each sampling station had a positive detection of aluminum above the 87 \( \text{mg/L} \) chronic screening value. Positive aluminum detections among the five surface water samples obtained from the unnamed tributary ranged from 602 to 688 \( \text{mg/L} \). The headwaters of the unnamed tributary are less than one hundred yards upgradient of Site 63, amongst pine and hardwood trees. The combination of acidic soil and acidification due to decaying leaves and pine needles most probably has contributed to the slightly acidic nature of surface water at Site 63. Field chemistry results suggest that the pH of the unnamed tributary is less than 4.0. Several hundred or even several thousand milligrams per liter of aluminum is not unusual for natural waters having a pH below 4.0. The slight acidity of surface water at Site 63, coupled with the natural occurrence of aluminum in site soil and sediment has effectively contributed to the observed levels of aluminum among each of the surface water samples.

Lead was identified among two of the five surface water samples at concentrations in excess of chronic screening values. The maximum concentration of lead detected among the five surface water samples was 2.2 \( \text{mg/L} \); the fresh water chronic screening value for lead is 1.32 \( \text{mg/L} \). The two lead detections were obtained from adjacent and downstream sampling stations. As with aluminum, water with a pH value below neutral may also dissolve considerable amounts of lead. The limited dispersion and low concentration of lead in surface water which exceeded applicable chronic screening values is not indicative of former or ongoing disposal activities, however.

Sediment

None of the TAL metal sampling results from Site 63 exceeded chronic sediment screening values; therefore, the extent of inorganic analytes in sediment were not addressed within the RI report. A summary of site contamination is presented in Table 5. Volatile, semivolatile, and PCB compounds were not detected among any of the five sediment samples submitted for analyses from Site 63. As a result of those analyses, the extent of volatile, semivolatile, and PCB compounds in sediment were also not addressed.

The pesticides 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane were detected in one of the five sediment samples retained for analysis from Site 63. The only other pesticide detection was that of 4,4'-DDD in a sample obtained from a separate sampling station. Each of the pesticides were detected at concentrations less than 15 \( \text{mg/kg} \). The maximum pesticide concentration among the five sediment samples obtained for laboratory analysis was 11 \( \text{mg/kg} \) of 4,4'-DDD. Each of the pesticide detections exceeded applicable chronic sediment screening values; however, the pesticide detections did not contribute significantly to either human health or ecological risks. The observed concentrations of the detected pesticides were typical of levels observed in sediments throughout MCB Camp Lejeune. Positive detections of these compounds at Site 63 are most likely the result of former base-wide application and use of pesticides. The frequency and overall concentration of pesticides at Site 63 is not indicative of pesticide disposal activities.

Summary of Site Risks

As part of the RI, both a human health risk assessment (RA) and an ecological RA were conducted to determine potential risks associated with possible exposure to environmental media at Site 63. The following briefly summarizes the findings of the human health and ecological RAs.

Human Health Risk Assessment
Contaminants of potential concern (COPCs) were selected as part of the human health RA for surface soil, subsurface soil, groundwater, surface water, and sediment. The selection of COPCs was based upon criteria provided in the USEPA Risk Assessment Guidance for Superfund. For each COPC identified, incremental lifetime cancer risk (ICR) values and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks posed by possible exposure to site media. Table 6 presents ICR and HI values for each environmental media and both current and future potential receptors. Current and future potential receptors evaluated in the RI included current military personnel, current trespassers (i.e., children and adults), future residents (i.e., children and adults), and future construction workers. Table 6 also presents total ICR and HI values, which represent combined risks posed by possible exposure to site media. The total site-related risk was estimated by logically summing the multiple exposure pathways likely to affect the receptor during a given activity.

Table 6 presents the HI values that exceed the USEPA acceptable limit of 1.0. As depicted in Table 6, unacceptable risk values include the HI for future child residents exposed to groundwater (10.0) and the HI for future adult residents exposed to groundwater (4.5). The subsections which follow present both current and future risk scenarios.

Current Scenario

In the current case, the following receptors were assessed: military personnel and trespassers. Receptor exposure to surface soil, surface water, and sediment was assessed for the trespassers. Receptor exposure to surface soil, subsurface soil, surface water, and sediment was assessed for military personnel. The potential risks associated with the current receptors were within or below the acceptable risk range as defined by USEPA.

Future Scenario

In the future case, child and adult residents were assessed for potential exposure to groundwater, surface soil, surface water, and sediment. A construction worker was evaluated for surface soil and subsurface soil exposure. There were no unacceptable risks associated with the construction worker. However, there were potential noncarcinogenic risks calculated for the child resident from groundwater (10.0) exposure. Similarly, there was a noncarcinogenic risk (4.5) calculated for the adult resident from groundwater exposure. These risk values exceeded the hazard index of 1.0 for noncarcinogenic effects. The maximum level of iron and zinc in groundwater were the primary contributors to these noncarcinogenic risks.

As stated previously, groundwater is not currently used potably at the site, and future residential development of the site is unlikely. Based on this information, the future groundwater exposure scenario evaluated in this risk assessment, although highly protective of human health, is unlikely to occur.

It should be noted that iron is an essential nutrient. The toxicity values associated with exposure to this metal are based on provisional studies which have not been verified by USEPA. In fact, if iron were removed from the evaluation of risk from groundwater ingestion, the noncarcinogenic risk for the child would decrease from 10.0 to 4.8 and, for the adult, from 4.5 to 2.3. As a result, the potential human health risk from exposure to iron in groundwater is conservative.

The other analyte contributing to the unacceptable HI value in groundwater for the future residential child and adult is zinc. Zinc had a HI of 3.6 for the future child resident and 1.6 for the future adult resident. While zinc was detected at a frequency of six out of eleven samples, only one detection exceeded the comparison criteria. This concentration of zinc (17,000 μg/L) is one order of magnitude greater than those detected in Site 63 soils. In addition, zinc was not detected in surface water. Consequently, the potential human health risk from exposure to zinc in groundwater is a conservative estimate.

Although the HI values for future residents exceed USEPA acceptable limits, the risks they represent appear to be insignificant. As a result, conditions at OU No. 13 may be considered protective of human health and the environment.

Ecological Risk Assessment
During the ecological RA, COPCs were selected for surface water, sediment, and surface soil, as provided in Table 7. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs summarize the conclusions made for aquatic and terrestrial receptors at Site 63.

The following subsections provide an overview of potential risks to both aquatic and terrestrial environs identified at Site 63 during this assessment. Potential risks to the aquatic environment at Site 63 are demonstrated by the cumulative quotient index (QI) ratios greater than 1.0 calculated for both surface water and sediment. In addition, potential risks to the terrestrial environment are demonstrated by exceedances of soil toxicity values and risk exhibited in terrestrial chronic daily intake (CDI) models. However, the significance of the potential risks is considered to be low based on this ecological risk assessment.

Aquatic Ecosystem

Surface water concentrations of aluminum, barium, and lead may be adversely impacting the aquatic environment in the freshwater stream at Site 63. Cumulative quotient index (QI) ratios were calculated for the surface water at 1.31 for acute and 16.28 for chronic. These inorganic COPCs were detected at relatively the same concentrations at each sampling location. However, due to the conservative barium criteria and lead in the blank sample, aluminum appears to be the only COPC potentially impacting the aquatic environment. It should be noted that aluminum and barium were detected at higher concentrations during the 1991 SI. In addition, aluminum dissolves readily into surface water under acidic conditions; pH concentrations detected at Site 63 surface water stations were below four. Therefore, the low pH levels may have elevated the concentrations of aluminum detected in the surface water.

The potential risk to the aquatic community posed by the sediment is demonstrated by cumulative QI value of 11.33 for the effects range-low (ER-L). It is noted that risk is not demonstrated by the cumulative QI values calculated for the effects range-median (ER-M) (0.98) and sediment quality criteria (SQC) (0.66) values. The risk to the aquatic environment from the sediment is primarily due to concentrations of chlordane, 4,4'-DDD, and 4,4'-DDE. However, these pesticides are not site-related contaminants, but rather a result of former base-wide pesticide control programs.

The intermittent, shallow nature of the stream may also introduce stress to the aquatic environment. The shallowness of the stream subjects the surface water to low dissolved oxygen concentrations and high temperatures both of which may adversely impact many aquatic organisms.

Terrestrial Ecosystem

Overall, some potential impacts to soil flora and fauna may occur as a result of concentrations of aluminum, chromium, copper, iron, lead, manganese, mercury, and zinc detected in the surface soil at Site 63. It should be noted that there is much uncertainty in the use of the flora and fauna surface soil screening values (SSSVs). In addition, the inorganics with the most exceedances of the SSSVs (aluminum, chromium, and iron) also exceed SSSVs for the background concentrations, indicating that regional conditions contribute to the potential risk to the terrestrial flora and fauna.

The terrestrial intake models only demonstrated a significant risk greater than one for the raccoon model. This risk was driven by concentrations of aluminum in the surface water via bioconcentration in fish tissue; however, it should be noted that background surface water concentrations of aluminum also may generate a risk in the raccoon model. Therefore, regional conditions are contributing to the terrestrial risk to the vertebrate population at Site 63.

The conclusions of the ecological RA, for both aquatic and terrestrial receptors, indicate that although a number of organic compounds and inorganic analytes exceeded applicable screening values, ecological risks at Site 63 appear to be insignificant. As a result, conditions at Site 63 may be considered protective of the environment.

Highlights of Community Participation

The Final RI Report and Final PRAP for OU No. 13 were released to the public on November 6, 1996. These documents are available to the public in an administrative record file at both the
Onslow County Public Library in Jacksonville, North Carolina and at the Installation Restoration Division Office (Building 67, Room 238) at MCB Camp Lejeune. A notice regarding the availability of these documents was published in the "Jacksonville Daily News" on November 3, 1996.

A public meeting was held on November 6, 1996 to accept questions from the community regarding the No Further Remedial Action Alternative for OU No. 13. During the public meeting, representatives of the DoN and the Marine Corps discussed the preferred remedial action under consideration. A copy of the public meeting transcript is provided as Appendix A to this ROD. A 30-day public comment period concerning the preferred remedy for OU No. 13 followed the public meeting and concluded on December 6, 1996. No significant comments, criticisms, or relevant information was received during the public comment period; therefore, responses to comments have not been prepared.

Scope and Role of Response Action

No Further Action with Institutional Controls is the selected alternative for OU No. 13. This decision is based upon the findings of the RI, particularly the results of both human health and ecological risk assessments. Justification for No Further Remedial Action with Institutional Controls is presented within the sections which follow.

Description of the Selected Remedy

No Further Action with Institutional Controls is the preferred remedy for Site 63. As the name suggests, this alternative involves taking no further action at OU No. 13. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain in their current state as long as existing site conditions do not change. In addition, aquifer use restrictions in the Base Master Plan will prohibit the installation of water supply wells within 1,000 feet of Site 63. This decision is justifiable because conditions at OU No. 13 are protective of human health and the environment. This selected Remedy will have no cost associated with it.

No Future Action with Institutional Controls Decision Rationale

A detailed justification in support of the preferred alternative for OU No. 13 is presented herein. The paragraphs which follow address individual site concerns and remedial limitations which have lead to the selection of the selected remedy.

There are no unacceptable site-related carcinogenic risks associated with exposure to environmental media at Site 63. Multiple exposure pathways were evaluated for current and future potential human receptors; resultant estimates indicate that carcinogenic site risks are within or below the acceptable risk range as defined by USEPA.

An assessment of potential noncarcinogenic risks posed by exposure to environmental media at Site 63 was also completed for possible current and future human receptors. This conservative evaluation of site risk suggests that future residents, given a number of exposure assumptions, could experience some adverse health effects. The evaluation was based upon the potential exposure of future child and future adult residents. Over 90 percent of noncarcinogenic risk generated by the future residential scenario is the result of presumed shallow groundwater ingestion. Ingestion of iron and zinc at the maximum concentrations detected among all groundwater samples obtained from Site 63 were used in the estimation of risk. Additionally, ingestion of iron and lead at the maximum concentrations detected among soil samples constituted the remaining noncarcinogenic risk to future child residents. It is important to note that this risk assessment is highly protective of human health and that future residential development of the site is unlikely.

The majority of site-related noncarcinogenic risk to future residents was generated by possible ingestion of inorganic analytes in groundwater. Hydraulic conductivity results from Site 63 suggest that potable wells supplying groundwater for human consumption from the uppermost portion of the surficial aquifer would not be practical. Groundwater flow rates would not be sufficient to support a potable source of drinking water. In addition, suspended material resulting from loose surficial soils would further inhibit groundwater flow capacities through siltation. Given these circumstances, it is unlikely that the surficial aquifer could be used as
a drinking water source. If a potable well were required in the future at Site 63 it would most likely supply groundwater from the deeper, Castle Hayne Aquifer.

An ecological risk assessment of potential site-related impacts to both aquatic and terrestrial ecosystems was performed. Environmental media were assessed to determine the theoretical risks posed to various on-site ecological communities. Results of the ecological risk assessment indicate that the aquatic environment may potentially be impacted by pesticides detected in the sediment and that risks posed to the terrestrial environment are a result of naturally occurring inorganic analytes detected in the surface water and surface soil. Similar aquatic and terrestrial risks have been demonstrated by reference samples collected throughout MCB Camp Lejeune from areas not known or suspected of having been impacted by facility operations. Based upon this assessment, the significance of potential risks to ecological receptors at Site 63 is considered negligible.

Inorganic analytes were detected in each soil, groundwater, surface water, and sediment sample obtained during the field investigation at Site 63. Analytes such as aluminum, arsenic, iron, lead, manganese, and zinc were principal contributors to both human health and ecological site risks. These and other inorganic analytes naturally occur, often abundantly, in site media. No discernible pattern of analyte distribution was evident among the various media sampled. Former site operations do not appear to have contributed to the presence or frequency of these analytes.
RESPONSIVENESS SUMMARY

The Responsiveness Summary serves a dual purpose and is the final component of the ROD. First, the Responsiveness Summary provides information regarding both the remedial preferences and the general site concerns of the community. Second, it demonstrates to members of the community that their comments and concerns are an integral part of the remedial decision making process.

A transcript of the November 6, 1996 public meeting is provided as Appendix A of this document. Based upon the comments received during the public meeting, members of the community support the selected remedy. No written comments concerning the proposed remedy for Site 63 were received during the public comment period.

Community Involvement

A review of MCB Camp Lejeune files suggests that community involvement is centered upon outreach programs and social clubs. Written concerns that the community may have regarding any Installation Restoration (IR) sites were not identified during the file search. A review of published newspaper articles indicated that the community is interested in the local drinking water supply, groundwater quality, and surface water quality of the New River; however, there were no expressed interests or concerns specific to the MCB Camp Lejeune IR sites (including Site 63). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watermen's Association, have posed questions to MCB Camp Lejeune and local officials in the past regarding other environmental issues. Representatives of the two groups were sought as interview participants prior to the development of the MCB Camp Lejeune Community Relations Plan. Neither group was available for the interviews.

Community relation activities pertaining to MCB Camp Lejeune IR sites in general and OU No. 13 specifically to date are summarized as follows:

- Conducted community relations interviews during February and March 1990. A total of 41 interviews were conducted with base personnel, on-base residents, local officials, and off-base residents.
- Prepared a Community Relations Plan during September 1990.
- Conducted additional community relations interviews during August 1993. Nineteen individuals were interviewed representing local business, military and civilian interests, civic groups, and residential communities.
- Prepared a Final Community Relations Plan in February 1994.
- Established information repositories at both the Onslow County Public Library in Jacksonville, North Carolina and at the Installation Restoration Division Office (Building 67, Room 238) at MCB Camp Lejeune.
- Established an administrative record for all IR sites at MCB, Camp Lejeune.
- Released the PRAP for OU No. 13 for public review and comment on November 6, 1996.
- Released a notice soliciting public comment and announcing availability of the PRAP document on November 3, 1996.
- Held a Remedial Action Board meeting on November 6, 1996 to solicit comments concerning the RI findings and PRAP recommendation.
- Held a public meeting on November 6, 1996 to solicit comments and to provide information and findings concerning OU No. 13. Approximately 16 members of the community were in attendance. The transcript from the public meeting is provided as Appendix A to this ROD and is also available at the two information repositories.

Integration of Comments

A public meeting was held on November 6, 1996 at the Onslow County Library in Jacksonville,
North Carolina. Members of the community and representatives from the DoN, MCB Camp Lejeune, USEPA Region IV and NC DEHNR were in attendance. The public meeting transcript is provided in Appendix A. No written comments concerning the proposed remedy for Site 63 were received during the public comment period.

As a result of both public meeting and public comment period, no significant changes to the selected remedy were required.
<table>
<thead>
<tr>
<th>Organic Compounds</th>
<th>Detection Frequency</th>
<th>Range of Positive Detection (g/kg)</th>
<th>Location of Detections</th>
<th>Maximum Detection Frequency</th>
<th>Range of Positive Detections (g/kg)</th>
<th>Maximum Detection Concentration</th>
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<tbody>
<tr>
<td>Toluene</td>
<td>1/9</td>
<td>2</td>
<td>SB03</td>
<td>0/9</td>
<td>ND</td>
<td>NA</td>
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<tr>
<td>Total Xylenes</td>
<td>1/9</td>
<td>3</td>
<td>SB03</td>
<td>0/9</td>
<td>ND</td>
<td>NA</td>
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<tr>
<td>Benzoic Acid</td>
<td>2/9</td>
<td>45-280</td>
<td>MW02</td>
<td>2/9</td>
<td>43-78</td>
<td>MW02</td>
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<tr>
<td>Di-n-butylphthalate</td>
<td>3/9</td>
<td>43-51</td>
<td>MW01</td>
<td>1/9</td>
<td>62</td>
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<tr>
<td>bis(2-Ethyhexyl)phthalate</td>
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<td>44-72</td>
<td>MW02</td>
<td>1/9</td>
<td>62</td>
<td>MW01</td>
</tr>
<tr>
<td>4-4'-DDE</td>
<td>1/9</td>
<td>58</td>
<td>SB04</td>
<td>0/9</td>
<td>ND</td>
<td>NA</td>
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<tr>
<td>4-4'-DDD</td>
<td>1/9</td>
<td>53</td>
<td>SB04</td>
<td>0/9</td>
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<td>NA</td>
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<td>4-4'-DDT</td>
<td>1/9</td>
<td>39</td>
<td>SB04</td>
<td>0/9</td>
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<td>NA</td>
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<td>Aroclor-1254</td>
<td>1/9</td>
<td>1000</td>
<td>SB02</td>
<td>0/9</td>
<td>ND</td>
<td>NA</td>
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<tr>
<td>Inorganic Analytes</td>
<td>Surface Soil Detection Frequency</td>
<td>Range of Positive Detections (mg/kg)</td>
<td>Location of Detection</td>
<td>Subsurface Soil Detection Frequency</td>
<td>Range of Positive Detections (mg/kg)</td>
<td>Location of Detection</td>
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</tr>
<tr>
<td>Aluminum</td>
<td>8/9</td>
<td>975-8,450</td>
<td>SB01</td>
<td>9/9</td>
<td>1,920-20,500</td>
<td>SB04</td>
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<tr>
<td>Arsenic</td>
<td>4/9</td>
<td>1.4-2.3</td>
<td>SB03</td>
<td>5/9</td>
<td>1.3-9.1</td>
<td>SB06</td>
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<tr>
<td>Barium</td>
<td>3/9</td>
<td>16.9-22.9</td>
<td>SB04</td>
<td>3/9</td>
<td>16.3-41.8</td>
<td>SB04</td>
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<td>Calcium</td>
<td>0/9</td>
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<td>NA</td>
<td>3/9</td>
<td>79.7-377.0</td>
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<td>SB03</td>
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<td>2.0-30.3</td>
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<td>Copper</td>
<td>8/9</td>
<td>2.3-20.3</td>
<td>SB05</td>
<td>9/9</td>
<td>2.9-24.0</td>
<td>SB04</td>
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<td>Iron</td>
<td>8/9</td>
<td>741-5980</td>
<td>SB03</td>
<td>9/9</td>
<td>682-16,100</td>
<td>SB04</td>
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<tr>
<td>Lead</td>
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<td>2.2-36.3</td>
<td>SB04</td>
<td>9/9</td>
<td>2.1-8.5</td>
<td>SB04</td>
</tr>
<tr>
<td>Magnesium</td>
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<td>32.2-324.0</td>
<td>SB01</td>
<td>9/9</td>
<td>40.9-1020.0</td>
<td>SB04</td>
</tr>
<tr>
<td>Manganese</td>
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<td>6.6-22.8</td>
<td>SB04</td>
<td>8/9</td>
<td>4.9-57.1</td>
<td>SB04</td>
</tr>
<tr>
<td>Nickel</td>
<td>5/9</td>
<td>2.1-3.9</td>
<td>SB01</td>
<td>7/9</td>
<td>2.2-7.3</td>
<td>SB04</td>
</tr>
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<td>373-697</td>
<td>SB03</td>
<td>7/9</td>
<td>290-2,000</td>
<td>SB04</td>
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<tr>
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<td>8/9</td>
<td>2.2-13.8</td>
<td>SB03</td>
<td>9/9</td>
<td>1.6-36.9</td>
<td>SB04</td>
</tr>
<tr>
<td>Zinc</td>
<td>6/9</td>
<td>8.4-57.1</td>
<td>SB04</td>
<td>7/9</td>
<td>6.6-33.9</td>
<td>SB04</td>
</tr>
</tbody>
</table>

Notes:

- g/kg - micrograms per kilogram
- mg/kg - milligrams per kilogram
- ND - not detected
- NA - not applicable
### TABLE 2

**SUMMARY OF POSITIVE DETECTIONS IN GROUNDWATER**  
**SITE INSPECTION, 1991**  
**SITE 63, VERONA LOOP DUMP**  
**RECORD OF DECISION, CTO-0340**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Potential Contaminant</th>
<th>Frequency</th>
<th>Range of Positive Detection</th>
<th>Location of Maximum</th>
<th>USEPA MCL (µg/L)</th>
<th>North Carolina WQS (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Disulfide</td>
<td>2/3</td>
<td>1</td>
<td>MW01, MW02</td>
<td>NE</td>
<td>70</td>
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<tr>
<td>Benzoic Acid</td>
<td>1/3</td>
<td>3</td>
<td>MW02</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>bis(2-Ethylhexyl)phthalate</td>
<td>1/3</td>
<td>9</td>
<td>MW02</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Aluminum</td>
<td>3/3</td>
<td>3,650-85,300</td>
<td>MW02</td>
<td>0.05-0.2</td>
<td>NE</td>
</tr>
<tr>
<td>Barium</td>
<td>3/3</td>
<td>56.1-5,410</td>
<td>MW02</td>
<td>2,000</td>
<td>2,000</td>
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<td>Chromium</td>
<td>3/3</td>
<td>4.4-134</td>
<td>MW02</td>
<td>100</td>
<td>50</td>
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<tr>
<td>Iron</td>
<td>3/3</td>
<td>4,320-100,000</td>
<td>MW02</td>
<td>300</td>
<td>300</td>
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<tr>
<td>Lead</td>
<td>3/3</td>
<td>4.3-369</td>
<td>MW02</td>
<td>15 (1)</td>
<td>15</td>
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<tr>
<td>Manganese</td>
<td>3/3</td>
<td>50.3-1,020</td>
<td>MW02</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

**Notes:**

- µg/L - microgram per liter
- MCL - Maximum Contaminant Level
- WQS - Water Quality Standard (North Carolina Administrative Code Title 15A, Subchapter 2L)
- (1) USEPA "action level" for lead
- NE - Not Established
<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Frequency</th>
<th>Positive Detection</th>
<th>FWQSV</th>
<th>NCWQSV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>2/2</td>
<td>1,030-1,170</td>
<td>NE</td>
<td>NE</td>
</tr>
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<td>Barium</td>
<td>2/2</td>
<td>26.9-34.8</td>
<td>NE</td>
<td>1,000</td>
</tr>
<tr>
<td>Calcium</td>
<td>2/2</td>
<td>1,570-2,520</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Copper</td>
<td>1/2</td>
<td>6.3</td>
<td>6.54</td>
<td>7.0</td>
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<tr>
<td>Iron</td>
<td>2/2</td>
<td>1,040-1,090</td>
<td>NE</td>
<td>1,000</td>
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<tr>
<td>Magnesium</td>
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<td>746-945</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>Manganese</td>
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<td>10.4-13.6</td>
<td>NE</td>
<td>200</td>
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<tr>
<td>Nickel</td>
<td>1/2</td>
<td>10.2</td>
<td>8.8</td>
<td>25</td>
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<td>Sodium</td>
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<td>4,150-4,780</td>
<td>NE</td>
<td>NE</td>
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<tr>
<td>Thallium</td>
<td>1/2</td>
<td>2.0</td>
<td>NE</td>
<td>NE</td>
</tr>
</tbody>
</table>

Notes:

- **mg/L** - micrograms per liter
- **FWQSV** - Fresh Water Quality Screening Value (USEPA Region IV, 1994).
- **NCWQSV** - North Carolina Water Quality Screening Value for fresh water aquatic life or more stringent standard to support additional uses.
- **NE** - Not Established
### TABLE 4
**SUMMARY OF POSITIVE DETECTIONS IN SEDIMENT**  
**SITE INSPECTION, 1991**  
**SITE 63, VERONA LOOP DUMP**  
**RECORD OF DECISION, CTO-0340**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Frequency</th>
<th>Range of Positive Detection</th>
<th>Effects Range Low (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>2/2</td>
<td>803-13,400</td>
<td>NE</td>
</tr>
<tr>
<td>Arsenic</td>
<td>1/2</td>
<td>3.5</td>
<td>8.2</td>
</tr>
<tr>
<td>Barium</td>
<td>2/2</td>
<td>2.7-34.2</td>
<td>NE</td>
</tr>
<tr>
<td>Beryllium</td>
<td>1/2</td>
<td>0.31</td>
<td>NE</td>
</tr>
<tr>
<td>Calcium</td>
<td>1/2</td>
<td>160</td>
<td>NE</td>
</tr>
<tr>
<td>Chromium</td>
<td>2/2</td>
<td>1.7-17.3</td>
<td>81</td>
</tr>
<tr>
<td>Copper</td>
<td>2/2</td>
<td>16.8-76.8</td>
<td>34</td>
</tr>
<tr>
<td>Iron</td>
<td>2/2</td>
<td>376-5750</td>
<td>NE</td>
</tr>
<tr>
<td>Lead</td>
<td>2/2</td>
<td>3.4-90.0</td>
<td>46.7</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2/2</td>
<td>36.5-525</td>
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<td>Manganese</td>
<td>2/2</td>
<td>2.7-14.7</td>
<td>NE</td>
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<tr>
<td>Nickel</td>
<td>2/2</td>
<td>3.5-8.2</td>
<td>20.9</td>
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<tr>
<td>Potassium</td>
<td>1/2</td>
<td>873</td>
<td>-</td>
</tr>
<tr>
<td>Vanadium</td>
<td>2/2</td>
<td>1.6-24.0</td>
<td>-</td>
</tr>
<tr>
<td>Zinc</td>
<td>2/2</td>
<td>3.5-19.0</td>
<td>150</td>
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</table>

**Notes:**
- **mg/kg** - milligrams per kilogram
- (1) Region IV - Effects Range Low from Long, et. al., 1995.
- NE - Not Established
<table>
<thead>
<tr>
<th>Media</th>
<th>Contaminants or Analytes</th>
<th>Comparison Criteria</th>
<th>Detection Above</th>
<th>Distribution of Positive Detections</th>
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</thead>
<tbody>
<tr>
<td>Surface Volatile (Ig/kg)</td>
<td>ND</td>
<td>Soil SL NA</td>
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<td>0/46 adj to 63-GW01</td>
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<tr>
<td>Soil Semivolatile (Ig/kg)</td>
<td>Nitrosodiphenylamine 200</td>
<td>NA 51 J 51 J SB12 1/45 0/45 NA adjacent to 63-GW01</td>
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<tr>
<td></td>
<td>Di-n-butylphthalate 120,000</td>
<td>NA 78 J 78 J 63-TW06 1/45 0/45 NA southeast</td>
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<tr>
<td></td>
<td>BEHP 11,000</td>
<td>NA 41 J 4,400 SB12 7/45 0/45 NA 1 exceeds blank conc</td>
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<tr>
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<td>Nitrosodiphenylamine 200</td>
<td>NA 51 J 51 J SB12 1/45 0/45 NA adjacent to 63-GW01</td>
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<tr>
<td></td>
<td>Di-n-butylphthalate 120,000</td>
<td>NA 78 J 78 J 63-TW06 1/45 0/45 NA southeast</td>
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<tr>
<td></td>
<td>BEHP 11,000</td>
<td>NA 41 J 4,400 SB12 7/45 0/45 NA 1 exceeds blank conc</td>
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<tr>
<td>Soils Pesticide (Ig/kg)</td>
<td>Dieldrin 1.0</td>
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<td>4-4'-DDE 500</td>
<td>NA 2.7 J 55 J SB35 7/45 0/45 NA central, scattered</td>
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<td>4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 NA central and eastern</td>
<td></td>
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<td></td>
<td>Endosulfan Sulfate 3,000</td>
<td>NA 2 J 50 J SB29 11/45 0/45 NA central, scattered</td>
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<td>4-4'-DDT 1,000</td>
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<td></td>
<td>alpha-Chlordane gamma-Chlordane</td>
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<td>4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 NA central and eastern</td>
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<td>gamma-Chlordane</td>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<tr>
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<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<tr>
<td></td>
<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<td></td>
<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
<td></td>
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<tr>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
<td></td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
<td></td>
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<td></td>
<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<td>alpha-Chlordane 4-4'-DDD 700</td>
<td>NA 12 J 26 J SB35 2/45 0/45 central and eastern</td>
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<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
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<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>NA 3.5 J 16 SB35 2/45 0/45 central and eastern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media</td>
<td>Detected Contaminants or Analytes</td>
<td>Screening Standard</td>
<td>Base Background</td>
<td>Min.</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Subsurface</strong></td>
<td><strong>Volatile (g/kg)</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Styrene</td>
<td>2,000</td>
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<td>41</td>
</tr>
<tr>
<td></td>
<td>BEHP</td>
<td>11,000</td>
<td>NA</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Pesticide (g/kg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dieldrin</td>
<td>1.0</td>
<td>NA</td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>4,4'-DDK</td>
<td>500</td>
<td>NA</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>4,4'-DDD</td>
<td>700</td>
<td>NA</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>4,4'-DDT</td>
<td>1,000</td>
<td>NA</td>
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<tr>
<td><strong>Soil</strong></td>
<td><strong>Semivolatile (g/kg)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nitrosodiphenylamine</td>
<td>200</td>
<td>NA</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>BEHP</td>
<td>11,000</td>
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<td>41</td>
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<td></td>
<td>Pesticide (g/kg)</td>
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<tr>
<td></td>
<td>Dieldrin</td>
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<td>NA</td>
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</tr>
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<td></td>
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<td>500</td>
<td>NA</td>
<td>2.6</td>
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<td>4,4'-DDD</td>
<td>700</td>
<td>NA</td>
<td>5.6</td>
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<td></td>
<td>4,4'-DDT</td>
<td>1,000</td>
<td>NA</td>
<td>7.8</td>
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<tr>
<td><strong>Groundwater</strong></td>
<td><strong>Volatile (g/L)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ND</td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Semivolatile (g/L)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ND</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Pesticide (g/L)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>PCB (g/kg)</strong></td>
<td>ND</td>
<td>Soil SL</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td><strong>Metal (mg/kg)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Antimony</td>
<td>6.5</td>
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</tr>
<tr>
<td></td>
<td>Barium</td>
<td>32</td>
<td>14.4 J</td>
<td>1120</td>
</tr>
<tr>
<td></td>
<td>Beryllium</td>
<td>180</td>
<td>0.2 J</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>Chromium</td>
<td>12.5</td>
<td>1.2</td>
<td>84.4</td>
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<tr>
<td></td>
<td>Copper</td>
<td>2.4</td>
<td>0.55</td>
<td>16</td>
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<tr>
<td></td>
<td>Iron</td>
<td>7,135</td>
<td>425 J</td>
<td>149,000</td>
</tr>
<tr>
<td></td>
<td>Lead</td>
<td>8.3</td>
<td>2 J</td>
<td>1,650</td>
</tr>
<tr>
<td></td>
<td>Manganese</td>
<td>8.0</td>
<td>1.5</td>
<td>586</td>
</tr>
<tr>
<td></td>
<td>Nickel</td>
<td>21</td>
<td>3.7</td>
<td>76.1</td>
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<tr>
<td></td>
<td>Silver</td>
<td>0.9</td>
<td>1.8</td>
<td>5.3</td>
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<tr>
<td></td>
<td>Zinc</td>
<td>42,000</td>
<td>6.7</td>
<td>1</td>
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<tr>
<td><strong>Groundwater</strong></td>
<td><strong>Total Metal (g/L)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iron</td>
<td>300</td>
<td>73.5</td>
<td>24,300</td>
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<tr>
<td></td>
<td>Manganese</td>
<td>50</td>
<td>1.8</td>
<td>311</td>
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<tr>
<td></td>
<td>Zinc</td>
<td>2,100</td>
<td>4.9</td>
<td>17,100</td>
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</table>
### TABLE 5 (Continued)

**SUMMARY OF SITE CONTAMINATION**

**SITE 63, VERONA LOOP DUMP**

**RECORD OF DECISION, CTO-0340**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction (units)</th>
<th>Detected Contaminants or Analytes</th>
<th>Screening Standard</th>
<th>Base Background</th>
<th>Min.</th>
<th>Max.</th>
<th>Location of Detection</th>
<th>Frequency</th>
<th>Screening Detection</th>
<th>Base Background</th>
<th>Positive Detections</th>
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<tbody>
<tr>
<td><strong>Surface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile (Ig/L)</td>
<td>ND</td>
<td>ND</td>
<td>NCWQS</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semivolatile (Ig/L)</td>
<td>ND</td>
<td>ND</td>
<td>NCWQS</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide (Ig/L)</td>
<td>ND</td>
<td>ND</td>
<td>NCWQS</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCB (Ig/L)</td>
<td>ND</td>
<td>ND</td>
<td>NCWQS</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal(2) (Ig/L)</td>
<td>Aluminum</td>
<td>87</td>
<td>1,350</td>
<td>602</td>
<td>688</td>
<td></td>
<td>63-SW05</td>
<td>5/5</td>
<td>5/5</td>
<td>0/5</td>
<td>maximum downstream</td>
</tr>
<tr>
<td>Sediment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volatile (Ig/kg)</td>
<td>ND</td>
<td>ND</td>
<td>NOAA ER-L</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semivolatile (Ig/kg)</td>
<td>ND</td>
<td>ND</td>
<td>NOAA ER-L</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide (Ig/kg)</td>
<td>4,4’-DDE</td>
<td>2</td>
<td>NA</td>
<td>4.2 J</td>
<td>4.2 J</td>
<td></td>
<td>63-S04</td>
<td>1/5</td>
<td>1/5</td>
<td>NA</td>
<td>adjacent to site</td>
</tr>
<tr>
<td></td>
<td>4,4’-DDD</td>
<td>2</td>
<td>NA</td>
<td>2.6 J</td>
<td>11 J</td>
<td></td>
<td>63-S04</td>
<td>2/5</td>
<td>2/5</td>
<td>NA</td>
<td>adjacent to site</td>
</tr>
<tr>
<td></td>
<td>4,4’-DDT</td>
<td>1</td>
<td>NA</td>
<td>1.6 J</td>
<td>1.6 J</td>
<td></td>
<td>63-S04</td>
<td>1/5</td>
<td>1/5</td>
<td>NA</td>
<td>adjacent to site</td>
</tr>
<tr>
<td></td>
<td>alpha-Chlordane</td>
<td>0.5</td>
<td>NA</td>
<td>4.7 J</td>
<td>4.7 J</td>
<td></td>
<td>63-S04</td>
<td>1/5</td>
<td>1/5</td>
<td>NA</td>
<td>adjacent to site</td>
</tr>
<tr>
<td></td>
<td>gamma-Chlordane</td>
<td>0.5</td>
<td>NA</td>
<td>6.2 J</td>
<td>6.2 J</td>
<td></td>
<td>63-S04</td>
<td>1/5</td>
<td>1/5</td>
<td>NA</td>
<td>adjacent to site</td>
</tr>
<tr>
<td>PCB (Ig/kg)</td>
<td>ND</td>
<td>ND</td>
<td>NOAA ER-L</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal (2) (mg/kg)</td>
<td>ND</td>
<td>ND above screening val</td>
<td>NOAA ER-L</td>
<td>Background</td>
<td>0/5</td>
<td>0/5</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Notes:** Concentrations are presented in Ig/L for liquid and Ig/kg for solids (parts per billion), metal concentrations for soils and sediments are presented in mg/kg (parts per million).

(1) Metals in both surface and subsurface soils were compared to twice the average base background positive concentrations for aluminum, barium, iron, manganese and priority pollutant metals only (priority pollutant metals include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc).

(2) Total metals in surface water and sediment were compared to the range of positive detections in upgradient samples at MCB, Camp Lejeune.

BEHP-bis (2-Ethylhexyl)phthalate

NA- Not applicable

ND- Not detected

MCL - Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories.


NOAA ER-L, - USEPA Region IV Sediment Effects-Range Low Screening Values, established by the National Oceanic and Atmospheric Administration.

APPENDIX A
PUBLIC MEETING TRANSCRIPT

RESTORATION ADVISORY BOARD MEETING

Proposed Remedial Action Plan

Operable Unit No.12 (Site 3)
Operable Unit No.13 (Site 63)

November 6, 1996.
Onslow Public Library,
Jacksonville, North Carolina

Reported by:

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Hampstead, North Carolina 28443
(910)270-4541
Fax:270-5180

* Copy *
WEDNESDAY EVENING SESSION

November 6, 1996

The Slide Presentation of the Proposed Remedial Action Plan for Operable Units 12 and 13 by Baker Environmental, Inc. during the Restoration Advisory Board Meeting, convened at 8:00 o’clock p.m. in the Conference Room of Onslow Public Library, 58 Doris Avenue East, Jacksonville, North Carolina.

MR.TOMAS TREBILCOCK: We’ll go ahead with the slide presentation.

Some of these figures that are going to be in here are in the Proposed Remedial Action Plan that we have there.

We apologize for getting that out so late, but I guess this has been on sort of a particular track.

But, anyway, my name is Tom Trebilcock with Baker Environmental to speak to you tonight about Operable Unit No.13, Site 63.

During the presentation, I would welcome any questions that you have and if you don't mind, if you don't object, just state your name before your question so our Court Reporter can just get a record of where the
questions are from and that will help us when we go to
address these questions with a response summary that will
be provided later.

As Matt talked about earlier, as he went through
each of the operable units, there are 18 operable units.
Some of those operable units are comprised of more than
one site.

It just so happens that Operable Unit 13 is
comprised of only one site and that's Site 63, the Verona
Loop Dump.

A sense of where the site is located, it's in
the western part of the facility over here, about two
miles south of the Marine Corps Air Station.

The next slide has a little bit better regional
location of it.

It’s about a mile east of Highway 17 for Verona
and it's about a mile-and-a-half west of the New River.

MR.CARRAWAY: That's the one we did not see on
our field trip.

MR.MORRIS: We went there, but there were trees
down across the entrance.

MR.TREBILCOCK: Yes.
Yeah, it got some storm damage in both hurricanes.

Site 63 is approximately a five acre site which is comprised of mixed hardwood and pine forest. It's located on sort of a topographic high or saddle between two drainages.

So it's sort of on top of a hill.

It's reported to have received what's called "bivouac" waste and I have a picture following this that shows some of what that might include, although the "bivouac" was never really described or defined in any historical documents.

There were no known hazardous waste disposed of at Site 63 also.

Same picture.

Okay, this is a photograph of Site 63 showing the site from an access road that comes off of Verona Loop Road which is what the site is named for.

Looking into the site looking north right here, you can see it's sort of a fairly wooded area. Actually, it's pretty thickly wooded.

Okay, the area is primarily used now as a
training area.

This is one that the personnel trenched out, a sort of foxhole that they've dug out there.

This area and the site are also used for hunting and recreational hunting, but primarily for exercises, training exercises, things like that.

Let me get this in a little better focus.

But, this shows some of the things that were observed out at the site and this is what--there are a few mounds of the same type of -- it looks like construction material, but it's concrete, some metal, scrap metal and in some of the other piles, there have been derelict vehicles, vehicle parts, tires, wheel covers and things like that.

So, you know, although we don't have a definition of "bivouac" waste, from these piles out there we could see the concrete and other -- looks like construction material.

There's a small tributary to Mill Run on this side of the Base and it runs right--abuts sort of the site itself.

This creek tends to dry up in the summer but
it's about two to three feet across right here.

And, that's the way most of it is all along beside Site 63.

This is - in case you're wondering - is a statement, just shows where a sample was taken, in this case the surface water and sediment sample.

The investigation at that particular site, the site was originally identified in an initial assessment study in 1983 as a potential dump area.

In 1991, the first samples were collected at Site 63 and that's part of the site investigation.

The findings from that site investigation prompted the next step, the remedial investigation.

Part of the site investigation was recommending further study of the site because only a limited amount of soil samples and groundwater samples were collected.

As part of the remedial investigation that we conducted in 1995, a total of 96 soil samples were collected and 11 shallow groundwater samples were collected from eight temporary wells and three existing shallow wells.

And, also, five surface water and five sediment
samples were collected.

The findings from the soil investigation indicated that among the 96 soil samples that were collected, 20 of those samples had - let me get this in focus - 20 of those samples had detectable levels of pesticides.

Now it's sliding away. This slide projector is living up to its name - sliding.

Twenty of those samples had pesticides, detectable levels of pesticides in them.

Nineteen of the samples had detectable levels of semi-volatile organic compounds in them.

And, then two of the ninety some samples had polychlorinated biphenyls or what's commonly referred to as PCBs.

And, then, finally, one sample had detectable levels of volatile organic compounds.

Now, the concentrations of these compounds with the exception of the semi-volatile organic compounds were below one hundred parts per billion.

Now, only a few, actually one semi-volatile organic compound was detected above that and it was
detected more than once.

This slide shows exactly where these soil samples were collected throughout the site.

This shows what was thought to be, or still remains to be what we think is the approximate site boundary and this is the gravel road that we saw the picture before.

Now, a lot of the sampling would basically extend out beyond the boundary of the site just in case, you know, this area wasn't well, and it hasn't been well defined in the records.

Okay, the findings from the groundwater investigation indicated that no organic compound was detected among the 11 groundwater samples that were collected.

Iron, manganese and zinc were however detected at concentrations which exceeded the North Carolina Groundwater Quality Standard.

But, those concentrations were detected at concentrations that are typical of natural site conditions in the coastal Plain in North Carolina.

Next slide.
If there are any questions--[laughter]--I'm kind of rolling through this.

MS.ELEANOR WOOD: I have one in looking at this chart and it talks about chlordane and it compares some criteria of stream sediment and there is no chlordane and I was curious about that.

MR.TREBILCOCK: That's right, for soil.

MS.WOOD: For soil.

MR.TREBILCOCK: Yes, that's right.

For some of the pesticides there are standards and they're related to how and what concentration in soil would a contaminant potentially impact groundwater.

And, for chlordane, for example, does not--

MS.WOOD: You don't have to deal with soil.

MR.TREBILCOCK: Well, it doesn't have a standard.

I'm sure there probably is a concentration of it that would impact groundwater, but I guess it hasn't been established.

I don't know.

Are there any other questions?

[No response]
This figure here shows the location of each of the samples, the groundwater sample locations. There are five within the known site boundary, or six within the known site boundary and five that extend outward from there.

There were, as I mentiond before, five surface water and five sediment samples collected.

There were also no organic compounds detected in the surface water samples and there were only two of the five samples that had detectable levels of pesticides in them.

MR. JAMES SWARTZENBERG: Excuse me, Jim Swartzenberg.

Is there a pattern to where these particular samples were taken from?

MR. TREBILCOCK: Where they were taken?

MR. SWARTZENBERG: Yes.

MR. TREBILCOCK: Yeah, actually--

MR. SWARTZENBERG: Found.

MR. TREBILCOCK: Oh, found.

MR. SWARTZENBERG: Where you found some pesticide and stuff.
MR. TREBILCOCK: It pretty much follows what we've seen in other sites, you know. It gets back I think not too long ago, actually '57 or sixties or fifties, pesticides were fairly commonly used around the Base.

And, when we do find them, they're pretty scattered throughout the Base.

MR. SWARTZENBERG: The same is true for the heavy metals and PCB's and all that.

MR. TREBILCOCK: Yeah, there were no particular--

MR. SWARTZENBERG: Next to where the concrete was?

MR. TREBILCOCK: Well, yeah, there were higher metals detected where we had--where we did observe some in the main part of the site there.

Visually, you could see metals in the sample like rusted iron so in those samples we have a higher concentration of iron.

But, that's where we had buried material mostly.

There were only a few places.

But, it usually did correlate.

Pesticides in sediment at least, they tend to adhere to particles so where the surface water flows
across soil, it may pick up the particles in the sediment.

So, we see a lot of water pollution in sediments because they sort of adhere to particles and they collect in these drainage basins.

Yes!

MR.CARAWAY: Eric Caraway!

I was noticing on the map itself of the samples, was there any particular reasoning why they were going more towards 17 and none of them were taken across the creek, or the little small branch?

MR.TREBILCOCK: Well, because it's in a sort of a topographic high, the thinking was that if there were sites and we weren't so sure where that site was, if the only thing we had to indicate where the site was, was that gravel road and also some of these debris piles, but the thinking was that if there were a disposal area, it would be on that kind of flat area at the top.

The site actually slopes pretty steeply down to that creek that's to the east.

Maybe if I can flash that, flip forward and show you the surface water sample locations--

MR.CARAWAY: My experience with landfills, you
fill in a low area.

MR.TREBILCOCK: Well, it's not a landfill.

MR.CARAWAY: Well, I know, but it was a dump site.

MR.TREBILCOCK: A dump site.

MR.CARAWAY: Yeah, okay, dump site, landfill, there's a definition now. Back then there wasn't.

If you have a low area you want to fill it in, you start in the lowest part of the area and work your way up.

So my question is not being able to see the area--

MR.TREBILCOCK: Right.

MR.CARAWAY: --Was the ridge part of the waste area, or was there a ridge and it was put on top and the things filtered down?

MR.TREBILCOCK: It looks like that just this area within the site boundary had the evidence of, you know, that construction debris.

And, I think those are what originally indicated where the site might be, the location of those debris piles.
Now, you know, we dug down in the ground over 46 spots and only two of those spots did we find any evidence of something buried and that was within this area here, within this same--

MR.CARAWAY: Well, that was part of my question was--

MR.TREBILCOCK: Yeah.

MR.CARAWAY: --That if we start by the creek and work our way towards and the further we got towards and then we worked towards 17 we're getting more samples, we're getting our information toward the 17 side versus the creek side.

MR.TREBILCOCK: Yeah.

MR.CARAWAY: Okay.

MR.TREBILCOCK: Yeah, I follow you.

And, actually, this out here had no evidence of much of anything. In fact, it looks like they're following the scenario that you described.

They were beginning to fill in or dump things down towards the creek from the top, you know, down.

MR.CARAWAY: Yeah.

MR.TREBILCOCK: You know, like pull up a truck
and dump it down towards in the direction of the creek.

But, it's sort of like that, but I don't think they buried much and if they did, it was just in--because we had the place pretty well peppered--

MR.CARAWAY: Right.

MR.TREBILCOCK: --With the soil locations.

MR.CARAWAY: Thank you.

MR.TREBILCOCK: Sure.

Okay, which brings us to I guess the goal of the Remedial Investigation is to provide some indication of these sites, do they pose a human health hazard?

A human health risk assessment was performed and for these different potential receptors:

Current military personnel.

A current trespasser.

An adult trespasser.

A child trespasser.

A future construction worker.

A future adult resident.

A future child resident.

Now, the Environmental Protection Agency has established guidelines to determine at what level do
carcinogenic or cancer risks, at what level and at what number do they pose a threat.

And, that number is below this number up here.

And, for non-carcinogenic or non-cancerous risk, the number is less than one.

Well, after going through exposure scenarios for the various potential receptors we had, we came up with a potential non-carcinogenic risk to future adult residents and future child residents.

And, those numbers are based on the ingestion of groundwater from the site.

Now, if you remember, we didn't see any indication of organic contaminants in groundwater, but we saw indications of metals, high metal concentrations in the groundwater samples.

So, these two scenarios assume that for the future adult resident and future child resident that groundwater that we collected would be their primary source of potable water, or drinking water.

So, that's how those are and so it's a very conservative number that represents based on what we are doing.
Based on the next slide, which we can come back to this one, but based on the no further remedial action which is the proposed remedy for Site 63, based on this criteria the site will remain in its current state, with no further environmental investigation.

And, also, there will be an aquifer for use restriction placed on the site.

The potential for residents to ingest the groundwater will be eliminated because that will be prohibited from future development.

Are there any other questions about any of the slides or about anything?

MR.SWARTZENBERG: Jim Swartzenberg!

So, you're not proposing that they even go in and clean up--

MR.TREBILCOCK: The surface debris?

MR.SWARTZENBERG: --The surface debris and stuff like that?

MR.TREBILCOCK: No, that's right.

Just leave it there.

MR.SWARTZENBERG: Is it your opinion that that wouldn't do any good?
MR. TREBILCOCK: Well, I think maybe Neal might have a better handle on that.

I think in the past we've sort of just said instead of suggesting, you know, if you say, well, we're going to clean up the site from the aesthetic point of view, you might indicate that, well, you think there might be something there that could cause future contamination.

Right now, we don't think that, you know, concrete or the scrap metal or whatever else is going to cause anything.

But, that's pretty much just a housecleaning thing that I don't know whether Camp Lejeune--

MR. SWARTZENBERG: That's not the problem in other words.

MR. TREBILCOCK: No.

MR. NEAL PAUL: No, that's not the problem.

MS. KATHERINE LANDMAN: It's not a problem of contaminated site.

You might consider it an eyesore--

MR. TREBILCOCK: Yeah.

MS. LANDMAN: --But, you know, at such time as
the Marine Corps wants to do that is something else. They might decide not to remove it.

MR.PAUL: It's a pretty remote area which we don't have any plans to use, or any planned use or any way to go in there.

on the other hand, you take lot 2 or 3, you know, I think you guys got to see that site and all the debris that was at that site. That's a site where we have a lot of debris that's not contributing to contamination of the site, but we are going to remove it because we want to turn it over to a future industrial land use.

So, if there's a land use plan, then yeah we would go in to remove the debris.

But, here, we don't have any planned land use.

MR.MORRIS: This site can be used or can be pointed out to the Marine Corps for their Operation Clean Sweep, which every spring they go through and pick up debris.

We can identify this as one of the sites that they could go ahead and clean up.

MR.PAUL: That's a good point, Tom.

MR.TREBILCOCK: Were there any other questions
about the site itself?

MR.SWARTZENBERG: If they did do the Clean Sweep thing - I don't want to run him over--

MR.TREBILCOCK: Oh, no, no.

MR.SWARTZENBERG: If you did do the Clean Sweep though, from what you said it wouldn't change your figures at all?

MR.TREBILCOCK: No, no.

MR.SWARTZENBERG: It would just make it look a little better.

MR.PAUL: It would make it look a little better.

MR.CARAWAY: Wouldn't it change the figures ten years down the road if that metal continues to deteriorate?

Is the metal above the ground?

MR.TREBILCOCK: Well, it could, but, you know, once again, it would be iron and things that really wouldn't be hazardous to people or to the environment.

I mean, it could become more unsightly, you know, if you have iron oxidizing and you're going to have a stain or whatever on your ground, but not from a hazard standpoint.
MS.TRACEY DeBOW: So, actually what we have at this site was a couple of examples which had semi-volatile organics so that somewhere between 43 and 80 micrograms per millimeter of water or per liter.

And, that would really be, what, parts per million or parts per billion?

MR.TREBILCOCK: Parts per billion.

MS.DeBOW: Parts per billion ratio, so it's more than likely by the time we did anything to remove those organics, they of themselves would dissociate--

MR.TREBILCOCK: Right.

MS.DeBOW: --And, not be worth the price--

MR.TREBILCOCK: Well, it would be very difficult to remediate or to remove it.

MS.DeBOW: Since it's such a small amount.

MR.TREBILCOCK: Yeah.

MS.DeBOW: And, we don't have any real risk of it getting in the creek?

MR.TREBILCOCK: No.

MS.DeBOW: Because I don't see any--

MR.TREBILCOCK: There is a chance for the pesticide, for example. In my opinion, the pesticides are
probably migrating from the site into the sediment in the form of particulates or, you know, tiny pieces absorbed have washed into the creek and are now at the bottom of the creek so when you collect a sediment sample, well, you're going to see pesticides on that particle absorbed.

MS.DeBOW: Yes.

MR.TREBILCOCK: Now it has become a piece of sediment, but it had been just a piece of regular surface water.

MS.DeBOW: But, from what I saw, the pesticides were below State minimum acceptable limits.

MR.TREBILCOCK: Yes.

MS.DeBOW: Yeah, okay.

MR.TREBILCOCK: In fact, this is one of the-- this site is probably at lower levels of pesticides than what we typically see.

And, fewer in number too.

MS.WOOD: And, the same would apply to the naphtha?

MR.TREBILCOCK: Yeah, it had two detections in the soil and they were both under one hundred parts per billion, so, yeah, the same thing would apply to those
also.

        MR.PAUL: And, Tom, correct me if I'm wrong, but
as a general rule, pesticides are pretty much in the soil, they're not going to be a mobile contaminant.

        MR.TREBILCOCK: No, no. They're going to adhere
to the soil.

        The bottom line really at this site it's going
to be controlled through time by the Marine Corps, but
right now there's no further remedial action indicated.

        MR.BARTMAN: If you look at the regulations, the
regulations that are involved here, you know, federal and
state governments set of qualitative regulations and then
you go through them and we do qualitative assessment and
we determine we may have levels in the media that are
above our regulatory levels, but we determine that the
concentration and the specifics of the contaminant were
not posing a human health risk, it won't go anywhere.

        MS.DeBOW: We won't go anywhere.

        MR.BARTMAN: We won't go in there, exactly.

        No exposures, no receptors.

        MR.TREBILCOCK: Well, if there aren't any more
questions, of if you'd like I'll be around after the
meeting if you want to talk to me about any specifics about the site, but I'll turn it over to Matt.

We're sort of going in backwards order. I talked about Operable Unit 13 and Matt Bartman's going to talk about Operable Unit 12.

MR.BARTMAN: The discussion that I'll be dealing with is Operable Unit 12, Site 3, which is also referred to as the old Creosote Plant.

I know these pictures are difficult to see.

But, the old creosote plant, I'm going to pass around this photo.

This is an aerial photo from 1949.

The old creosote plant is also referred to, like I said, to Operable Unit 12, Site 3, and it's located on Holcomb Boulevard, about a half-mile off of Holcomb Boulevard, the main side of the Base.

It's also referred to as Lot 204 and that's the big chimney, if anyone’s going to the site you'll be able to see this site.

This is from the entrance coming from Holcomb Boulevard to the site.

And, this is what we refer to as the northern
area during our investigation.

This area will be referred to as the treatment area, but then there's also the southern portion of the site.

This is the side of the chimney for those of you who were on the site may be familiar with the area.

Just to get everyone in here - see the reason I passed around the aerial photo from 1949, this plant was in operation from 1951 to 1952 and basically the operation of the plant was to treat lumber for the construction of the Base railroad.

And, as you can see in that aerial photo, the Base railroad has not been constructed yet.

There's no indication of subsurface creosote disposal however until we did our investigation.

However, like Site 63, there was a site inspection completed here where subsurface contamination in the form of creosote or PAH, polycyclic aromatic hydrocarbon contamination was indicated, therefore turning it into the remedial investigation site.

Currently, the area is currently used to construct a staging area for the removal of downed trees.
That's all taken place in the northern area of the site from the hurricane that's taken place.

Now you can see the north area is the staging area for all the downed trees.

This is a very quick slide of the layout of the site.

Again we have the northern area where the downed trees are now staged.

This is what we refer to as the treatment area and then the railroad spike or the southern portion of the site.

Mainly all the creosote treating operations were conducted in this area. Again, the reason the chimney is located here.

A dirt track and the railroad spike area which not only comes to about here, but you can see remanants of it where they used the pumps where they appeared to derive water.

Field Investigation Summary.

What Baker Environmental did here, we had a multi-phase field program which was conducted from September 1994 to September 1996.
And, I say multi-phase because unlike Tom's investigation, we found contamination and had to keep delineating our contamination both in groundwater and in soil.

In September of 1994, we came out here and collected approximately 84 surface soil samples and those surface soil samples were analyzed in the field using a kit that's a immunoassay kit, bacterial testing kit, to determine where PAHs - again polyaromatic hydrocarbons which we knew are our known contaminants given our source which was the creosote.

So, we came out here and we had to delineate the site using surface soil samples.

We had to kind of focus our investigation in the area where we think creosote contamination was going to be a problem.

We came out in November of 1994 using the information that we collected in September and were able to focus our surface and subsurface soil investigation in a specific area where we knew we had contamination.

As a follow-up, we had to come back out in June of '95 to take additional samples because we were able to
locate through subsurface soil contamination in '94 that we had additional problems.

This is again the treatment area and this is just to give you an indication of how many samples we collected out here.

The pink being the ENSYS investigation.

The green being the different phases of the investigation we did in November of '94 and June of '95. And, this does not even show the northern area where we had several soil samples taken and also the railroad spike area.

The multi-phase investigation also included groundwater investigation.

In December of 1994 we put in seven shallow and one intermediate monitoring well.

And, then due to the contamination we found there, we came back out and had to put in eight. We sampled the eight existing shallow monitoring wells.

We installed five new shallow monitoring wells.

One intermediate well and one deep well.

The shallow wells being roughly 25 to 30 feet. Intermediate depth, 40 to 60 feet below ground
surface.

And, the deep well 140 feet below ground surface.

MS.WOOD: How many deep wells?

I'm sorry, I got confused reading this.

The deep wells were going in to Castle Hayne?

MR.BARTMAN: Yeah.

MS.WOOD: But not the intermediate?

MR.BARTMAN: No. The intermediate would be the upper portion of Castle Hayne.

MS.WOOD: Right, okay.

MR.BARTMAN: And, the reason we had to do this intermediate and deep wells in multi-phase so we could go out there, we investigate the shallow for particle contamination.

We go down vertically to see if the intermediates are contaminated. If the intermediates are contaminated, we focus in and keep going deeper until we can find the particle extent of the contamination.

In order to confirm our findings from the June of 1995 investigation, we came back out in September and did another full round of sampling to confirm the presence
or absence of contamination.

That was again by September of 1995.

Through the findings of September of 1995, we kind of have suspected misleading information between July of '95 and September of '95 and wanted to confirm that and that was in the deep well.

We only put in one deep well.

So, we had contamination in '95. We did see the contamination in September of '95 and we came back out in January of '96 and sampled that water and confirmed that there was an absence of contamination deep.

Had we found contamination, we would've had to go deeper.

But, given the nature of the contaminants which again the majority of them are PAHs, again the contaminants don't travel or migrate very readily in soil.

Usually you don't see them in the groundwater because they don't have a high mobility, or high leachability into the groundwater.

But, unfortunately, given the levels of creosote in our soil, we saw them in groundwater.

This figure indicates the areas where our
groundwater monitoring wells were placed.

I apologize for the figures.

Again, the pink indicates the shallow monitoring wells.

The blue are the intermediate wells.

And, the purple is the deep well.

You see we have wells on the north area, the treatment area and the southern portions of the site.

Due to contamination we had here in this intermediate well, in the second phase, we decided to put in this intermediate well.

And, then go back and due to the contamination put in this deep well.

What we found in all these phases of investigations was that a majority of our contamination both in soil and in groundwater, as we suspected but had to confirm, was all of our contamination was in what we were thinking would be the treatment area.

The chimney area used to heat the creosote.

If you don't know what creosote is, I could explain it, but I think everybody knows what it is.

But, at first, it's a very tarry material that
needs to be cut using fuel related materials.

    They heat it and then they treat the lumber.

    So, we could tell that this was all where the treatment took place.

    And, we found in the northern area and in the southern portion of the area we found isolated detections of creosote contamination, apart from the drippings but no known disposal.

    So, we did have contamination in other portions of the site, but concentrated mainly again in this treatment area.

    Like Tom's site, we had to go through the human health risks.

    Fortunately, for us we had limited receptors.

    We only had the future residential child, future residential adult.

    The third, military personnel that could be exposed.

    We think at that site in the future construction workers.

    As you can see, the risks obviously to the future residential child and would be the residential
adult, both carcinogenic and non-carcinogenic risks.

    And, this is from the ingestion of groundwater.

    However, shallow groundwater in this area is not even used as a potable water supply.

    However, we still have to consider it as a potential exposure to future adult, to future residents.

    Given that we don't have a risk to subsurface soils, which the construction worker is the only exposed receptor to subsurface soil.

    However, we knew that that was part of our readings and our findings or detections, we knew that subsurface soil was where our contamination was. However, there's no risk.

    That puts us in a Catch-22 because we have contamination but it's not causing risk, so what do you do with it?

    So, we knew that our sources was the soil. Our groundwater was causing our contamination and causing our risks.

    So, we had to remove the source and that's what we plan on doing as part of our proposed remedial action.

    We went through five different alternatives.
The alternatives have been selected for treatability studies at this phase, Number 5, which was the source removal and biological treatment.

For those of you who did visit Lot 203, saw two water treatment plants, for the pump and treat plant, there's a biocell constructed there, we'll be doing a similar biological treatment.

This biological treatment will be for PAH contamination where that one at Lot 203 is for POL waste.

We'll be doing a treatability study hopefully beginning in March to test out whether this technology will be feasible to remediate this contamination.

We'll be excavating for subsurface soil contamination down to roughly nine feet, where we know we have known contamination.

Placing it into the biocell, mixing it with several different types of bugs, nutrients, having it aerated, water applied to it to see if the bugs, the nutrients are able to degrade or decompose this contamination.

As for groundwater, we know we have contamination in our groundwater.
We know it exceeds regulatory levels.
We know that it poses a potential risk.
However, we feel that the source is really the soil, so therefore we remove the soil.
All we want to do here is monitor the groundwater.
Apparently, it's not posing a risk.
So, what we want to do is, again, monitor the groundwater, see if once we remove the source what happens to the concentrations in the groundwater?
Do they remain the same?
Do they increase?
Is there another source out there?
So, this monitoring will be conducted over a 30 year period, probably on a semi-annual basis and will be up for a five year review by the regulators.
So, that's roughly what's going to be happening at Site 3.

MS.WOOD: It says here the clinical phase, this is because it is impractical to remediate the saturated soil, which earlier it states is detectable for PAH contamination because of water--[inaudible].
So, it is saturated soil below the water table.

MR. BARTMAN: Uh-huh.

MS. GOOD: Okay, and it is the PAHs are not going to migrate.

MR. BARTMAN: No, they don't migrate readily into the water.

Think of it this way, a piece of tar, take a beaker and put some sand in it, drop the piece of tar into that and that's what you have.

MS. GOOD: Okay.

And, they aren't going to break down into any other--

MR. BARTMAN: They don't biodegrade. They're not like chlorinated solvents.

MS. GOOD: All right.

MR. BARTMAN: No biodegradability. They don't migrate readily even in presoils or groundwater.

That's why we don't see--we had this known source inside this, I guess when I said take a beaker of sand or a fish tank. Throw a piece of asphalt in there and you have the water flowing back and forth, you don't see the migration.
And, that's exactly what's happened in this case.

MS.GOOD: Thank you.

MR.JOE BARNETT: You said the risk looks like is higher for children, or I didn't understand that statistic.

It looked like it was less for children.

MR.BARTMAN: Can't remember.

MS.DeBOW: It was ten to the minus three.

MR.BARTMAN: Ten to the minus three.

It's actually less for children, higher for an adult.

MR.BARNETT: Does that mean for the adult, because it started as a child and there's--

MR.BARTMAN: Basically--

MR.BARNETT: --A cumulative effect over your lifetime for carcinogenic effect?

MR.BARTMAN: Exactly.

MR.BARNETT: Okay.

MR.BARTMAN: Also, exposure, the amount ingested is higher for an adult. Exposure period's longer, so you're at a higher risk.
There's usually a flip-flop for non-carcinogenic. Usually the child is at higher risk, the adult is at lower risk.

MR. SWARTZENBERG: What's the land use plan for that area? Is there any?

MR. BARTMAN: Neal!

MR. PAUL: I don't think so. Tom!

MR. MORRIS: As a matter of fact, I was contacted this afternoon about that treatment site.

They want to build a storage area into that particular area.

MR. BARTMAN: Into the southern portion, or into the treatment area?

MR. MORRIS: Into the southern portion of the southern portion.

MR. BARTMAN: Okay.

MR. MORRIS: In other words, it's going to start down the road a bit and extend up into the southern portion of--

MS. WOOD: The railroad spur.

MR. MORRIS: --The railroad spur, right..

MR. BARTMAN: All right.
MR.PAUL: This is high performance storage facility is P0Ls?

MR.MORRIS: Yes, PLOs.

MR.BARTMAN: It probably wouldn't be a problem from our standpoint if it's that treatment area. The southern portion, there's a monitoring well on W06 which I believe is the most downgraded shallow well.

It's going to be one of the wells that we're going to need to monitor because, for some reason, we found contamination of subsurface soil and in that groundwater as well.

So, as far as, I mean, as long as they don't disturb any of the wells that we'll be using for longterm monitoring, we're probably in good shape.

MR.PAUL: Is that an old site or new site?

MR.MORRIS: For?

MR.PAUL: What you talked about.

MR.BARTMAN: That is not the existing site that we've been planning on--

MR.MORRIS: This is the one that NEPA is still doing documentation on.
MR.PAUL: The only problem I see with it, this facility is going to be only a hazardous waste storage facility to the south?

MR.MORRIS: Uh-huh.

MR.PAUL: And, if we have contamination already in the area, I don't know.

MS.LANDMAN: My response to that would be they would need to stay around the area and need to monitor.

MR.PAUL: Yeah, right.

I don't want it to get that the current use facility is contributing to the contamination and then builds into--[inaudible].

MR.MORRIS: I only brought that up because they are still looking in that area as far as doing additional development.

MR.BARTMAN: One of the things during the investigation, I talked about PAHs in the creosote contamination, this is not like water. We kind of knew going in what contaminants we were looking for.

Now, the regulators still require that we did full scan - I say full scan, that means we looked at all the organics, semi-volatile organics, pesticide PCBs and
metals, as well as on select samples of soil and groundwater, we ran full scan.

And, we did find trace levels of detections in fish which was the volatile contaminants and in groundwater and in soil.

So, that's when we go back to this multi-phase groundwater samples to find out where that contamination was coming from.

So, I just want to let everybody know that we didn't just blow off certain chemical parameters. We did examine other things.

The PAHs are driving our risks and our contamination problems, so that's what our remedial effort goes out to.

MR.PAUL: What units will be discussed after our meeting will be more than likely--

MR.BARTMAN: Will be eleven which is Site 7, Tarawa Terrace and also Site 80 which is the Paradise Point Golf Course.

If there's any questions on that now, what's going on with those sites, what's happened at those sites, I can answer those also.
MS.WOOD: I did have a question on 80.
When did the dumping and cleaning of the
pesticides stop?

MR.BARTMAN: The time critical for--

MS.GOOD: No, no, when did they start cleaning
up I wasn't sure on that.

MR.BARTMAN: Okay.

MR.DUNN: There was no dumping.

MS.GOOD: Just washing it out, but--

MR.BARTMAN: It's a discharging unit.

MS.GOOD: Right, well, when did they start doing
that?

When you all came in, were they doing it, or had
it stopped fifteen years ago, or what was the length of
time?

MR.BARTMAN: Well, it's still a pesticide mixing
area.

MS.GOOD: oh, they're still, but they're not
washing it?

MR.BARTMAN: It's registered pesticides.

MS.GOOD: Okay.

MR.BARTMAN: It's not the DDDs, the DDEs.
Unregulated pesticides are not being used.

   MS.GOOD: Yeah, okay.

   MR.DUNN: The area is still a maintenance area for the golf course.

   They still apply pesticides to the golf course, but they're not the hazardous pesticides that we used in the past.

   MS.WOOD: Okay, so the hazardous pesticides were stopped around '78?

   MR.DUNN: I believe that's right.

   MS.GOOD: DDT?

   MR.DUNN: The DDT earlier, but the chlordane I think was in '78.

   MR.BARTMAN: Yeah, the Chlordane

   MS.LANDMAN: The highest concentration area in that particular site was probably due to a single event spill rather than--I mean, there were other trace areas that may have been due to washout or overspill to poor mixing practices.

   But, the one main area was most likely due to one single incident spill in time which, you know, we wouldn't know.
That's what the results appear to be.

MR. BARTMAN: If there's any questions regarding these sites as you read through the documents, the fact sheets of the Proposed Remedial Action Plan, feel free to give Peter or Neal a call, or Tom or I at Baker Environmental and we'll be able to answer questions relating to the site.

[Whereupon the proceedings concluded at 8:50 o'clock p.m.]
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC
EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/Base San LDFL (SITE 5)
USMC/CHEM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 01/20/1998
Operable Unit: 12
ROD ID: EPA/ROD/R04-98/019
Media: Groundwater, Sediment, Soil, Surface Water
Contaminant: Base Neutral Acids, Dioxins/Dibenzofurans, Inorganics, Metals, PAH, PCBs, Pesticides, VOC
Abstract:

Please note that the text in this document summarizes the Record of Decision for the purposes of facilitating searching and retrieving key text on the ROD. It is not the officially approved abstract drafted by the EPA Regional offices. Once EPA Headquarters receives the official abstract, this text will be replaced.

Marine Corps Base (MCB) Camp LeJeune is a training base for the US Marine Corps located in Onslow County, North Carolina. MCB Camp LeJeune is located approximately 45 miles south of New Bern and 47 miles north of Wilmington, North Carolina. The facility covers approximately 236 square miles and includes 14 miles of coastline. The military reservation is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The eastern border of MCB Camp LeJeune is the Atlantic shoreline; while U.S. Route 17 and State Route 24 border the western and northwestern boundaries of MCB Camp LeJeune, respectively. The City of Jacksonville, North Carolina, borders the facility to the north. Currently, there are 41 Installation Restoration Program (IRP) sites at Camp LeJeune. These 41 IRP sites have been grouped into 17 OUs.

OU 8
Site 16 is the only site within OU No. 8. Site 16, the Montford Point Burn Dump, is located southwest of Montford Landing Road and Wilson Drive intersection within the Montford Point development area of Camp Johnson. Site 16 is approximately 4 acres in size. Northeast Creek is located approximately 400 feet southeast of the study area and flows in a southwesterly direction towards/into the New River. Most of Site 16 is cleared; however, the area which surrounds Site 16 is comprised of pine and hardwood forest. An opening in the southeast corner of the study area leads to Northeast Creek. Site 16 is used for vehicle staging and for vehicle training exercises. A mock-up jet aircraft is located in the center of the study area. The aircraft is used in refueling exercises by tank truck operators, however, no fuel is used in the training. There are no permanent structures at Site 16. There are no endangered species known to reside at Site 16. Likewise, there are no wetlands which would provide a habitat to a variety of plant and animal species.

OU 5
Sites 41 and 74 are contained in OU No. 5. These two sites were grouped into one OU since both have a reported history of Chemical Warfare Materiel (CWM) disposal.

OU 4
Site 41, the Camp Geiger Dump, near the former Trailer Park, is
located east of Highway 17, encompasses approximately 30 acres and is situated in a topographically high area. Most of the site is heavily wooded and vegetated. Drainage from the site is received by Tank Creek to the south and an unnamed tributary to the north. Two seeps are located along the northern and eastern boundaries of the disposal area. The seeps have an orange color appearance due to the presence of iron, and flow into the unnamed tributary. The site was used as an open burn dump from 1946 to 1970. The site is littered with construction or demolition debris. Unexploded Ordnance (UXO) may also be present.

Site 74, the Mess Hall Grease Pit Disposal Area, is located approximately one-half mile east of Holcomb Boulevard in the northeast section in a remote area of MCB Camp LeJeune. Site 74 consists of two Areas Of Concern (AOC): the former grease disposal area (5 acres) and a former pest control area (1 acre). Both AOCs are heavily wooded, overgrown with vegetation, and flat. The grease pit area and pest control area are separated by a dirt road and are situated approximately one-quarter mile apart. There are no structures in the area that are associated with the operation of the facility, with the exception of an operational supply well (HP-654). This supply well is not contaminated. Site 74 has been fenced as part of MCB Camp LeJeune institutional controls. The site was used as a former disposal area from the early 50s until 1960.

Camp Lejeune is a training base for the U.S. Marine Corps, located in Onslow County, North Carolina. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base. Camp Geiger is located at the extreme northwest corner of MCB, Camp Lejeune, Onslow County. The main entrance to Camp Geiger is off U.S. Route 17, approximately 3.5 miles southeast of the City of Jacksonville, North Carolina. Operable Unit (OU) 10, Site 35, the Camp Geiger Area Fuel Farm, refers primarily to five, 15,000 gallon above ground storage tanks (ASTs), a pump house, and a fuel unloading pad situated within Camp Geiger just north of the intersection of Fourth and "G" Streets. To date, the Site 35 study area has been roughly bounded to the west by D Street, to the north by Second Street, to the east by Brinson Creek, and to the south midway between Fourth and Fifth Streets. OU 10 is one of 13 operable units within MCB Camp Lejeune.

The surface topography at Site 35 is generally flat to the south and west of the ASTs. The ground surface dips rapidly to the north and east in the direction of Brinson Creek. Overland surface drainage is toward Brinson Creek. Shallow groundwater flow direction is generally west to east across
the site in the direction of Brinson Creek. The top of groundwater is encountered roughly 8 to 10 feet below the ground surface (bgs) across the flat portion of the site and at lesser depths as the surface topography converges with Brinson Creek. Operable Unit 1 covers an area of approximately 690 acres and consists of Sites 21, 24, and 78 which are geographically close. OU 1 is located approximately one mile east of the New River and two miles south of State Route 24. The operable unit is bordered by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Main Service Road to the southwest, and woodlands and Cogdels Creek to the southeast.

Site 21, which is identified as Transformer Storage Lot 140, is located within the northwest section of Site 78. The site is bordered by Ash Street to the southwest, Center Road to the southeast, and a wooded area to the northwest. A dirt road surrounds most of the site along with surface drainage ditches. The southern and central portions of the site (approximately 220 feet by 900 feet) include several fenced-in areas, while the northern section (approximately 500 feet long) is an open area. Surface cover within the site consists of gravel, sandy soil, and concrete with a few vegetated areas. The two primary areas of concern within Site 21 are the Former Pesticide Mixing/Disposal Area and the Former PCB Transformer Disposal Area. With the exception of a low depressed area at the northern portion of the site, there are no visual signs of waste disposal throughout the site.

Site 24, which is referred to as the Industrial Fly Ash Dump, is located adjacent to the southeast portion of Site 78. Specifically, the site is located south and east of the intersection of Birch and Duncan Streets and extends south toward Cogdels Creek. The site is primarily a wooded area, approximately 100 acres in size, that is somewhat overgrown. The site is hilly and unpaved with site drainage toward Cogdels Creek. Dirt roads are interspersed throughout, which lead to the suspected disposal areas. The roads are periodically utilized for military vehicle maneuvers. Several areas indicating past disposal activities are evident throughout the site (i.e., surficial deposits of fly ash and mounding). Site 24 is not currently used for the disposal of wastes.

Site 78, which is referred to as the Hadnot Point Industrial Area (HPIA), is located adjacent to the northwest portion of Site 24 and houses the industrial area of MCB Camp Lejeune. This area is comprised of maintenance shops, warehouses, painting shops, printing shops, auto body shops, and other similar industrial facilities. In general, the HPIA is defined as the area bounded by Holcomb Boulevard to the northwest, Sneads Ferry Road to the northeast, Duncan Street to the southeast, and Main Service Road to the southwest. Site 78 covers approximately 590 acres. The majority
of the site area is paved (e.g., roadways, parking lots, loading dock areas, and storage lots), however, there are many small lawn areas associated with individual buildings within the site and along lengthy stretches of roadways. In addition, there are several acres of woods in the southern portion of the site. Recreational ballfields and a parade ground are located in the southwest corner of the site.

Operable Unit 5, which covers an area of approximately 5 acres, is made up solely of Site 2. The site is located at the intersection of Holcomb Boulevard and Brewster Boulevard. The site is bordered to the north by a wooded area that generally drains north toward Overs Creek; to the west by Holcomb Boulevard; and to the east by a water treatment plant. Within the site, there are two main areas of concern: the area around Building 712 [including the Lawn Area (LA) the Mixing Pad Area (MPA)] and the Former Storage Area (FSA), which is located at the southern portion of the site across the railroad tracks.

The land at Site 2 is primarily flat, but dips sharply at the drainage ditches which run parallel to the Camp Lejeune Railroad. There is a drainage ditch on both the east and west side of the railroad tracks. Drainage along the eastern edge of the Building 712 area is towards these drainage ditches, which run in a north-northwest direction toward Overs Creek. Drainage along the western edge of the Former Storage Area (FSA) is also towards these drainage ditches. Another drainage ditch extends westward from the Building 712 area; underneath Holcomb Boulevard.

**Remedy:**

The selected remedy for Operable Unit 11 (OU11) is a combination of the two separate remedies selected for Sites 7 and 80. For both sites, the selected remedy is the "no action" plan. Consequently, the selected remedy for OU11 is the "no action" plan.

This includes conducting no further environmental investigations or sampling. The operable unit, and all environmental media located within the OU, will remain as they currently are. The "no action" plan is justifiable because environmental conditions within OU11 appear to be protective of human health and the environment.

Estimated Capital Cost: $0  
Estimated Annual O & M Costs: $0  
Estimated Present Worth Costs: $0

**Text:**

Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 12
ONSLOW COUNTY, NC
01/20/1998
SUBJ: Record of Decision
Operable Unit 11, Sites 7 & 80
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

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 the Remedial Action at Operable Unit 11. This remedy is supported by the previously completed Remedial Investigation and Baseline Risk Assessment Reports.

The selected remedial alternative is no further action. This involves taking no further remedial actions at the site and leaving the environmental media as they currently exist. 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 MCB Camp Lejeune 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 MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward final cleanup of the NPL site.

CC: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kate Landman, LANTDIV
Dave Lown, NCDEHNR
Ms. Gena Townsend  
Remedial Project Manager  
US EPA Region IV  
Atlanta Federal Center  
Waste Management Division  
Federal Facilities Branch  
100 Alabama Street SW  
Atlanta, Georgia 30303

Dear Ms. Townsend:

On August 21, 1997, Major General Ray L. Smith, Commanding General for Marine Corps Base, Camp Lejeune signed the Record of Decision (ROD) for Operable Unit Number 11 (Sites 7 and 80).

This ROD is enclosed for your records. We appreciate your agency’s concurrence and will now proceed with the implementation of institutional controls that will ensure protection of human health and the environment.

If you have any questions or comments, please contact Mr. Mick Senus, Installation Restoration Division, Environmental Management Department, at telephone (910) 451-5068.

Enclosure: 1. Record of Decision for Operable Unit No.11

Copy to: (w/encl)  
COMLANTNAVFACEGCOM (Code 1823, K. Landman)  
CMC (LFL, K. Dryer)
FINAL

RECORD OF DECISION
OPERABLE UNIT NO. 11
(SITES 7 AND 80)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0274

APRIL 10, 1997

Prepared For:

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

Under:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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A Public Meeting Transcript

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<td>applicable or relevant and appropriate requirements</td>
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<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>VOC</td>
<td>volatile organic compound</td>
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DECLARATION

Site Name and Location

Operable Unit No. 11

(Site 7 - the Tarawa Terrace Dump, and Site 80 - the Paradise Point Golf Course Maintenance Area)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit (OU) No. 11 (Sites 7 and 80) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1990 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record file for OU No. 11.

The Department of the Navy (DON) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment, Health and Natural Resources (NC DEHNR) and the United States Environmental Protection Agency (USEPA) Region IV on the selected remedy.

Description of the Selected Remedy: No Action

The selected remedy for OU No. 11 is the "no action" plan. The "no action" plan involves taking no further remedial actions at OU No. 11. This includes conducting no further environmental investigations or sampling.

At Site 80, a Time-Critical Removal Action (TCRA) was completed prior to implementation of the "no action" plan. Under the TCRA, pesticide and arsenic contaminated surface soil was excavated, removed from the site, and disposed. The applicability of the "no action" plan at Site 80 was dependent on the implementation of this TCRA. The TCRA reduced current human health risks to within acceptable limits, and eliminated contaminated surface soil from being a future potential source of groundwater contamination.

<img src 98019e>
1.0 INTRODUCTION

This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 11 at Marine Corps Base (MCB), Camp Lejeune. OU No. 11, one of 18 operable units at the Base, consists of two sites:

- Site 7, the Tarawa Terrace Dump
- Site 80, the Paradise Point Golf Course Maintenance Area

The environmental media at both sites were investigated as part of a Remedial Investigation (RI) conducted for OU No. 11. Based on the results of the RI, preferred remedial action alternatives were identified for both sites in a Proposed Remedial Action Plan (PRAP) document. Then, the public was given an opportunity to comment on the RI and the PRAP. Based on comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for OU No. 11. This ROD document presents the final selected remedy for OU No. 11 along with a summary of the remedy selection process.

1.1 Description of Operable Unit No. 11

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB, Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

OU No. 11 is one of 18 Operable Units located within MCB, Camp Lejeune. Operable Units were developed at the Base to combine one or more individual sites that share a common element. In the case of OU No. 11, Sites 7 and 80 were grouped together because of their close geographic proximity and the detection of pesticides in soil at both sites.

Figure 1 depicts the location of OU No. 11 within MCB, Camp Lejeune. As shown, OU No. 11 is located on the northeastern portion of the Base, situated on either side of Northeast Creek. Site 7 is located on the creek's northern bank, and Site 80 is located on the southern bank.

1.2 Report Organization

The Decision Summary is organized into six main sections. Section 1.0 presents an introduction to the ROD document. Sections 2.0 and 3.0 present pertinent background information and the selected remedies for Sites 7 and 80, respectively. Section 4.0 presents the selected remedy for OU No. 11, which is a combination of the individual remedies selected for Sites 7 and 90. Section 5.0 evaluates the selected remedy for OU No. 11 with respect to the statutory determinations (i.e., the five requirements identified in the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 121). Finally, Section 6.0 presents the responsiveness summary which contains a history of community involvement and a summary of die comments received during the public comment period.

2.0 Site 7

Section 2.0, which focuses on Site 7, presents the following information: a site name, location, and description; a site history and a summary of previous investigations and enforcement activities; highlights of community participation; the scope and role of the response action; a summary of the site characteristics; a summary of the site risks; and the selected remedy.

2.1 Site Name, Location, and Description

Site 7, located approximately 8 mile south of the Tarawa Terrace Housing Complex, is referred to as the Tarawa Terrace Dump. Figure 2 presents a site map depicting the site boundaries and land features. As shown, Site 7 is bordered by the Tarawa Terrace Housing Complex to the north and northwest, the Tarawa Terrace Community Center (Building No. TT44) to the northeast, Northeast Creek to the south, the Tarawa Terrace Wastewater Treatment Plant to the southwest, and an unnamed road that leads to the wastewater treatment plant to the west. Most of Site 7, including
the marsh/swamp area that borders Northeast Creek, is densely wooded. Within the site boundaries, two unnamed surface water bodies (referred to in this report as the Eastern and Western Tributaries) flow south into Northeast Creek. Northeast Creek flows west and eventually empties into the New River. The site also contains a smaller tributary (referred to in this report as the drainage ditch) that flows southeast into the Western Tributary. Northeast Creek, the Eastern and Western Tributaries, and the drainage ditch are all tidally influenced. During high tide, ponded water covers most of the marsh/swamp area.

Based on a site reconnaissance (conducted in March 1994 as part of the RI) and a review of historical information, four areas of concern were identified at Site 7. The first area of concern is a potential dump area located cast of the utility right-of-way. The second area of concern is a smaller cleared area located west of the utility night-of-way. Both areas of concern were identified using aerial photographs from 1973 and 1978. The third area of concern, identified based on elevated pesticides and polychlorinated biphenyl (PCB) levels detected during previous investigations, is located south of the community center. The fourth area of concern is located east of the Tarawa Terrace Wastewater Treatment Plant and adjacent to the drainage ditch. Visual debris, including paint cans, motor oil cans, and other rusted cans, were observed in this wooded area.

2.2 Site History and Previous Investigations/Enforcement Activities

2.2.1 Site History

Site 7 is known to be a former dump that was used during the construction of the Tarawa Terrace housing complex. The precise years that the dump was in operation are unknown, but it was reportedly closed in 1972. Historical records do not indicate that hazardous materials were disposed at this site. However, construction debris, wastewater treatment plant filter media, and household trash are known to have been disposed.

2.2.2 Previous Investigations/Enforcement Activities

Previous investigations conducted at Site 7 include a Site Inspection (1991) and a Remedial Investigation (1994–96). The following paragraphs briefly describe these investigations. More detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker Environmental, Inc., 1996).

Site Inspection, 1991

In June 1991, Hilliburton/NUS conducted a Site Inspection that included the following field activities:

- Soil Investigation (8 surface soil samples collected from 0 to 2 feet below ground surface [bgs]; 5 subsurface soil samples collected from 3 to 12 feet bgs; samples analyzed for full Target Compound List [TCL] organics, Target Analyte List [TAL] Inorganics, and cyanide)
- Groundwater Investigation (installation of 3 shallow monitoring wells; 3 samples collected from these wells; samples analyzed for full TCL organics, TAL total inorganics, and cyanide)

Figure 3 identifies sampling locations associated with the Site Inspection.

Table 1 presents the results of soil sample analyses. Both surface and subsurface soil samples collected from locations 7-MW02, 7-SB01, and 7-SB02 contained pesticides and PCBs. The maximum concentrations of dieldrin (2,500 micrograms per kilogram [µg/kg]) and endrin (1,300 µg/kg) were detected at 7-MW02 (7.5 to 9.5 feet bgs). The maximum concentration of endosulfan HI (2,000 µg/kg) was detected at 7-SB02 (7 to 9 feet bgs). The compound known as Aroclor 1260 was detected in a total of seven surface and subsurface soil samples. Aroclor-1260 concentrations ranged from 108 µg/kg at 7-SB05 (0 to 2 feet bgs) to 25,000 µg/kg at 7-MW02 (7.5 to 9.5 feet bgs).

Table 2 presents the results of groundwater sample analyses. Two pesticides, dieldrin and endrin ketone, were detected at low levels (0.63 micrograms per liter [µg/l] and 0.09 µg/l, respectively).
respectively) in the groundwater sample collected from 7-MW02. Four inorganic constituents (manganese, chromium, lead, and iron) were detected at levels that exceeded either North Carolina Water Quality Standards (NCWQSs), or Federal Maximum Contaminant Levels (MCLs) for drinking water (i.e., the state and federal regulatory standards). The concentrations that exceeded state and/or federal standards are shaded in Table 2.

Remedial Investigation, 1994-96

In October 1994, Baker Environmental, Inc. (Baker) initiated an RI at Site 7 which included the following field activities:

- **Surface Soil Investigation** (35 samples collected from 0 to 1 foot bgs; samples analyzed for full TCL organics and TAL inorganics)
- **Confirmatory Surface Soil Investigation** (18 samples collected from 0 to 1 foot bgs; samples analyzed for TCL PCBs)
- **Subsurface Soil Investigation** (28 samples collected from 1 foot bgs to just above the groundwater table; 5 of the 28 were collected from test pit excavations; samples analyzed for full TCL organics and TAL inorganics)
- **Confirmatory Subsurface Soil Investigation** (16 samples collected from 1 foot bgs to just above the water table; samples analyzed for TCL PCBs)
- **Groundwater Investigation - Round One** (installation of 2 permanent shallow monitoring wells and 3 temporary shallow monitoring wells; 8 samples collected from the 5 newly installed wells and 3 existing "Shallow wells; samples analyzed for full TCL organics, and TAL inorganics [total and dissolved fractions]
- **Groundwater Investigation - Round Two** (3 samples collected from existing wells; samples analyzed for TAL inorganics [total and dissolved fractions], total dissolved solids [TDS], and total suspended solids [TSS]
- **Groundwater Investigation - Round Three** (3 samples collected from existing wells; samples analyzed for TAL inorganics [total and dissolved fractions], TDS, and TSS)
- **Surface Water Investigation** (a total of 13 samples collected from the drainage ditch that discharges to the Western Tributary, the Western Tributary itself, the Eastern Tributary, and Northeast Creek; samples analyzed for full TCL organics and TAL inorganics)
- **Sediment Investigation** (a total of 27 samples collected from the drainage ditch that discharges to the Western Tributary, the Western Tributary itself, the Eastern Tributary, and Northest Creek; samples analyzed for full TCL organics and TAL inorganics)
- **Ecological Investigation** (a total of 6 benthic macroinvertebrate samples collected from the Western Tributary and Northeast Creek; aquatic survey; earthworm bioaccumulation study)
- **Habitat Evaluation** (site reconnaissance in which botanical and animal species were identified and documented; collection of unknown botanical species for further identification)

Figures 4, 5, and 6 depict sampling locations associated with the RI. Figure 4 identifies surface and subsurface soil sampling locations; Figure 5 identifies groundwater sampling locations; and Figure 6 identifies surface water, sediment, benthic macroinvertebrate, and earthworm sampling locations.

Table 3 summarizes the results of soil, groundwater (round one), surface water, and sediment sample analyses. In this table, shaded blocks indicate constituents that were detected in exceedence of the comparison criteria (e.g., federal standards, state standards, background levels). As shown, several inorganic constituents exceeded comparison criteria in surface and
subsurface soil samples. In groundwater samples, one volatile organic compound (VOC), chloroform, exceeded its state standard. However, the chloroform concentrations were less than 10 times the concentrations detected in quality control samples. As a result, chloroform was most likely a laboratory-related contaminant rather than a site-related contaminant. Five inorganic constituents (aluminum, chromium, iron, lead, and manganese) also exceeded their comparison criteria in groundwater samples. In surface water and sediment, semivolatile organic compounds (SVOCs), pesticides, and inorganic constituents were detected at levels that exceeded comparison criteria.

Table 4 summarizes inorganic results from groundwater sampling rounds one, two, and three. During the round one sampling event, aluminum, chromium, iron, lead, and manganese were detected at levels exceeding the federal and/or state standards. However, these exceedances were believed to be due to the nature and location of the wells sampled and the sampling procedures that were employed, rather than a site-related inorganics problem. To confirm this, the State of North Carolina requested a second sampling round. Aluminum and iron were the only inorganics detected at levels exceeding standards during the round two sampling event. To further ensure that the site does not contain inorganics contamination, the State requested a third sampling round. Once again, only aluminum iron were detected above standards. Based on this information, it does not appear as though there is a site-related inorganics problem. Aluminum does not pose a problem because the federal standard for this inorganic is only a secondary, non-enforceable MCL. Iron does not pose a problem because it naturally occurs groundwater at the Base at levels exceeding standards.

2.3 Highlights of Community Participation

The RI report for Site 7 and the PRAP for OU No. 11 were released to the public on February 5, 1997. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 11 mailing list were sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI document was published in the "Jacksonville Daily News" on February 2, 1997. A public comment period was held from February 5 to March 7, 1997. In addition, a public meeting was held on February 5, 1997 to respond to questions and to accept public comments on the PRAP for OU No. 11. The public meeting minutes were transcribed and a copy of the transcript is available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the ROD in the local newspaper, and place this ROD in the information repositories.

2.4 Scope and Role of the Response Action

Because Sites 7 and 80 are geographically separated, separate response actions, or selected remedies, were developed for each site. The response action, or selected remedy, for OU No. 11 is a combination of the two separate response actions developed for Sites 7 and 80, respectively. Section 2.4 of this ROD presents the response action developed for Site 7; Section 3.4 presents the response action developed for Site 80; and Section 4.0 presents the response action developed for OU No. 11.

The response action for Site 7 was developed to address site conditions that appear to be protective of human health and the environment. (Site conditions appear to be protective based on the results of the human health and ecological risk assessments [RAs] and additional groundwater sampling rounds conducted during the RI.) As a result, the only response action identified and evaluated for Site 7 was the "no action" plan.

2.5 Summary of Site Characteristics

Site 7 exhibited the following site characteristics, as determined during the RI:

- Some VOCs were detected in soil, including acetone, 2-butanone, trichloroethene, and toluene in surface soil, and acetone and methylene chloride in subsurface soil. All of these VOCs, with the exception of toluene in surface soil, are believed to be the result of laboratory contamination. The toluene is believed to be the result of a
random, isolated spill that is not indicative of a significant toluene problem at the site. The maximum toluene concentration (461 \text{ g/kg}) did not exceed the comparison criterion of 1,600,000 \text{ g/kg} which is a United States Environmental Protection Agency (USEPA) Region III Risk-Based Concentration (RBC).

- Polynuclear aromatic hydrocarbons (PAHs) were the most prevalent SVOCs detected in soil. The positive detections of PAHs in both surface and subsurface soil were primarily located in the northern and eastern portions of the site. PAHs were not detected in the groundwater.

- Pesticides were infrequently detected in surface and subsurface soil samples. The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endosulfan II, alpha-chlordane, and gamma-chlordane were the most prevalent pesticides detected in soil. Pesticide concentrations detected at the site are similar to pesticide concentrations detected across the Base. In some cases, pesticide concentrations at the site were lower than Base pesticide concentrations. Consequently, the pesticides are believed to be the result of historical Base-wide pest control spraying. Dieldrin was the only pesticide detected in groundwater, and it was only detected in one groundwater sample.

- Trace levels (i.e., less than 0.10 milligrams per kilogram [mg/kg]) of Aroclors 1254 and 1260 were detected in a limited number of surface and subsurface soil samples. Aroclor 1254 was not detected in the subsurface soil. The random occurrence of these contaminants may be due to the past disposal of oils. These contaminants were not detected in the groundwater.

- The occurrence of inorganics was widespread in both the surface and subsurface soil. Inorganics which exceeded surface soil and subsurface soil Base background concentrations included aluminum, barium, beryllium, calcium, nickel, and zinc. The sporadic and random locations of these exceedences, however, do not suggest a significant inorganic contamination problem in either the surface or subsurface soil.

- In groundwater samples, one VOC, chloroform, exceeded its state standard. However, the chloroform concentrations were less than 10 times the concentrations detected in quality control samples. As a result, chloroform was most likely a laboratory-related contaminant rather than a site-related contaminant.

- During the first round of groundwater sampling, five inorganic constituents (aluminum, chromium, iron, lead, and manganese) exceeded their comparison criteria. During the second and third groundwater sampling rounds, aluminum and iron were the only inorganics detected above the criteria. However, the criterion for aluminum is only a secondary, non-enforceable federal MCL. As a result, aluminum does not appear to represent a significant site-related problem. Iron also does not pose a problem because it naturally occurs in groundwater at the Base at levels exceeding standards.

- Levels of arsenic, iron, and manganese in the surface water exceeded federal criteria. With the exception of dieldrin, no other organic contaminants exceeded surface water criteria. No sediment contaminant concentrations exceeded sediment criteria.

2.6 Summary of Site Risks

As part of the RI, a human health RA and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 7. The following subsections briefly summarize the findings of these RAs.

2.6.1 Human Health Risk Assessment

During the human health RA, contaminants of potential concern (COPCs) were selected for surface soil, subsurface soil, groundwater, surface water, and sediment, as shown in Table 5. The
selection of COPCs was based on criteria provided in the USEPA Risk Assessment Guidance for Superfund.

For each COPC, incremental lifetime cancer risk (ICR) values and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. Table 6 presents ICR and HI values for each environmental medium and receptor evaluated. (Receptors included current residential children and adults, future residential children and adults, and future construction workers.) Table 6 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 6 indicate an ICR value that exceeds the USEPA acceptable limit of 1E-04, or an HI value that exceeds the USEPA acceptable limit of 1.0. As shown, unacceptable risk values include: the HI for future child residents exposed to groundwater (8.8); the ICR for future adult residents exposed to groundwater (1.6E-04); and the HI for future adult residents exposed to groundwater (3.8). Although these values exceed acceptable limits, the risk they represent appears to be insignificant for the following reasons:

Future Residential Child: Groundwater HI = 8.8

The HI value of 8.8 exceeds the acceptable limit of 1.0, thus indicating potential for risk upon exposure. However, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. Additionally, potable water is currently supplied through the Bases public water supply system. This system will likely be utilized, rather than an on site groundwater source, in the event of future construction.

The main contributor to the HI value of 8.8 was aluminum, which accounted for approximately 64 percent of the risk. Aluminum was detected at concentrations ranging from 959 to 88,800 μg/L in all three sampling rounds. However, the federal standard for aluminum (50 μg/L) is only a Secondary MCL (established to maintain the aesthetics of potable water) that is not enforceable; there is no state standard. There is no apparent pattern to the positive detections of aluminum at Site 7, and there does not appear to be a significant site-related source of aluminum. Based on this information, the HI of 8.8, primarily based on aluminum concentrations, may be an overestimate of the risk that actually exists at Site 7.

Future Residential Adult: Groundwater ICR = 1.6E-04

The ICR value of 1.6E-04 only slightly exceeds the acceptable limit of 1E-04, thus indicating only a slight potential for risk. In addition, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. As previously mentioned, the Base's public water supply system, rather than an on site groundwater source, will likely be utilized in the event of future construction.

The main contributor to the ICR value of 1.6E-04 was beryllium, which accounted for approximately 76 percent of the risk. However, beryllium was only detected in unfiltered groundwater samples (i.e., total inorganics; samples) during the first sampling round. Beryllium was not detected in any of the filtered groundwater samples (i.e., dissolved inorganics samples) nor was it detected in the second or third sampling rounds. As a result, high beryllium levels appear to be the result of suspended solids in the unfiltered samples rather than a site-related source. Based on this information, the ICR of 1.6E-04, which is primarily based on beryllium concentrations, is most likely an overestimate of the risk that actually exists at Site 7.

Future Residential Adult: Groundwater HI = 3.8

The HI value of 3.8 exceeds the acceptable limit of 1.0, thus indicating potential for risk. In addition, the future residential development of Site 7 is highly unlikely because it is a tidally influenced swamp area. As a result, the future residential scenario is highly unlikely and so are the risks it generates. As previously mentioned, the Base's public water supply system, rather than an on site groundwater source, will likely be utilized in the event of future construction.

The main contributor to the HI value of 3.8 was aluminum, which accounted for approximately 64
percent of the risk Aluminum was detected at concentrations ranging from 959 to 88,800 mg/L in all three sampling rounds. However, the federal standard for aluminum (50 mg/L) is only a Secondary MCL (established to maintain the aesthetics of potable water) that is not enforceable; there is no state standard. There is also no apparent pattern to the positive detections of aluminum at Site 7, and there does not appear to be a significant site related source of aluminum. Based on this information, the HI of 8.8, primarily based on aluminum concentrations, may be an overestimate of the risk that actually exists at Site 7.

Although these risk values exceed USEPA acceptable limits, the risks they represent do not warrant a remedial action. In addition, these risks were only based on inorganic results obtained during the fast groundwater sampling round. Inorganic results from the second and third rounds indicated decreased concentrations which would further reduce potential risks. As a result, conditions at Site 7 may be considered protective of human health and the environment.

2.6.2 Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface water, sediment, and surface soil, as shown in Table 7. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs summarize the conclusions made for aquatic and terrestrial receptors at Site 7.

Aquatic Receptors

Based on the results of the surface water, sediment, and benthic macroinvertebrate sampling at the Western Tributary freshwater stations, there may be a reduction in the benthic macroinvertebrate population in this surface water body. However, the source of this reduction is not known. It may be the result of site-related inorganics in the surface water, non-site-related pesticides in the sediment tributary washout that occurred during high rainfall events, or periodic High tidal events. Regardless, the population reduction appears to recover by the downstream saltwater station.

In addition, the aquatic population at the Western Tributary (in particular, the species density and diversity) is similar to the population at off site reference stations. There were also no exceedences of surface water screening values (SWSVs) or sediment screening values (SSVs) at the Western Tributary station. As a result, conditions in the Western Tributary do not appear to represent unacceptable ecological risks.

Based on the results of the surface water, sediment, and benthic macroinvertebrate sampling at the Northeast Creek stations, there is no significant reduction in the benthic macroinvertebrate population for this surface water body. Lead was the only potentially site-related contaminant that exceeded a screening value. However, its exceedences were relatively minor (in surface water, lead was detected at a maximum concentration of 27.1 mg/L which slightly exceeds the SWSV of 25 mg/L; in sediment, lead was detected at a maximum concentration of 86 mg/L which slightly exceeds the SSV of 46.7 mg/L). In addition, the population at Northeast Creek (in particular, the species density and diversity) is similar to the population at off site reference stations. As a result, conditions in Northeast Creek do not appear to represent unacceptable ecological risks.

The benthic community in the drainage ditch and the Eastern Tributary were not determined. However, based on exceedences of SWSVs and SSVs, ecological impacts could potentially occur at these surface water bodies. In particular, some inorganics in surface water and pesticides in sediment could potentially impact the ecology. The pesticides in sediment are not considered site-related, but the inorganics in surface water may be site-related. However, the ecological risks were determined using inorganics concentrations in unfiltered surface water samples. Consequently, the actual ecological risks to inorganics in surface water will most likely be insignificant.

Terrestrial Receptors

Based on the comparisons of surface soil contaminant levels to surface soil screening values (SSSVs), there may be a reduction in the terrestrial flora and fauna population. However, the earthworm bioaccumulation study indicated that the SSSVs may have overestimated the potential risk. In addition, several worms that contained contaminant levels exceeding SSSVs were found in
areas containing no visible signs of stressed or dead vegetation.

Quotient Indices (QIs) generated using the Terrestrial Intake Model indicated that the cottontail rabbit, raccoon, and short-tailed shrew may potentially be at risk from contaminants in the surface water and surface sod. The risk to the rabbit, however, does not appear to be significant because the QI of 5.13 only slightly exceeds the acceptable QI level of 1.0. The QIs for the raccoon and short-tailed shrew are 70.4 and 311, respectively. Aluminum was the main contributor to these unacceptable risk values. However, based on the conservative nature of the model, and the assumption that aluminum is most likely not a site-related contaminant, the potential for a decrease in the raccoon and shrew population from site-related COPCs is expected to be low.

The conclusions of the ecological RA (for both aquatic and terrestrial receptors) indicate that although several SWSVs and SSSVs were exceeded, ecological risks at Site 7 appear to be minimal and do not warrant a remedial action. As a result, conditions at Site 7 may be considered protective of the environment.

2.7 Selected Remedy

The selected remedy for Site 7 is the "no action" plan. As its name suggests, the "no action" plan involves taking no further action at Site 7. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain as they currently are. The "no action" plan is justifiable because, based on the human health and ecological RAs and the three groundwater sampling rounds, conditions at Site 7 appear to be protective of human health and the environment.

3.0 SITE 80

Section 3.0, which focuses on Site 80, presents the following information: a site name, location, and description; a site history and a summary of previous investigations and enforcement activities; highlights of community participation; the scope and role of the response action; a summary of the site characteristics; a summary of the site risks; and the selected remedy.

3.1 Site Name, Location, and Description

Site 80, located northwest of Brewster Boulevard within the Paradise Point Golf Course, is referred to as the Paradise Point Golf Course Maintenance Area. The site consists of a one-acre area which is relatively flat, with a slight slope to the northeast.

Figure 7 presents a site map. As shown, Site 80 contains a machine shop (Building No. 1916), a maintenance building (Building No. 600), and a maintenance wash down area consisting of a concrete wash pad and sump. The wash pad is used to clean golf course maintenance equipment and the sump is used to collect water and oil runoff generated from the equipment cleaning. Water and oil collected by the sump travels into an oil/water separation pit located southeast of the wash pad.

A drainage ditch is located cast of the wash down area. During a March 1994 site reconnaissance, surface water runoff was observed flowing southeast across the site toward the drainage ditch. The drainage ditch then flows north past the eastern edge of the soil mound area. As shown on Figure 7, groundwater flow direction in the shallow aquifer is generally toward the northeast with a mounding effect near the washdown area.

The northeast portion of the site contains several large soil mounds that are overgrown with small pines. There is an open area located south of the mounds where golf course maintenance debris (i.e., tree limbs, lawn clippings, wooden timbers, and brush piles) is deposited. Evidence of burning operations conducted within this open area was observed during the March 1994 site reconnaissance. These soil mounds were generated from the installation of golf course ponds along the fairways in the late 1980s. It has been reported that wastes were disposed on or around the mounds. However, the types of waste that were disposed and the exact disposal locations are unknown. Employees of the maintenance garage were instructed not to use the soil from this area for fill material.
In addition, old maintenance equipment is scattered throughout the open and wooded areas surrounding Building No. 600. Two drums, identified during the March 1994 site reconnaissance, were removed from the site by Base personnel. These drums were located northeast of Building No. 600 just across the machine shop road. However, the contents of the drums are unknown.

Currently, a mobile trailer is stationed within the west/northwest portion of the site (i.e., the area located north of the machine shop road and east of the golf course road). Base personnel reported that a leach field associated with the golf courses sanitary sewer system is also located within this area (see Figure 7). However, the exact location of the leach field is not known. Based on an average groundwater elevation of 13 feet bgs in this area, the leach field is most likely located at a shallow depth.

3.2 Site History and Previous Investigations/Enforcement Activities

3.2.1 Site History

The Paradise Point Golf Course was constructed in the 1940s and Building No. 1916 was constructed in 1946. Reportedly, Site 80 has been used as a maintenance area since the initial construction of the golf course. Today, the maintenance area is still in operation. Current golf course maintenance operations include the machine shop (a potential source of waste oils), the equipment wash down area (a potential source of contaminated washwater), and the routine spraying of pesticides and herbicides.

3.2.2 Previous Investigations/Enforcement Activities

Previous investigations/enforcement activities conducted at Site 80 include a Site Inspection (1991), a Remedial Investigation (1994-95), and a Time-Critical Removal Action (1996). The following paragraphs briefly describe these investigations/activities. More detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991), the Remedial Investigation Report (Baker, 1996), and the Contractor's Closeout Report for the Time-Critical Removal Action (OHM Remediation Services Corp., 1996).

Site Inspection, 1991

In June 1991, Halliburton/NUS conducted a Site Inspection that included the following field activities:

- Soil Investigation (3 surface soil samples collected from 0 to 6 inches bgs; 7 near surface soil samples collected from 0 to 2 feet bgs, and 7 subsurface soil samples collected from 3 to 17 feet bgs; samples analyzed for full TCL organics and Chlorinated herbicides)
- Groundwater Investigation (installation of 3 shallow monitoring wells; 3 samples collected from these wells; samples analyzed for full TCL organics and chlorinated herbicides)
- Surface Water/Sediment Investigation (3 surface water samples and 5 sediment samples collected from the drainage ditch; samples analyzed for full TCL organics, chlorinated herbicides, and total petroleum hydrocarbons)

Figure 8 identifies sampling locations associated with the Site Inspection.

Table 8 presents the results of soil sample analyses. As shown, several pesticides, including aldrin, chlordane, 4,4'-DDD and its metabolites (4,4'-DDE and 4,4'-DDT), and dieldrin, were detected in these samples. The pesticide 4,4'-DDD was reported at the greatest concentration (700 \( \mu \)g/kg in sample SB02-0002). Herbicides were not detected in any of the samples. In addition, the PCB Aroclor 1254 was detected in two discrete surface soil locations (SB02 and MW03) at concentrations of 830 \( \mu \)g/kg and 1,500 \( \mu \)g/kg, respectively.

Table 9 presents the results of groundwater sample analyses. As shown, four VOCs (toluene at 180 \( \mu \)g/L, ethylbenzene at 5 \( \mu \)g/L, xylene at 21 \( \mu \)g/L, and carbon disulfide at 25 \( \mu \)g/L) were detected in the groundwater sample collected from monitoring well 80-MW03.
Table 10 presents the results of surface water sample analyses. It should be noted that originally five surface water samples were proposed. However, when the investigation was conducted, sampling locations 80-SW01 and 80-SW02 contained no water. As shown on Table 10, all three surface water samples contained acetone at concentrations ranging from 11 to 190 \(\mu g/L\). Surface water samples from locations 80-SW04 and 80-SW05 also exhibited toluene at concentrations of 30 \(\mu g/L\) and 140 \(\mu g/L\), respectively, and total petroleum hydrocarbons at concentrations of 1390 \(\mu g/L\) and 1660 \(\mu g/L\), respectively.

No contaminants were detected in sediment sample analyses.

Remedial Investigation, 1994–95

In October 1994, Baker initiated an RI at Site 80 which included the following field activities:

- Site Survey
- Surface Soil Investigation (37 samples, including 3 background samples, collected from ground surface to one foot bgs; analyzed for full TCL organics and TAL inorganics)
- Additional Surface Soil Investigation Focused on the West/Northwest Portion of Site 80 (21 samples collected from ground surface to one foot bgs; samples analyzed for TCL pesticides)
- Subsurface Soil Investigation (38 samples collected from one foot bgs to just above the groundwater table; samples analyzed for full TCL organics and TAL inorganics)
- Additional Subsurface Soil Investigation Focused on the West/Northwest Portion of Site 80 (13 samples collected from one foot bgs to just above the groundwater table; samples analyzed for TCL pesticides)
- Groundwater Investigation (installation of 4 shallow monitoring wells and one intermediate monitoring well; 8 samples from 5 newly installed wells and 3 existing shallow wells; samples analyzed for full TCL organics and TAL inorganics [total and dissolved fractions])
- Additional Groundwater Investigation Focused on the West/Northwest Portion of Site 80 (installation of one shallow monitoring well [80-MW08]; one sample collected from this well; sample analyzed for TCL pesticides)
- Additional Groundwater Investigation of Inorganics in the Shallow Aquifer (9 samples collected from 9 on site wells; samples analyzed for TAL inorganics [total fraction only]; samples designated with the suffix -02)
- Habitat Evaluation (site reconnaissance in which botanical and animal species were identified and documented; collection of unknown botanical species for further investigation)

Figure 9 depicts the sampling locations associated with the RI. Table 11 summarizes the results of surface soil, subsurface soil, and groundwater sample analyses. In this table, shaded blocks indicate a constituent that was detected in excess of its comparison criteria (e.g., federal standards, state standards, background levels). As shown, several inorganic constituents exceeded comparison criteria in surface and subsurface soil samples. In groundwater samples, one SVOC, bis (2-ethylhexyl) phthalate, exceeded its comparison criterion. However, bis (2-ethylhexyl) phthalate concentrations were less than 10 times the concentrations detected in quality control samples. As a result, bis (2-ethylhexyl) phthalate appears to be a laboratory-related contaminant rather than a site-related contaminant. Six inorganic constituents (aluminum, arsenic, chromium, iron, lead, and manganese) also exceeded their comparison criteria in groundwater samples.

Time-Critical Removal Action, 1996

During the RI, pesticide and arsenic contaminated surface soil was detected at concentrations
that may pose potential risk to human health throughout Site 80. To address this contamination, a Time-Critical Removal Action was conducted from March to August 1996. Under the removal action, approximately 988 tons of contaminated soil was excavated and transported off-site to a disposal facility. Table 12 presents the remediation levels to which the contaminated soil was removed under the Time-Critical Removal Action. The excavation area at the site was then backfilled and revegetated.

3.3 Highlights of Community Participation

The RI report for Site 80 and the PRAP for OU No. 11 were released to the public on February 5, 1997. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Building 67, Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 11 mailing list were sent a copy of the Final PRAP and Fact Sheet. The notice of availability of the PRAP and RI document was published in the "Jacksonville Daily News" on February 2, 1997. A public comment period was held from February 5 to March 7, 1997. In addition, a public meeting was held on February 5, 1997 to respond to questions and to accept public comments on the PRAP for OU No. 11. The public meeting minutes were transcribed and a copy of the transcript is available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the ROD in the local newspaper, and place this ROD in the information repositories.

3.4 Scope and Role of the Response Action

The response action for Site 80 was developed to address site conditions that appear to be protective of human health and the environment. (Site conditions appear to be protective based on the results of the human health and ecological RAs conducted during the RI.) As a result, the only response action identified and evaluated for Site 80 is the "no action" plan. [Note: Section 2.4 of this ROD presents the response action developed for Site 7; and Section 4.0 presents the response action developed for OU No. 11.]

3.5 Summary of Site Characteristics

Site 80 exhibited the following site characteristics, as determined during the RI:

- Concentrations of VOCs detected in the surface and subsurface soil samples (including acetone and carbon disulfide) were less than 10 times the concentrations detected in quality control samples. Therefore, it is believed that the presence of these contaminants is not due to past activities at the site.

- PAHs were infrequently detected in the surface soil at concentrations less than 100 lg/kg. The location of most of the PAH detections and the highest PAH concentrations were located in the soil mound in the northeast area of the site. This location is near the open area where burning operations of wood and leaves occur; burning may be the source of this contamination. Phenanthrene was the only PAH detected in the subsurface soil (53J lg/kg) at a depth of 5 to 7 feet.

- Pesticides were the most frequently detected contaminants in the surface soil at Site 80. They exhibited the highest concentration ranges of all soil contaminants. Pesticides were detected in 20 of 55 surface soil samples. Pesticides detected in the surface soil included dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane and gamma chlordane. Concentrations of pesticides ranged from 0.6J lg/kg for 4,4'-DDE in sample 80-OA-SB04-00 to 260,000 lg/kg for 4,4'-DDD in sample 80-DPA-SB03-00. The highest pesticide levels were detected in the west/northwest portion of the site. Additionally, elevated levels of pesticides were detected in the lawn area near the soil mounds. Pesticide levels in this area were one to three orders of magnitude lower than in the west/northwest area. Pesticides at other locations of the site were four orders of magnitude lower than in the west/northwest area. Pesticide concentrations at this site were higher than what is normally attributed to past historical pest control applications at MCB, Camp Lejeune.
Pesticides were also the predominant contaminants in the subsurface soil at Site 80. However, concentrations were one to two orders of magnitude less than concentrations in the surface soil. The highest subsurface pesticide contaminant levels were detected in the west/northwest portion of the site. 4,4'-DDD was the most frequently detected pesticide (12 of 45 samples) and exhibited the highest concentration (510 J g/kg) at a depth of 11 to 13 feet at soil boring location 80-MW04. The maximum concentration of 4,4'-DDT (240 J g/kg) was detected at 11 to 13 feet at soil boring location 80-MW04.

Inorganic contaminant levels detected in the surface soil were within one order of magnitude (or less) of Base background concentrations. The inorganics arsenic, barium, chromium, manganese, mercury, and selenium exhibited concentrations above Base background levels for inorganics in the subsurface soil.

Carbon disulfide was the only VOC detected in groundwater. Its concentration, 1J J g/L, was well below the state standard of 700 J g/L.

SVOCs were detected at low levels in a limited number of shallow monitoring wells. The SVOCs included acenaphthene, fluorene, carbazole, and pyrene. The maximum concentration of acenaphthene (4J J g/L) and pyrene (1 J g/L) did not exceed the state standards of 80 J g/L and 210 J g/L, respectively. Fluorene was detected at a concentration (3J J g/L) well below its state standard (280 J g/L).

The pesticides 4,4'-DDD and 4,4'-DDT were detected in monitoring well 80-MW04 at concentrations of 2.2J J g/L and 0.58 J g/L, respectively. Federal and/or state groundwater standards have not been adopted for these pesticides.

Two groundwater sampling rounds were conducted for inorganics analyses. During the first sampling round, concentrations of total inorganics the groundwater were within one order of magnitude or less of the dissolved inorganics concentrations. Aluminum, arsenic, chromium, iron, lead, and manganese were detected at concentrations exceeding their respective federal and/or state standards during the first sampling round. Nickel and thallium were the only inorganics detected in excess of their federal and/or state standards during the second sampling round. Total inorganics concentrations in the shallow groundwater were within the range of inorganics concentrations typically detected at MCB, Camp Lejeune.

3.6 Summary of Site Risks

As part of the RI, a human health RA and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 80. The following subsections briefly summarize the findings of these RAs.

3.6.1 Human Health Risk Assessment

During the human health RA, COPCs were selected for surface soil, subsurface soil, and groundwater, as shown in Table 13. The selection of COPCs was based on criteria provided in the USEPA Risk Assessment Guidance for Superfund.

For each COPC, ICR and HI values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. Table 14 presents these ICR and HI values for each environmental medium and receptor. (Receptors included current civilian adult base personnel, future residential children and adults, and future construction workers.) Table 14 also presents total ICR and HI values, which represent risks to all environmental media combined, for each receptor.

Shaded blocks in Table 14 indicate an ICR value that exceeds the USEPA acceptable limit of 1E-04, or an HI value that exceeds the USEPA acceptable limit of 1.0. As shown, unacceptable risk values include: the ICR for current adult base personnel exposed to soil (1.7E-04); the HI for future child residents exposed to soil (1.9); the ICR for future child residents exposed to groundwater (8E-04); the HI for future child residents exposed to groundwater (26.09); the ICR for future adult residents exposed to groundwater (1.7E-03); and the HI for future adult residents exposed to groundwater (11.04). Although these values exceed acceptable limits, the
risk they represent appears to be minimal for the following reasons:

Current Civilian Adult Base Personnel: Soil ICR = 1.7E-04

Pesticides and inorganics in surface soil (including dieldrin, 4,4'-DDD, and arsenic) were the main contributors to the unacceptable ICR value of 1.7E-04. However, a Time-Critical Removal Action was conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil was excavated, removed from the site, and sent to a disposal facility. The removal of this soil reduces the ICR value to below the acceptable limit of 1E-04 thereby eliminating the unacceptable carcinogenic risk associated with soil exposure.

Future Residential Child: Soil HI = 1.9

Pesticides and inorganics in surface soil (including dieldrin, 4,4'-DDT, and arsenic) were the main contributors to the unacceptable HI value of 1.9. However, a Time-Critical Removal Action was conducted for pesticide and arsenic contaminated surface soil at Site 80. Under the removal action, the contaminated surface soil was excavated, removed from the site, and sent to a disposal facility. The removal of this soil reduces the HI value to below the acceptable limit of 1.0 thereby eliminating the unacceptable noncarcinogenic risk associated with soil exposure.

Future Residential Child: Groundwater ICR = 8.0E-04

The ICR value of 8.0E-04 only slightly exceeds the acceptable limit of 1E-04, thus indicating only a slight potential for risk. In addition, the main contributor to this ICR value was arsenic which accounted for approximately 96 percent of the risk. However, arsenic was only detected in one monitoring well at a concentration that exceeded the state and federal standard. (In well 80-MW03, arsenic was detected at 102 \( \text{g/L} \) which exceeds the state and federal standard of 50 \( \text{g/L} \). The ICR value of 8.0E-04 was generated using this 102 \( \text{g/L} \) detection level.) Upon resampling this well using a low flow peristaltic pump, arsenic was detected at a concentration (42 \( \text{g/L} \)) that did not exceed the state and federal standard. The well was observed to have poor groundwater recharge, samples collected from the well were silty, and the total suspended solids reading for water from the well was relatively high (21 \( \text{g/L} \)). As a result, it appears as though high arsenic concentrations at well 80-MW03 were the result of suspended solids in the well water rather than a site-related arsenic source. The risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the Time-Critical Removal Action prohibits arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Child: Groundwater HI = 26.09

The main contributor to this HI value of 26.09 is arsenic which accounts for approximately 66 percent of the risk. However, arsenic was only detected in one monitoring well at a concentration that exceeded the state and federal standard. (In well 80-MW03, arsenic was detected at 102 \( \text{g/L} \) which exceeds the state and federal standard of 50 \( \text{g/L} \). The HI value of 26.09 was generated using this 102 \( \text{g/L} \) detection level.) Upon resampling this well using a low flow peristaltic pump, arsenic was detected at a concentration (42 \( \text{g/L} \)) that did not exceed the state and federal standard. The well was observed to have poor groundwater recharge, samples collected from the well were silty, and the total suspended solids reading for water from the well was relatively high (21 \( \text{g/L} \)). As a result, it appears as though high arsenic concentrations at well 80-MW03 were the result of suspended solids in the well water rather than a site-related arsenic source. The risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the Time-Critical Removal Action prohibits arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Adult: Groundwater ICR = 1.7E-03

The risk associated with this unacceptable ICR value of 1.7E-03 appears to be insignificant for the same reasons identified for the groundwater ICR value of 8.0E-04. These reasons are: 1) 1.7E-03 only slightly exceeds the acceptable ICR limit of 1E-04, and 2) arsenic accounts for approximately 96 percent of this ICR value, but the risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the Time
Critical Removal Action prohibits arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Future Residential Adult: Groundwater HI = 11.04

The risk associated with this unacceptable HI value of 11.04 appears to be insignificant for the same reason identified for the groundwater HI value of 26.09. Arsenic accounts for approximately 66 percent of the HI value, but the risk associated with arsenic in groundwater appears to be an overestimate of the risk that actually exists at Site 80. In addition, the Time Critical Removal Action prohibits arsenic contaminated surface soil from being a future potential source of groundwater contamination.

Although several risk values for Site 80 exceed USEPA acceptable limits, the risks they represent appear to be minimal. As a result, conditions at Site 80 may be considered protective of human health and the environment.

3.6.2 Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface soil as shown in Table 15. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs present the conclusions made for terrestrial receptors at Site 80.

Terrestrial Receptors

The ecological RA indicated that pesticides located in grass covered areas could potentially decrease the terrestrial invertebrate and plant populations. Several samples contained pesticide concentrations exceeding the SSSVs by several orders of magnitude. In addition, pesticides in the grass covered areas exhibited high bioconcentration factor (BCF) values indicating that these pesticides may accumulate in species ingesting terrestrial invertebrates and plants. However, the Time-Critical Removal Action in which pesticide-contaminated surface soil was removed from the site alleviates the ecological risks associated with pesticides in surface soil.

Several constituents in gravel covered areas at Site 90 also exceeded SSSVs. However, the gravel covered areas have been disturbed by vehicle traffic and are not likely to support a significant terrestrial invertebrate population. With the exception of a few patches of grass, plants do not grow in these areas. Consequently, the potential ecological impacts associated with constituents in gravel covered areas are relatively insignificant.

The rabbit was the only species with a total QI value that exceeded the acceptable level of 1.0. However, the rabbit's QI (2.8) only slightly exceeds the acceptable level of 1.0. Thus, it appears as though there is a relatively low potential for adverse impacts to the rabbit population. In addition, much of the site is gravel covered which reduces the rabbit's potential habitat.

The conclusions of the ecological RA indicate that although several SSSVs were exceeded and the rabbit's QI exceeded the acceptable limit, ecological risks at Site 80 are minimal. Thus, conditions at Site 80 appear to be protective of the environment.

3.7 Selected Remedy

The selected remedy for Site 80 is the "no action" plan. As its name suggests, the "no action" plan involves taking no further action at Site 80. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain as they currently are. The "no action" plan is justifiable because, based on the human health and ecological RAs and the Time-Critical Removal Action, conditions at Site 80 appear to be protective of human health and the environment.

4.0 THE SELECTED REMEDY FOR OU NO. 11

The selected remedy for OU No. 11 is a combination of the two separate remedies selected for Sites 7 and 80. For both sites, the selected remedy is the "no action" plan. Consequently, the selected remedy for OU No. 11 is the "no action" plan.
The "no action" plan, as its name suggests, involves taking no further action at OU No. 11. This includes conducting no further environmental investigations or sampling. The operable unit, and all environmental media located within the operable unit, will remain as they currently are. The "no action" plan is justifiable because environmental conditions within OU No. 11 appear to be protective of human health and the environment.

5.0 STATUTORY DETERMINATIONS

A selected remedy should satisfy the statutory requirements of CERCLA Section 121 which include: (1) protect human health and the environment; (2) comply with applicable or relevant and appropriate requirements (ARARs); (3) achieve cost-effectiveness; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The following paragraphs evaluate the selected remedy for OU No. 11 with respect to these requirements.

5.1 Protection of Human Health and the Environment

Based on the human health and ecological RAs conducted during the RI, conditions at Sites 7 and 80 appear to be protective of human health and the environment, both now and in the future.

Although unacceptable human health risks were generated for both Sites 7 and 80, these risks are considered to be overly conservative estimates of the risks that actually exist. Unacceptable risks to groundwater were generated under the future residential scenario at Site 7. However, this scenario is highly unlikely because the site mainly consists of a tidally influenced swamp area. There is also a potable water distribution system located at the Base that will likely be utilized, rather than on site groundwater source, in the event of future construction.

Unacceptable risks to surface soil were generated under the current Base personnel and future residential scenarios at Site 80. However, the Time-Critical Removal Action for pesticide and arsenic contaminated surface soil was conducted to reduce this current risk to within acceptable limits. Unacceptable risks to groundwater were also generated under the future residential scenario at Site 80. However, the elevated inorganics levels contributing to these risks are believed to be the result of a poorly constructed well rather than a significant site-related problem. [Note: For a more comprehensive discussion of human health risks, refer to Sections 2.6.1 and 3.6.1 of this ROD.]

Unacceptable ecological risks were also generated for Sites 7 and 80. Like the unacceptable human health risks, the unacceptable ecological risks are considered to be overly conservative estimates of the risks that actually exist. At Site 7, several SWSVs, SSVs, and SSSVs were exceeded. However, the exceedences were minor, and/or total inorganics concentrations were used to determine the risks. QIs for cottontail rabbits, raccoons, and short-tailed shrews (5.13, 70.4, and 311, respectively) were also exceeded. However, aluminum (an elemental metal) was the main contributor to these risks, and the terrestrial intake model is known to be extremely conservative. At Site 80, several pesticides exceeded SSSVs. However, the Time-Critical Removal Action for pesticide and arsenic contaminated surface soil alleviates these exceedences. The QI for the rabbit (2.8) also exceeded the acceptable level of 1.0, but this exceedence was minor. [Note: For a more comprehensive discussion of ecological risks, refer to Sections 2.6.2 and 3.6.2 of this ROD.]

Based on the nature of the human health and ecological risks at Sites 7 and 80, conditions at OU No. 11 appear to be protective of human health and the environment, both now and in the future. Therefore, no remedial actions need to be implemented in order to maintain adequate protection. The "no action" plan is a justifiable, protective remedy.

5.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will not comply with all of the chemical-specific ARARs that apply to Sites 7 and 80. Chemical constituents will remain untreated at levels exceeding state and federal standards. Tables 3 and 11 identify the constituents that will exceed chemical-specific ARARs at Sites 7 and 80, respectively. Despite these exceedences, the risks associated with these constituents will be minimal; leaving them untreated at the sites should not have any detrimental impacts on human health or the environment. A waiver of the chemical-specific ARARs,
however, may be required before the selected remedy can be implemented.

5.3 Cost-Effectiveness

There are no costs associated with the selected remedy for OU No. 11. The "no action" plan is cost effective since any other action would not provide significant, if any, benefits to public health or the environment.

5.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected remedy for OU No. 11 should be a permanent solution. Future risks at both Sites 7 and 80 are expected to be insignificant, so no further remedial actions will be necessary and the "no action" plan should be a permanent solution.

Alternative treatment technologies were not considered for OU No. 11 because conditions at Sites 7 and 80 appear to be protective of human health and the environment. Treatment technologies were not considered appropriate based on site conditions and potential risks to human health and the environment.

5.5 Preference for Treatment as a Principal Element

The selected remedy for OU No. 11 does not satisfy the statutory preference for treatment as a principal element. However, the remedy is still capable of providing adequate protection of human health and the environment.

6.0 RESPONSIVENESS SUMMARY

6.1 Overview

The selected remedy for OU No. 11 (Sites 7 and 80) is the "no action" plan. Based on the comments received during the public comment period, the public appears to support the selected remedy. In addition, the USEPA and the NC DEHNR are in support of the selected remedy outlined herein.

6.2 Background on Community Involvement

A record review of the MCB, Camp Lejeune files indicates that the community involvement centers mainly on a social nature, including the community outreach programs and Base/community clubs. The file search did not locate written Installation Restoration Program (IRP) concerns of the community. A review of historic newspaper articles indicated that the community is interested in the local drinking and groundwater quality, as well as that of the New River, but that there are no expressed interests or concerns specific to the environmental sites (including Sites 7 and 80). Two local environmental groups, the Stump Sound Environmental Advocates and the Southeastern Watertmen's Association, have posed questions to the Base and local officials in the past regarding other environmental issues. These groups were sought as interview participants prior to the development of the Camp Lejeune, IRP, Community Relations Plan. Neither group was available for the interviews.

Community relations activities to date are summarized below:

- Conducted additional community relations interviews, February through March 1990. A total of 41 interviews were conducted with a wide range of persons including Base personnel, residents, local officials, and off-Base residents.
- Prepared a Community Relations Plan, September 1990.
- Conducted additional community relations interviews, August 1993. Nineteen persons were interviewed, representing local business, civic groups, on- and off-Base residents, military and civilian interests.
- Established two information repositories.
Established the Administrative Record for all of the sites at the base.

Formed Restoration Advisory Board (RAB) in May 1996.

Released PRAP for public review in repositories, February 5, 1997.

Released public notice announcing public comment and document availability of the PRAP, February 2, 1997.

Held RAB meeting, February 5, 1997, to review PRAP and solicit comments.

Held public meeting on February 5, 1997, to solicit comments and provide information. Approximately 10 people attended. The public meeting transcript is available in Appendix A of this ROD document, and in the repositories.

6.3 Summary of Comments Received During the Public Comment Period and Agency Responses

A public meeting was held on February 5, 1997 in the Onslow County Library in Jacksonville, North Carolina. Representatives from LANTDIV, MCB, Camp Lejeune, USEPA Region IV, NC DEHNR, OHM Corporation, and the RAB attended the meeting. The transcript for the public meeting is provided in Appendix A.
<table>
<thead>
<tr>
<th>Constituent</th>
<th>No. of Detections/Total</th>
<th>Range of Concentrations</th>
<th>No. of Detections/Total</th>
<th>Range of Concentrations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Samples</td>
<td></td>
<td>No. of Samples</td>
<td></td>
</tr>
<tr>
<td><strong>Organics (1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>1/8</td>
<td>1,000</td>
<td>0/5</td>
<td>ND</td>
</tr>
<tr>
<td>Fluoranthene</td>
<td>2/8</td>
<td>220-290</td>
<td>0/5</td>
<td>ND</td>
</tr>
<tr>
<td>Benzoic acid</td>
<td>2/8</td>
<td>6,300-15,000</td>
<td>1/5</td>
<td>7,900</td>
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<td>Aldrin</td>
<td>1/8</td>
<td>4.3</td>
<td>0/5</td>
<td>ND</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>3/8</td>
<td>12-20</td>
<td>2/5</td>
<td>58-190</td>
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<tr>
<td>4,4'-DDE</td>
<td>1/8</td>
<td>240</td>
<td>0/5</td>
<td>ND</td>
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<td>Dieldrin</td>
<td>3/8</td>
<td>12-540</td>
<td>3/5</td>
<td>400-2,500</td>
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<td>Endosulfan II</td>
<td>3/8</td>
<td>7.6-1,400</td>
<td>3/5</td>
<td>73-2,000</td>
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<tr>
<td>Endrin</td>
<td>2/8</td>
<td>91-140</td>
<td>4/5</td>
<td>14-1,300</td>
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<tr>
<td>Aroclor-1260</td>
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<td>108-12,000</td>
<td>4/5</td>
<td>660-25,000</td>
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<tr>
<td><strong>Inorganics (2)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>8/8</td>
<td>3,690-9,700</td>
<td>5/5</td>
<td>1,030-5,030</td>
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<tr>
<td>Arsenic</td>
<td>3/8</td>
<td>1.1-1.7</td>
<td>3/5</td>
<td>1.1-1.5</td>
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<tr>
<td>Barium</td>
<td>8/8</td>
<td>9.1-223</td>
<td>5/5</td>
<td>6.6-72.8</td>
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<td>Beryllium</td>
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<td>3/5</td>
<td>0.29-3.6</td>
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<td>Cadmium</td>
<td>8/8</td>
<td>1.1-5.0</td>
<td>5/5</td>
<td>1.2-4.5</td>
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<td>Calcium</td>
<td>7/8</td>
<td>190-58,200</td>
<td>3/5</td>
<td>3,660-9,990</td>
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<tr>
<td>Chromium (Total)</td>
<td>8/8</td>
<td>4.2-10.6</td>
<td>5/5</td>
<td>5.2-12.5</td>
</tr>
<tr>
<td>Cobalt</td>
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<td>1.7-8.1</td>
<td>5/5</td>
<td>1.9-10.2</td>
</tr>
<tr>
<td>Iron</td>
<td>8/8</td>
<td>876-5,330</td>
<td>5/5</td>
<td>981-5,490</td>
</tr>
<tr>
<td>Lead</td>
<td>8/8</td>
<td>3.0-114</td>
<td>5/5</td>
<td>2.4-17.0</td>
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<tr>
<td>Magnesium</td>
<td>8/8</td>
<td>104-1,150</td>
<td>4/5</td>
<td>99.9-541</td>
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<td>Manganese</td>
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<td>3.2-69.0</td>
<td>5/5</td>
<td>3.0-47.7</td>
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<td>Mercury</td>
<td>8/8</td>
<td>0.11-0.53</td>
<td>5/5</td>
<td>0.12-0.45</td>
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</tbody>
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### TABLE 1 (Continued)

**SUMMARY OF THE ANALYTICAL RESULTS FOR SOIL SITE INSPECTION, 1991**

**OPERABLE UNIT NO. 11 (SITE 7)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Surface Soil (0-2 feet)</th>
<th>Subsurface Soil (3-12 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of positive detections/No. of samples</td>
<td>Range of Positive detections</td>
</tr>
<tr>
<td>Nickel</td>
<td>8/8</td>
<td>2.8-13.1</td>
</tr>
<tr>
<td>Potassium</td>
<td>6/8</td>
<td>110-507</td>
</tr>
<tr>
<td>Selenium</td>
<td>1/8</td>
<td>0.54</td>
</tr>
<tr>
<td>Silver</td>
<td>8/8</td>
<td>0.66-3.0</td>
</tr>
<tr>
<td>Sodium</td>
<td>1/8</td>
<td>754</td>
</tr>
<tr>
<td>Thallium</td>
<td>8/8</td>
<td>0.44-2.0</td>
</tr>
<tr>
<td>Vanadium</td>
<td>8/8</td>
<td>4.5-18.1</td>
</tr>
<tr>
<td>Zinc</td>
<td>2/8</td>
<td>1.1-44.5</td>
</tr>
<tr>
<td>Cyanide</td>
<td>8/8</td>
<td>0.54-2.5</td>
</tr>
</tbody>
</table>

**Notes:**

1. Organic concentrations expressed in l g/kg (microgram per kilogram).
2. Inorganic concentrations expressed mg/kg (milligram per kilogram).

bgs = Below ground surface.  
ND = Not detected.

TABLE 3 (Continued)

SUMMARY OF THE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION, 1994-95
OPERABLE UNIT NO. 11 (SITE 7)
MCB, CAMP LEJEUNE, NORTH CAROLINA

Notes:

(1) Detections compared to maximum base background concentrations.
(2) 1994 Proposed rule for Disinfectants and Disinfectant By-Products: Total for all Trihalomethanes cannot exceed the 80 parts per billion (ppb) level.
(3) SCML = Secondary Maximum Contaminant Level (not enforced).
(4) Action Level.
(5) Shaded blocks indicate detections above comparison criteria

NE = No Criteria Established
NA = Not Applicable
NJ = Estimated/tentative value
J = Estimated value
RBC = Region III Risk Based Concentration
SSL = Region III Soil Screening Level for the Protection of Groundwater
MCL = Federal Maximum Contaminant Level
NCWQS = North Carolina Water Quality Standard
AWQC = Ambient Water Quality Standard
µg/L = microgram per liter (ppb)
µg/kg = microgram per kilogram (ppb)
mg/kg = milligram per kilogram (parts per million [ppm])
NOAA ER-L = National Oceanic Atmospheric Administration Effective Range - Low
NOAA ER-M = National Oceanic Atmospheric Administration Effective Range - Median
-- = Undefined

<table>
<thead>
<tr>
<th>Inorganic</th>
<th>NCWQS</th>
<th>MCL</th>
<th>TW01-01</th>
<th>TW01-02</th>
<th>TW01-03</th>
<th>TW03-01</th>
<th>TW03-02</th>
<th>TW03-03</th>
<th>MW03-01</th>
<th>MW03-02</th>
<th>MW03-03</th>
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<tbody>
<tr>
<td>Aluminum</td>
<td>NE</td>
<td>50-200</td>
<td>15,600</td>
<td>959</td>
<td>2,660</td>
<td>17,800</td>
<td>3,980</td>
<td>1,460</td>
<td>88,000</td>
<td>927</td>
<td>739</td>
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<tr>
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<td>2,000</td>
<td>2,000</td>
<td>225</td>
<td>51</td>
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<td>58</td>
<td>44.8</td>
<td>370</td>
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<td>Beryllium</td>
<td>NE</td>
<td>4</td>
<td>1.2</td>
<td>ND</td>
<td>ND</td>
<td>3</td>
<td>ND</td>
<td>ND</td>
<td>1.6</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium</td>
<td>50</td>
<td>100</td>
<td>17.1</td>
<td>ND</td>
<td>ND</td>
<td>11.7</td>
<td>4</td>
<td>ND</td>
<td>104</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Copper</td>
<td>1,000</td>
<td>1,300</td>
<td>10.6</td>
<td>3.8</td>
<td>1.9</td>
<td>ND</td>
<td>2.7</td>
<td>ND</td>
<td>20.8</td>
<td>4.4</td>
<td>ND</td>
</tr>
<tr>
<td>Iron</td>
<td>300</td>
<td>300</td>
<td>8,330</td>
<td>3,390</td>
<td>2,870</td>
<td>6,200</td>
<td>4,140</td>
<td>3,330</td>
<td>25,400</td>
<td>2,680</td>
<td>2,230</td>
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<tr>
<td>Manganese</td>
<td>50</td>
<td>50</td>
<td>42.4</td>
<td>38</td>
<td>38.4</td>
<td>18.4</td>
<td>15</td>
<td>11.6</td>
<td>13,000</td>
<td>3.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Lead</td>
<td>15</td>
<td>15</td>
<td>41.6</td>
<td>1.4</td>
<td>10.6</td>
<td>27.1</td>
<td>7.9</td>
<td>3.4</td>
<td>67.5</td>
<td>1.3</td>
<td>ND</td>
</tr>
<tr>
<td>Zinc</td>
<td>2,100</td>
<td>5,000</td>
<td>ND</td>
<td>7.2</td>
<td>7.4</td>
<td>167</td>
<td>6.6</td>
<td>7.1</td>
<td>180</td>
<td>ND</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Notes:

1. Concentrations are reported in micrograms per liter (μg/L).
2. Shading indicates an exceedance of the state and/or federal standard.

-01 = Round One
-02 = Round Two
-03 = Round Three
ND = Not Detected
NC = No Criteria Established
MCL = Maximum Contaminant Level
NCWQS = North Carolina Water Quality Standard
## TABLE 5
CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Surface Soil</th>
<th>Subsurface Soil</th>
<th>Groundwater</th>
<th>Surface Water</th>
<th>Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volatiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloroform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Butanone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-Hexanone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Toluene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Styrene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Xylenes (Total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Semivolatile</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-Methylphenol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Acenaphthylene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Dibenzofuran</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>Phenanthrene</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Anthracene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Di-n-butylphthalate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fluoranthene</td>
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<td></td>
<td>X</td>
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<tr>
<td>Pyrene</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Butylbenzylphthalate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3,3-Dichlorobenzidine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Chrysene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>bis(2-Ethylhexyl)phthalate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Di-n-octylphthalate</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
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<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Indeno(1,2,3-cd)pyrene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Benzo(g,h,i)perylene</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Pesticide/PCBs</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>delta-BHC</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Aldrin</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4,4'-DDE</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4,4'-DDD</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>4,4'-DDT</td>
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<td>X</td>
</tr>
<tr>
<td>Endrin ketone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
TABLE 5 (continued)

CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Surface</th>
<th>Subsurface</th>
<th>Groundwater</th>
<th>Surface Water</th>
<th>Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aroclor-1260</td>
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<td></td>
<td></td>
<td>X</td>
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</tr>
<tr>
<td>Inorganics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barium</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
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<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Copper</td>
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<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
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</tr>
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<td>Magnesium</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Vanadium</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

X = Selected as a COPC for human health risk assessment.

<IMG SRC 98019R2>
TABLE 7
CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT
OPERABLE UNIT NO. 11 (SITE 7)
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Freshwater Stations</th>
<th>Saltwater Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water</td>
<td>Surface Water</td>
</tr>
<tr>
<td></td>
<td>Aquatic</td>
</tr>
<tr>
<td>Contaminant</td>
<td>Receptors</td>
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<tr>
<td>Inorganics</td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>X</td>
</tr>
<tr>
<td>Arsenic</td>
<td></td>
</tr>
<tr>
<td>Barium</td>
<td>X</td>
</tr>
<tr>
<td>Beryllium</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td></td>
</tr>
<tr>
<td>Cobalt</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>X</td>
</tr>
<tr>
<td>Iron</td>
<td>X</td>
</tr>
<tr>
<td>Lead</td>
<td>X</td>
</tr>
<tr>
<td>Manganese</td>
<td>X</td>
</tr>
<tr>
<td>Mercury</td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td></td>
</tr>
<tr>
<td>Selenium</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td></td>
</tr>
<tr>
<td>Thallium</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>X</td>
</tr>
<tr>
<td>Zinc</td>
<td>X</td>
</tr>
<tr>
<td>Volatiles</td>
<td></td>
</tr>
<tr>
<td>2-Butanone</td>
<td></td>
</tr>
<tr>
<td>2-Hexanone</td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td></td>
</tr>
<tr>
<td>Xylenes</td>
<td></td>
</tr>
<tr>
<td>Semivolatiles</td>
<td></td>
</tr>
<tr>
<td>Acenaphthylene</td>
<td></td>
</tr>
<tr>
<td>Anthracene</td>
<td></td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
<td></td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td></td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
<td></td>
</tr>
<tr>
<td>Benzo(g,h,i)perylene</td>
<td></td>
</tr>
<tr>
<td>Contaminant</td>
<td>Aquatic Receptors</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td></td>
</tr>
<tr>
<td>Bis(2-ethylhexyl)phthalate</td>
<td></td>
</tr>
<tr>
<td>Chrysene</td>
<td></td>
</tr>
<tr>
<td>Di-n-butylphthalate</td>
<td></td>
</tr>
<tr>
<td>3,3′Dichlorobenzidine</td>
<td></td>
</tr>
<tr>
<td>Fluoranthene</td>
<td></td>
</tr>
<tr>
<td>Indeno(1,2,3-cd) pyrene</td>
<td></td>
</tr>
<tr>
<td>Phenantherene</td>
<td></td>
</tr>
<tr>
<td>Pyrene</td>
<td></td>
</tr>
<tr>
<td>Pesticides/PCBs</td>
<td></td>
</tr>
<tr>
<td>Aldrin</td>
<td></td>
</tr>
<tr>
<td>Alpha-chlordane</td>
<td></td>
</tr>
<tr>
<td>Gamma-chlordane</td>
<td></td>
</tr>
<tr>
<td>4,4′-DDE</td>
<td></td>
</tr>
<tr>
<td>4,4′-DDD</td>
<td></td>
</tr>
<tr>
<td>4,4′-DDT</td>
<td></td>
</tr>
<tr>
<td>Dieldrin</td>
<td></td>
</tr>
<tr>
<td>Endosulfan II</td>
<td></td>
</tr>
<tr>
<td>Endrin ketone</td>
<td></td>
</tr>
<tr>
<td>Aroclor-1254</td>
<td></td>
</tr>
<tr>
<td>Aroclor-1260</td>
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</tr>
</tbody>
</table>

Notes:

X = Indicates contaminant of potential concern
### TABLE 8

**SUMMARY OF THE ANALYTICAL RESULTS FOR SOIL SITE INSPECTION, 1991**

**OPERABLE UNIT NO. 11 (SITE 80)**  
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Surface Soil (0-6 inches bgs)</th>
<th>Near Subsurface Soil (0-2 feet bgs)</th>
<th>Subsurface Soil (3-17 feet bgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Positive Detections/ No. of Positive Detections</td>
<td>Range of Positive Detections</td>
<td>No. of Positive Detections/ No. of Positive Detections</td>
</tr>
<tr>
<td>Methylene Chloride</td>
<td>1/3</td>
<td>7</td>
<td>0/7</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0/3</td>
<td>ND</td>
<td>1/7</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>0/3</td>
<td>ND</td>
<td>1/7</td>
</tr>
<tr>
<td>4,4′-DDD</td>
<td>1/3</td>
<td>18</td>
<td>3/7</td>
</tr>
<tr>
<td>4,4′-DDE</td>
<td>0/3</td>
<td>ND</td>
<td>5/7</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>0/3</td>
<td>ND</td>
<td>4/7</td>
</tr>
<tr>
<td>Aroclor-1254</td>
<td>0/3</td>
<td>ND</td>
<td>2/7</td>
</tr>
</tbody>
</table>

**Notes:**

Concentrations expressed in μg/kg (microgram per kilogram)  
ND = Not detected.  
bgs= Below ground surface.

<table>
<thead>
<tr>
<th>Constituent</th>
<th>North Carolina USEPA Standards</th>
<th>USEPA MCLs</th>
<th>No. of Positive Detections/ No. of Samples</th>
<th>Range of Positive Detections</th>
<th>Location of Maximum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>1,000</td>
<td>1,000</td>
<td>1/3</td>
<td>180</td>
<td>80MW03</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>29</td>
<td>700</td>
<td>1/3</td>
<td>5</td>
<td>80MW03</td>
</tr>
<tr>
<td>Xylenes</td>
<td>400</td>
<td>10,000</td>
<td>1/3</td>
<td>21</td>
<td>80MW03</td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td>--</td>
<td>--</td>
<td>1/3</td>
<td>25</td>
<td>80MW03</td>
</tr>
</tbody>
</table>

Notes:

Concentrations expressed in μg/L (microgram per liter)
USEPA = U.S. Environmental Protection Agency
MCL = Federal Maximum Contaminant Level
-- = Criteria not established.

### Table 10

**Summary of the Analytical Results for Surface Water Site Inspection, 1991**

**Operable Unit No. 11 (Site 80)**

**MCB Camp Lejeune, North Carolina**

Near Site (80-SW03, 80-SW04, 80-SW05)

<table>
<thead>
<tr>
<th>Constituent</th>
<th>No. of Positive Detections/No. of Samples</th>
<th>Range of Positive Detections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>3/3</td>
<td>11-190</td>
</tr>
<tr>
<td>Toluene</td>
<td>2/3</td>
<td>30-104</td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td>1/3</td>
<td>6</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons</td>
<td>2/3</td>
<td>1390-1660</td>
</tr>
</tbody>
</table>

**Notes:**

Concentrations expressed in μg/L (microgram per liter)

## Table 12

**Remediation Levels for the Time-Critical Removal Action**  
**Operable Unit No. 11 (Site 80)**  
**MCB Camp Lejeune, North Carolina**

<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>Remediation Level (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>340</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>360</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>2,400</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>1,700</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>4,400</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>4,400</td>
</tr>
</tbody>
</table>
### TABLE 13

**CONTAMINANTS OF POTENTIAL CONCERN (COPCs)**
**EVALUATED DURING THE HUMAN HEALTH RISK ASSESSMENT**
**OPERABLE UNIT NO. 11 (SITE 80)**
**MCB CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Contaminant of Potential Concern</th>
<th>Surface Soil</th>
<th>Subsurface Soil</th>
<th>Groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volatiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon disulfide</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Semivolatiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acenaphthene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dibenzofuran</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluorene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbazole</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyrene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Di-n-octylphthalate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pesticide/PCBs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aldrin</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dieldren</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,4’-DDD</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4,4’-DDT</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Alpha-Chlordane</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gamma-Chlordane</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inorganics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Arsenic</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Barium</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manganese</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nickel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

X = Selected as a COPC for human health risk assessment.


<IMG SRC 9801982>
## CONTAMINANTS OF POTENTIAL CONCERN (COPCs) EVALUATED DURING THE ECOLOGICAL RISK ASSESSMENT OPERABLE UNIT NO. 11 (SITE 80) MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant of Potential Concern in Surface Soil

### Inorganics

- Aluminum
- Arsenic
- Barium
- Beryllium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Manganese
- Mercury
- Nickel
- Selenium
- Silver
- Vanadium
- Zinc

### Semivolatiles

- Benzo(b)fluoranthene
- Bis(2-ethylhexyl)phthalate
- Chrysene
- Di-n-butylphthalate
- Pyrene

### Pesticides

- Aldrin
- Alpha-chlordane
- Gamma-chlordane
- 4,4'-DDE
- 4,4'-DDD
- 4,4'-DDT
- Dieldrin
February 5, 1997.
Tarawa Terrace I
Elementary School,
Jacksonville, North Carolina

Reported by:

E D N A   P  O L L  O C K, CVR
207 Moores Landing Extension
Hampstead, North Carolina 28443
(910) 270-4541
Fax: 270-5180

* COPY *
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OPERABLE UNIT 11, SITES 7 and 80:

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WEDNESDAY EVENING SESSION

February 5, 1997

The Meeting of the Restoration Advisory Board of
Marine Corps Base, Camp Lejeune, Jacksonville, North
Carolina convened at 7:50 o'clock p.m. in the Dining Hall
of Tarawa Terrace I Elementary School.

MR. MATT BARTMAN: Okay, let's get going.

[Whereupon Mr. Bartman then supplemented his
presentation with the use of colored slides.]

MS. TOWNSEND: Focus?

MR. BARTMAN: Focus - I think it's your eyes,
Gina. It looks fine to me.

But, my contacts are getting bad though.

Stop me at any time. Ask me any questions.

I don't know if I'll answer them, but you can
ask them!

Okay, what we're going to be talking about right
here is Operable Unit 11 which consists of two sites, Site
7 and Site 80.

Site 7 is known as the Tarawa Terrace Dump.

Site 80 is the Paradise Point Golf Course
Maintenance Area, which is my favorite site. I wish I
could've gotten a chance to play there while we were investigating this site.

MR. SWARTZENBERG: Is that the one with the chemicals?

MR. BARTMAN: Chemicals?

MR. SWARTZENBERG: The area where they were mixing the pesticides?

MR. BARTMAN: Yes, the pesticide mixing area.

This slide is difficult to view and I apologize for that.

But, Site 7, I guess as you're sitting in this classroom you're pretty close to Site 7. It's within the Tarawa Terrace Housing Complex.

It's right off Highway 24. However, you'd be better off entering Tarawa Terrace II entrance and that would bring you to Site 7.

Site 80 is what I refer to as the main side of the Base and if you were to come through the guard gate, make your first right, go down Brewster Boulevard to the very end, you'd run into the golf course and the maintenance area within the golf course proper.

What I'd like to talk about is basically I break
these talks down into four different categories:

Where the sites are, a little bit of description of them.

Remedial investigation - what did Baker do out there.

Some of the findings.

What are the risks at the site.

And, then what are we going to do about those risks, if there are any.

Again, Site 7 is located a quarter-mile south of the Tarawa Terrace Housing Complex which we're all sitting in right now.

It's bordered to the northwest by the Tarawa Terrace Housing Community.

Bordered to the northeast by the Tarawa Terrace Community Center.

It's bordered in the southwest by the Tarawa Terrace Waste Water Treatment Plant.

And, to the southeast by Northeast Creek.

In fact, in the area of Northeast Creek, it's a complete marsh area so as you're walking onto the site and try to get to Northeast Creek, you're going to find
yourself waist deep in muck.

The use of operation of the dump are unknown.

However, we do know that it was closed in 1972.

And, if you do some site reconnaissance or walk around the site, you'll see discarded paint cans, discarded oil cans.

It's not unsightly, but you can see remnants of a lot of what I would call housing debris.

The site is heavily wooded and like I said, there's a marsh area in the area of Northeast Creek.

Within the site, there are two unnamed tributaries which flow in the direction of Northeast Creek and basically these receive surface water runoff from the housing community and drain away into Northeast Creek.

These sites, I apologize these don't really tell you much about the site, but I guess you can see it's heavily wooded.

That is a utility right-of-way that's cut right through the site and everything to the right is really where the site is located.

So, you can see that during our investigation we had some difficult things to do with clearing trees to be
able to get drill rigs in there and do soil borings.

We did test pits in there because of potential buried debris and different things of potential buried drums.

So, again, we had a lot of access problems to the site.

This is the community center and in the rear of the swing set you drop down I guess a fairly steep hill to the site, so even though there's access from the community center to the site, it's not something that a child would readily want to do, but it can be done.

Site 80, again it's located northwest of Brewster Boulevard within the Paradise Point Golf Course area.

I couldn't tell you which hole it's located off of, but it's a one acre site. It has maintenance buildings.

There's a wash pad there and I can't remember whether during your site tour you even viewed this area, but I'm sure Tom took you there.

The northeast portion of the site contains large soil mounds.
I'm just going to flip to the view of the site.

There's old maintenance equipment scattered throughout the site and there's this building.

This building here I believe is where they keep like all the fertilizers and the pesticides and different things and there's a building in the rear of this one where they do all the maintenance on all the golf course equipment.

This is a road that leads off of that golf course maintenance building all the way back.

And, this road comes back to the original area where we thought our problem was going to be.

Look at the soil mounds in the rear of that road.

And, the history goes back that those soil mounds were created when they dug out the irrigation ponds for the golf course, they deposited soil there.

Now, the soil wasn't the problem, but they were going to use this soil for a bar pit to build up the golf course at later times.

Well, someone said that there were solvents dumped in these soil mounds and not to use the soil
because it was contaminated.

    So this is where we thought our initial problem

was going to be.

    But, as it turned out, this wasn't the problem

at all.

    The golf course was constructed in 1940, but
this maintenance area started in 1946 and, as we know,
it's still in operation.

    So, what did we do?

    Well, there were site inspections conducted by
another subcontracting firm in 1991 and what they found
were some pesticides in the soil at Site 7.

    So, that rolled in the remedial investigation
phase which we commenced in October of 1994.

    And, as part of this investigation, we did
surface to subsurface investigations.

    We did groundwater investigations.

    And, at Site 7, we did a surface water sediment
investigation and an ecological investigation.

    At Site 80, this wasn't necessary because there
wasn't a surface water body to investigate.

    It looks like it took a long time to do all this
sampling because, you know, we concluded our investigation in October of '96.

Actually, we concluded in November of '94 but because of some inconsistencies and some data gaps, we had to come back out for different sampling rounds at Site 7 to prove that our groundwater really wasn't impacted with metals.

So, really, all the investigation procedures concluded in October of '96.

But, we were not out in the field for two years, thank God.

So, what did we find?

At Site 7, we have low concentrations and infrequent detections of organic contaminants in the surface and subsurface, nothing to really write home about.

In groundwater, we have organic contaminants and frequently detected.

The inorganic-contaminants are below State and Federal standards.

However, this is why we had to continue to come back out to Site 7 and do three rounds of groundwater
sampling on three wells.

The initial round of sampling, we had high levels of lead, I believe manganese, iron and aluminum which were above State standards.

So, the State recommended that we go out and re-sample these points.

Two of the points were what we called temporary wells, wells you just put into the ground, take a sample and pull out.

Well, we left the wells in place.

The other well was in that marsh area and you can literally go down to that well and grab it by the well casing and move the well like this.

So, what does that tell us?

Well, it probably tells us that they're highly turbid samples, there's a lot of sediment involved in the groundwater sample that we're collecting and that that sample probably isn't truly representative of the water.

It's probably representative more of the sediment that's in the water.

So, in those two additional rounds of sampling that we did, we used a different sampling technique where
we used low flow purge sampling to get a more representative sample of the groundwater and less of the sediment.

There's less disturbance, less turbidity in the sample.

And, from those three rounds, we show that the only inorganics that remain above State standards are iron and aluminum which aluminum really, as far as the Federal, it's a secondary MCL which means it's really for aesthetics, it's not because it creates a problem.

As far as surface water, we have metals - arsenic, lead and manganese, which are above criteria.

Again, lead and manganese, especially manganese all over this Base is above criteria in groundwater, so obviously in surface water we should also see a problem.

In sediments we have pesticides above criteria and I'm assuming that the pesticides in the sediment are due to the overlay and runoff draining into these surface water bodies depositing in the sediment and just from the overall applications across the Base from many years of use of pesticides.

From a risk assessment standpoint, we looked at

This is one of the few sites where we've had to really look at current residents, but with the Tarawa Terrace Housing Community, how can you not look at current residents?

Well, what we found is that there were no risks to current children.

No risk to current adults.

And, for future residents, we had a non-carcinogenic risk.

And, again, that was based from the ingestion of aluminum in groundwater.

And, for the future construction worker, there were no risks estimated.

What did we do at Site 80?

We did both soil and groundwater sampling at Site 80.

Again, we had no surface water or sediment to investigate.

There were elevated levels and frequent detections of pesticides in the surface soil.
In the groundwater, we had low levels of organics and metals.

I made a little bit of an error here.

The soil at Site 80, we might have had infrequent detections, but in one concentrated area we have a lot of pesticides.

And, what we’ll lead into and I’ll talk about the remedial alternative, it’s in that particular area where we had elevated levels of pesticides, that problem had to be taken care of immediately.

And, what you’ll see is the receptors that we looked at and discussed were future adults and child residents, future construction workers and current civilian adult Base personnel.

One thing you’ll see are current civilian Base adult personnel are the people that work there.

We had to evaluate them from a risk standpoint.

You don’t see the current adult and children because no one lives in this area.

And, future construction workers, that's something that's always possible.

The risks to current adult Base personnel, we
had an unacceptable carcinogenic risk there and that was
mainly due to the elevated levels of pesticides in the
soil which leads us to this:

For site 7, if you remember to go back, we had
no unacceptable risks.

Low levels of contamination that really didn't
cause risks.

So, our proposal here is for no further action.

For Site 80, we have to use institutional
controls which include the Off for Use restrictions and
the only reason that is because we do have arsenic in the
groundwater, both in rounds one and the second round of
sampling that indicates there's a potential carcinogenic
risk from the ingestion of groundwater.

MS. WOOD: What did they use the arsenic for?

MR. BARTMAN: Arsenic's often associated with
pesticide use with pesticides.

It's--I wouldn't say it's used--

MS. WOOD: I always think--

MR. BARTMAN: I'm sorry.

MS. WOOD: I think of rat poison with arsenic.

MR. BARTMAN: Well, it's a poison and so in
pesticides it's also used to, say to cut the pesticides, but it's also inorganic.

I used the word "cut" but I'm trying to like figure--

MS. WOOD: I understand what you mean, yes.

MR. BARTMAN: --In the manufacturing of pesticides, you find that particular metal associated with pesticide use.

So, what we had to do for Site 80 because we demonstrated there was a current risk to the current civilian adult Base personnel was come up with what is known as a time critical removal action for pesticide contaminated soil.

And, basically, a time critical removal action is an overriding mandate to protect human health.

We need to initiate action within six months and usually these removal actions are low cost, small volumes and there's very few options for the remedial alternative you're going to take.

You kind of know that it's – I call it this. Jim may call it something else – a dig in a hole.

You go in, you take the soil, you dig it up and
you remove it, which is what we basically did in this case.

There is the need to go through many alternative decisions and screenings and evaluations to kind of know what you're going to do.

And, it's basically driven by the potential risk to a receptor like right now, the immediate need.

And, the only reason—go ahead!

MR. CALLAWAY: The removal of the soil, where was it taken?

MR. BARTMAN: I'll let Jim give you that, yeah.

The lack of action for a time critical removal action.

The only reason that this could be stopped if there's a lack of money availability, budgets, or lack of contract mechanisms to implement the time critical removal action.

So, what I'd like to do is— that's a short synopsis on what a time critical removal action is and this partnering team was able to implement this I believe within— we had the design ready to go to remove this soil in less than four months, review and then in less than
eight months, OHM was out there remediating this soil.

This may sound like a long time to you, but to me, that's very quick to have findings, a plan of action, a design and implementation in less than a year.

MR. HUMPHRIES: They were doing that when we visited the site. It's all done now, right?

MR. BARTMAN: It is done.

OHM - Jim was the Project Manager that handled the removal of the soil.

We found it. He removed it.

And, that's our jobs.

So, I'm going to let Jim handle this right now, if you don't mind, about how much was removed, how it was removed and where did it go to.

MR. DUNN: Just as a little refresher.

[Whereupon Mr. Dunn then supplemented his presentation with the use of overhead projected transparencies.]

The golf course - this is Brewster Road and the golf course is basically in there.

This is the entire golf course right in this area. This is the area that was remediated was Site A.
This is the large metal building that Matt had a picture of.

This is the maintenance area behind it.

When Baker went out and did this sampling, they had several hits over here of pesticides.

In these areas, they were sporadic, one hit out of several samples. Of course, that single sample taken was hot.

Knowing that they were going to go into time critical removal action, rather than spend time and money doing a bunch of sampling, the sampling task came over to us together with the removal.

We got these drawings from Baker.

They estimated that these were the areas that would need remediation.

The first thing we did was grid these areas and using an on-site GC determined where we had pesticides that required removal.

Each of these squares is a ten-by-ten grid.

The original areas - this is one, the big original area with the trailer getting expanded in this direction.
We knew this was all hot, so it all was remediated.

As we started our laboratory analyses, we set up this grid which then expanded in all directions until every one of these outer squares ended up being cleaned.

Remember, there were three over here?

Well, we ended up - the whites were clean, the rest was removed.

MR. BARTMAN: If you don't mind me interrupting you, Jim.

MR. DUNN: Sure.

MR. BARTMAN: But, what we did, we determined the risks and then Baker determined what the remediation levels, what level that they were going to need to remediate to.

When Jim went out and did his screening, all those points are points above what we determined our remediation levels were going to be.

Levels already protective of the individual receptors, the current civilian Base personnel.

So, everywhere that he has a black circle is above those remediation levels that we've determined.
MR. DUNN: Once we got all this sampling, we then went into remediation.

Let me take you back.

Those are all the sample points. They're not all hot. They're the sample points.

We ended up with this configuration being the areas that were excavated.

Where you have a double hash, the depth went down to two feet.

The remaining areas, the depth was to one foot.

But, that was the configuration of the final excavation.

By doing this gridding initially we saved both time and knowledge.

In the concept, we could've gone out and simply excavated the areas that Baker had delineated for us, the full areas.

By going out and doing all the gridding, we ended up with these areas which (a) were less and (b) were exactly the areas of the pesticide contamination.

When we finished with the excavation, a final sampling effort was conducted and in the final sampling
effort, we procured a sample every 50 lineal feet of
sidewall and every 500 square feet of base in every
excavation.

If we got an excavation that was less than 500
square feet, we had a sidewall and a base.

These samples were tested on-site with our GC
and then sent off-site for confirmation by an accredited
lab.

We ended up excavating 988 tons of material.

The original engineer's estimate I believe was
around 700 tons.

During our process of finding a disposal site,
we found a facility in Michigan that could take this
pesticide contaminated material, stabilize it and put it
in their Class C hazardous waste landfill at a price
substantially cheaper than we had been previously quoted.

So, we ended up able to do the additional work
on this delivery order and still have a savings overall
for the government for this removal action.

Specifically, this material went to a facility
called EvoTech in Belleville, Michigan.

MR. CALLAWAY: So, basically, they take ownership
of it after it's been delivered.

MR. DUNN: That's correct.

MR. CALLAWAY: The Base maintains ownership until delivery.

MR. DUNN: That's correct.

I've got some after-the-fact construction photos which are part of our final report.

They're a little different than the site that Matt showed earlier.

[Whereupon Mr. Dunn then distributed photographs]

This is the start which runs start to finish right through the set.

MR. BARTMAN: In going back to, you know, the initial investigation of what we thought the problem was, the upper right hand corner, we will see none of the excavation took place.

Those are where the soil mounds are.

That's where we thought our problem was.

Thank you, Jim.

And, we thought that was going to be our problem and as luck would have it, we just started to investigate other areas.
The largest excavation area which is one sample point and that particular sample point just happened to come up with the hardest hit of pesticides in the surface soil and from there, it grew into that large excavation area.

And, you can assume, you know, well, why did this happen?

Well, I mean, it's a pesticide mixing area.

There's a dirt access road that goes back to the soil mounds.

One day somebody came, had excess mixture in their tank, pulled the plug--

MR. DUNN: A little tricky thing that was in here - there's a septic tank drainfield--

MR. BARTMAN: Oh, yeah.

MR. DUNN: --Right in the middle of that.

This area, a two foot excavation, got down to the top of the drainfield, but amazingly enough, the drainfield had not been contaminated with pesticides.

So, it hadn't got into the septic field at all.

MR. BARTMAN: That's another lucky thing.

MR. DUNN: Our backhoe did, but the pesticides
didn't!

    MR. BARTMAN: I mean, Nature worked to our
benefit here also because we were dealing with a pesticide
contaminant, not a very migratory contaminant, stayed on
the surface and you can see from that excavation, mainly
in the first foot.

    MR. DUNN: Well, the first sixteen inches of
material in this area was loam and it was all hot.

    I mean, once we got down to soil, they could get
to the individual areas that were and weren't.

    MR. SWARTZENBERG: Did you fill it back in?

    MR. DUNN: Yes.

    MR. SWARTZENBERG: So, it's clean now?

    MR. DUNN: Yes. We'll get the pictures to you,
too.

    The fill from this particular site came from the
Bay, I think.

    MR. SWARTZENBERG: Let me just ask a question.

    You contracted somebody to move them - trucks?

    MR. DUNN: Yes.

    MR. SWARTZENBERG: To move the dirt, you
contracted somebody?
MR. DUNN: Yes.

MR. SWARTZENBERG: Is there any special insurance policy in case the truck gets in a wreck or something?

MR. DUNN: Five million required of the trucker and ten of us.

MR. SWARTZENBERG: So, that's an insurance policy more or less of--

MR. DUNN: It's hazardous waste transporter's insurance.

MR. SWARTZENBERG: Hazardous, yeah.

MR. DUNN: They carry it and we carry it.

MR. SWARTZENBERG: Okay.

MR. DUNN: Yeah, there's about I would say 25 licensed hazardous waste haulers that serve this area.

MR. SWARTZENBERG: Oh, so, they have--the drivers have special qualifications?

MR. DUNN: Yes, the drivers have to be trained, carry cards and carry qualifications.

They're limited in the hours they can run just like long haul.

MR. CALLAWAY: Basically, they go to a class that teaches them how to handle the particular items that
they're transporting, in addition to the regular DOT
certifications they have to have.

MR. DUNN: Correct.

They haven't gone to 40 hour training yet, but

they do have 24 required of them.

MR. BARTMAN: Correct me if I'm wrong, Jim, but

this was completed in '95 or '96?

MR. DUNN: '96.

MR. BARTMAN: '96.

MR. DUNN: We started in March and we finished in

early August.

That is the entire time frame of--

MS. WOOD: Screening?

MR. DUNN: --screening, drawings, getting into

the field and doing the work.

The real field work was done in about six weeks.

MR. BARTMAN: Okay.

MR. DUNN: Early June to middle to late July.

MR. BARTMAN: For me, that's expedited.

MR. DUNN: That's pretty quick.

MR. BARTMAN: I mean, to go out there and find

the problem, investigate it, fill out or write a report,
talk to the individuals involved, you know go through the
design and then get it hauled out and moved out of there,
you don't see it happen that quick too often.

MS. DEBOW: Pretty dramatic.

MR. CALLAWAY: Couldn't you use your pit that
you've got over on two or three that you've designed to do
some of this?

Would this not fall in the category of something
that would work there?

MR. DUNN: There was a lot of discussion on that.

Thus far, pesticides have not been a successful
bio-candidate.

I think they may be in the future as bio-
technology grows.

The thing to remember, the biocells now are
permitted for non-hazardous materials.

MS. DEBOW: Oh, okay, I see.

MR. DUNN: You can permit a hazardous biocell,
site specific, site only currently.

That may change but it hasn't at this stage and
I don't know of any move to change.

MR. CALLAWAY: So, in other words, if we found an
area that had just say a million tons and it was cost

prohibitive to transport it to Michigan or wherever, we
could possibly get a permit to have a biocell there on
site?

MR. DUNN: Or, look at other in-situ
technologies, absolutely, yes.

MS. DEBOW: Looking at the arsenic levels on Site
80, I want to see if I'm reading this right as I was
wondering whether you would be intending to re-test the
groundwater for arsenic particularly at NWO.3 where it was
high?

MR. DUNN: NWO.3 was.

MS. DEBOW: I think that was one that--and I may
be reading it wrong.

MR. BARTMAN: No.

MR. DUNN: NWO.3 was removed as part of remedial
action. That was right in the middle and wasn't it the
bum well?

MR. BARTMAN: Yeah, it was a well that was put in.

In 1991, they did the SI. That's when that was put in.

That well was poorly constructed and not a
valid, I would say a good sampling point.
MS. DEBOW: Deteriorated?

MR. BARTMAN: Deteriorated, yeah, over time, sand packed.

Again, the turbidity, sediment, so was the arsenic truly representative of the water or the particulates that were in the water?

And, we felt from what we could see in the repetition sampling and the fact that you don't have a groundwater anywhere else, arsenic doesn't show up in the other wells, that that particular well - and from our field notes and during development of that well, some of the readings that we take, the turbidity readings - that that well was--the construction of that well was in jeopardy.

MS. DEBOW: That's valid.

Now, I didn't see in here that we have proven that we have reduced the arsenic below Federal standards and in the ecological studies I did see that there was an elevated quotient of index to rabbits and other things, so what I'm wondering is did we remove the arsenic?

Can we go ahead and assume the--

MR. BARTMAN: No, the arsenic in soil was
removed.

We didn't mention it, but the arsenic was removed - was addressed and removed as part of the time critical removal action.

MS. DEBOW: Yeah, and I do see--

MR. DUNN: In the soil.

MS. DEBOW: --Where it says we did that. I mean, that's where I couldn't see closure.

MR. DUNN: [Showing photograph]--This is where it was removed and this is the replacement that we put in.

MS. DEBOW: And, this one's fine.

This one's giving us good value.

MR. DUNN: Yes.

MS. DEBOW: And, then around this site, we're now getting valid low arsenic levels?

That's where I missed the last closing statement.

MR. DUNN: Matt, when was your last round?

MR. BARTMAN: Geez! We had arsenic initially at 102.

Our second round, we dropped to 42.

MS. DEBOW: Which is below.
MR. BARTMAN: Which is below, yeah, the State standard.

MS. DEBOW: And, that was one test.

So, what I'm wondering is are we going to do one more test or is one considered sufficient?

MR. BARTMAN: Do you want to field this one?

MS. LANDMAN: Isn't that a part of the monitoring?

MR. BARTMAN: There is no monitoring site.

MS. LANDMAN: In this particular case because we questioned the validity of the original sample.

MR. BARTMAN: Also, we have one sampling point above that criteria.

MS. LANDMAN: Right.

MR. BARTMAN: If it were known that arsenic were a widespread groundwater problem, or suspected widespread groundwater problem, you would continue to sample those points.

MS. LANDMAN: In this particular case, we didn't feel it was necessary to go back out and sample it again.

MS. DEBOW: Well, that's kind of the way I would read that.
From what you're telling me now, that even
though we've dedicated some part of this write-up to tell
ourselves that the arsenic levels were more than twice
standard, we also are saying now that that was due to one
aberrant value.

And, so now we're just going to ignore that
aberrant value because we got a good value but we're not
going to validate that that's true - determine which one's
right, is that what I'm hearing?

MR. BARTMAN: One additional sampling is not why
we're saying that it's valid.

MS. DEBOW: Okay. I like that.

MR. BARTMAN: Right.

We're saying that it's valid because arsenic in
the initial round was not a problem, with the exception of
one well.

So, we didn't find a site related arsenic
problem.

We confirmed that, that one point was not a
problem and that it was the construction of the well that
was causing the problem and the sediment caused that
elevated hit by doing that second round of sampling.
MS. DEBOW: Okay. Because the second question I had was concerning the environmental impact, the ecological studies--

MR. BARTMAN: Uh-huh.

MS. DEBOW: --Where it discussed the ecological quotients for rabbits as being high and I keep thinking of hawk seeking rabbits, so since arsenic will bio-accumulate I was somewhat concerned that the terrestrial receptors really could be accumulating anything left over.

That was my next question.

We didn't prove that that was not due to arsenic, but there's no comment in there that it probably was due to the pesticides that were removed.

MS. LANDMAN: Pesticide and the arsenic.

MS. DEBOW: And, the arsenic?

MS. LANDMAN: That were removed and the risk values for the ecological receptors were based on the site conditions prior to remedial action.

So with the removal of that soil--

MS. DEBOW: Should improve the risk values?

MS. LANDMAN: That should at least go away because there are no more.
MR. BARTMAN: It should. It's actually--

MS. LANDMAN: Right.

MR. BARTMAN: --Part of Gina's requirements that we demonstrate that removal of those soils, the remaining soil that's left.

So we demonstrate using those values that we have taken through our risk assessment demonstrate that those levels are not acceptable.

MS. LANDMAN: The remediation levels that were determined for removal of the soil were based on reducing the risk to both human health and ecological disasters to an acceptable level.

That's how they were calculated, so the clean-up was based on basically a back calculation of what levels do we need to reduce these risks down to acceptable levels.

We worked backwards. What does that become in the concentration.

Then we go back out to the site. All the areas that exceed that concentration were removed.

MS. DEBOW: And, particularly relative to arsenic, that 42 says we did that for arsenic?
MR. BARTMAN: No, 42 is in the groundwater.

MS. DEBOW: In the groundwater.

MR. BARTMAN: Right.

MS. LANDMAN: And, the risk to the ecological receptors were in the surface soil exposure.

MS. DEBOW: Okay.

MR. BARTMAN: So, it's where you take care of it in the soil.

MS. DEBOW: Gotcha!

MR. DUNN: The arsenic number in groundwater is probably very false.

Arsenic is a very, very heavy element and arsenic sticks to the soil and sediment and my guess is that those samples were not done with low flow.

MR. BARTMAN: The initial sample was not done low flow.

MR. DUNN: Okay.

MR. BARTMAN: That's why the second sample was done low flow in order to reduce the level of turbidity in that well we knew was poorly constructed, but we have to demonstrate, just like you're asking that question. That same question was posed by Gina and at that time, Dave's
counterpart, Patrick Walters, proved to me that it's well construction, not truly in the groundwater.

So, that's why we had to do additional sampling.

MS. LANDMAN: And, to add to the complication of that is we had to remove that well during the soil removal.

So at that point the question is do we have any reason, do we have enough concern to going back out and install a new well to replace it, take another sample or not?

We have all this evidence to show that this is no longer an issue, so what would we gain by just spending time and money to go back out there to re-install the well, to sample it one more time?

And, that's really what it boils down to.

MS. DEBOW: Now, on Site 7, I had a comment.

I was somewhat curious about the swamps down at the bottom end of Site 7.

MR. BARTMAN: I think it's a marsh.

MS. DEBOW: Marsh?

MR. BARTMAN: I get corrected.

MS. DEBOW: Salt marsh.
MR. BARTMAN: There is a difference and I get corrected.

Our ecological--I'm sorry.

MS. LANDMAN: It's both.

MR. BARTMAN: I don't know, I get corrected by ecological scientists all the time.

I say swamp. She says it's not a swamp, it's a marsh, so I don't know.

MS. DEBOW: If there are cypress trees in it, it's probably more swamp.

MR. BARTMAN: Okay.

MS. DEBOW: If there's just flats with grasses, it's probably salt marsh.

MS. LANDMAN: There's probably areas of both.

MS. DEBOW: Yeah.

We saw some decrease in macro-invertebrates in surface water down there. I couldn't quite tell what that meant.

To me, it means we saw a decrease in the number of clams, mussels and other macro-invertebrates that live on the bottom in the low waters of salt marshes.

Is that what I was reading? And, that wasn't
explained as possibly why, other than maybe it's due to this toxicity.

MR. BARTMAN: I get all the tough questions!

Ask a human risk question.

The fed.fix are not clams, mussels, they are micro-organisms.

MS. DEBOW: Not macro-invertebrates. The macro invertebrates are my oysters.

The micro-invertebrates are the little guys.

MR. BARTMAN: Okay. See, I told you.

MS. DEBOW: And, this says macro-invertebrates so that's my oysters.

MS. WOOD: On Page 8 if anyone wants to follow.

MR. BARTMAN: Yeah.

I don't have an answer for you at this point.

MS. DEBOW: It seems what I'm reading here that where my concerns lie are although we are prohibiting groundwater consumption and from what you told me, we're not prohibiting residential pesticide use in this area so we're going to continue to have groundwater runoff, which may not be a RAB issue.

It may be a Camp Lejeune issue.
But, we do have some ecological impact and we haven't figured out why.

That's what I saw here that even this didn't quite identify why we're seeing ecological impact.

It could be the lead.

We've got a couple of things going on there and I was wondering if you knew anymore about that.

But, I read it as shrimp and mussels and dinner that we might be losing.

MR. BARTMAN: I don't think that's the case.

I can't give you an answer right now.

MS. LANDMAN: Can we get the ecological risk assessment person--

MR. BARTMAN: Oh, yeah.

MS. DEBOW: Thanks.

MS. LANDMAN: --Make a phone call to you and discuss the issue?

MR. BARTMAN: Yes.

MS. DEBOW: Sure, sure.

MR. BARTMAN: I apologize for that. That is not my area. I mean I should know this, but it's not something that's fresh in my mind.
MR. HUMPHRIES: Yeah, I don't think you can get--

MS. DEBOW: It may not even apply to this. It may be something where we can say, hey, look by the way, even though this isn't due to our off-site, it's something that you in the community need to be aware of and maybe use less pesticides on your lawn at Tarawa Terrace.

MR. BARTMAN: Uh-huh.

MS. DEBOW: Or, something like that.

MS. WOOD: They're not using pesticides on the lawns.

MS. DEBOW: I have no idea, but whether it's a RAB issue or just the way I was reading this leads me to believe it's a RAB issue.

MR. SWARTZENBERG: You can't get oysters to grow in water unless you've got at least--you know, I've heard of oysters growing in ten parts per thousand, but we don't have anything like that up in this area.

You have to at least get down on Courthouse Bay before you get anything like that.

The clams even less.

In fact, the hurricane killed a lot of clams because there was so much fresh water.
MS. LANDMAN: I'm pretty sure that most of the samples probably were crabs and I don't know what you call them--

MR. BARTMAN: Crayfish.

MS. LANDMAN: --They're just tiny little things.

MR. BARTMAN: I mean, this is all fresh--

MS. DEBOW: These are all indicators.

MS. LANDMAN: Right.

MR. BARTMAN: Right.

MS. LANDMAN: I agree with you. That's why we need to get you talking to the ecological person to answer any questions.

MS. DEBOW: Something's going on there, the way this is written and I'm not quite sure what it is.

Whether it's related to this off-site or something else, but something's going on there.

MS. WOOD: Well, to be anecdotal which doesn't help you at all, but we used to ride our horses down the Boy Scout area which is down, you know, from there and take off the point there and swim, we had a great time for several years.

MR. BARTMAN: Uh-huh.
MS. WOOD: And, finally, we discovered we were coming out of that water with skin rashes and an awful odor and so we gave up that in particular.

So, I don't think it's necessarily related. It's been an ongoing accumulation of variety of things in this whole area.

MR. BARTMAN: Do they say what that's caused from?

MS. WOOD: I don't know. We just decided, you know, there was a whole group of us that we did not need to be in that water on those horses any longer, you know.

MR. BARTMAN: Does the treatment plant discharge in that area?

MS. LANDMAN: If you're up in the Montford Point area, that's well up there.

MS. WOOD: No, this is you know where the--

MS. LANDMAN: Okay, you're across the creek.

MS. WOOD: I'm on the same side. It's further down toward the entrance we used to go.

The golf course is here. The Boy Scouts area is down there and we'd, you know, go off and--

MS. LANDMAN: Right, that's on the other side of
Northeast Creek.

MR. BARTMAN: Yeah, you're the other side of site 7.

MS. WOOD: You're right.

MS. LANDMAN: That's right.

MS. WOOD: But, my point is that whole water--

MR. BARTMAN: That whole water area.

MS. WOOD: --has deteriorated in the last 25 years.

MS. LANDMAN: But, in response to your question, I suggest we get the ecological best person from Baker to discuss the issue with you and then perhaps we can get a summary of that conversation into the meeting minutes that go out to all the RAB members.

MR. BARTMAN: Right, that'll be in the file record of decision because it is a public comment--

MS. DEBOW: Thank you.

MR. BARTMAN: --That has to be addressed.

MR. HUMPHRIES: I've got a question on Site 7.

Several years ago, there was a cleaners approximately 800 yards from here that was dumping tetrachlorethylene into the groundwater.
MS. LANDMAN: ABC Cleaners.

MR. HUMPHRIES: Yeah, I didn't want to say the name.

They went to litigation with the EPA.

What happened?

MS. TOWNSEND: They are working on that now.

They're in remedial action now.

It will soon be public record and they should have a repository set up.

MS. LANDMAN: It's at the Onslow County Library?

MS. TOWNSEND: Yeah, that's what I've read that you can see all the documents associated with it, but that is definitely a superfund site and they are remediating.

And, they have gone through the same public meeting process that we have, although it's just one site so they don't have meetings as frequently as we do, but they have gone through the same process that we have for investigation and remediation, although it's taken them a lot longer.

And, a representative from the Base attended almost every one of those meetings.
MS. CASEY: I think probably Tom was probably the one.

MS. TOWNSEND: I know Tom was attending them.

MS. CASEY: Yeah.

MR. BARTMAN: The lead-in was supposed to go from the session on the time critical removal action to Rich's discussion.

[Whereupon this part of the proceedings concluded at 8:45 o'clock p.m.]
The old creosote plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Baserailroad. Reportedly, an on site sawmill, located in the northern portion of the site, was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment procedures that were used are not known, records show that preservations (i.e., creosote) were stored for reuse in a railroad tank car.

In typical pressure treatment processes, wood ties are placed inside cylindrical chambers, which are filled with wood-treating preservations. Then, hydrostatic or pneumatic pressures, ranging from 50 to 200 pounds per square inch (psi), are applied within the chambers.
treatment chamber until the wood absorbs the desired amount of preservatives. When the treatment process is complete, a pump removes the excess preservative from the chamber and sends it to a storage vessel for reuse. Excess preservative is then removed from the wood by applying a vacuum, or by allowing the wood to drip dry. In the past, treated wood lay in open areas for several days, allowing preservative to drip. Today, treated wood is typically placed on lined and covered drip pads to collect excess preservative.

The main treatment area at Site 3 was most likely located within and immediately surrounding the dirt path loop in the southern portion of the site. This area contains an abandoned chimney that was probably associated with creosote heating/thinning activities. (Creosote is heated and mixed with fuel oil to create a less viscous consistency.) The 240-foot long concrete pad encircled by the dirt path loop was probably used as a dark track for pressure cylinder chambers or treated wood ties. However, the concrete pad does not contain visual evidence of contamination. South of the pad, evidence of rail lines was observed indicating that a railroad connection may have been located in this area. The railroad connection may have transported creosote or ties to and from the treatment area.

**Remedy:**

The amended remedy for the soil at Operable Unit (OU) No. 13 (Site 3) includes excavation of polycyclic aromatic hydrocarbon (PAH)-contaminated subsurface soil to an estimated depth of nine feet below ground surface (bgs) and disposal of the excavated soil in a Subtitle D landfill. More specifically, the amended remedy includes:

- Excavating the soil from zero to three feet bgs (approximately 660 cubic yards) and stockpiling the soil at Site 3 for testing and potential use later as backfill. The excavated soil is not expected to contain PAHs.
- Excavating the subsurface soil from three to nine feet bgs within the area of concern (approximately 1,340 cubic yards), or to just above the water table.
- Transporting the excavated soil to a Subtitle D disposal facility. Based upon preliminary Toxicity Characteristic Leaching Procedure (TCLP) testing conducted in October 1997, the soil appears to be non-hazardous and may be disposed of at a Subtitle D facility. The soil will be tested to reconfirm the non-hazardous status.
- Confirmatory soil sampling in the excavation area to ensure that PAH-contaminated soil located above the water table has been removed to acceptable remediation levels.
- Backfilling the excavated area with clean soil, including the excavated soil from zero to three feet bgs, and clean soil from an
The amended remedy addresses the principal threat at OU No. 13 (Site 3) which is the PAH-contaminated subsurface soil. Although the groundwater remedy selected in the original Record of Decision (ROD) has not been affected by this change to the soil remedy, the following will also be implemented in accordance with the Land Use Control Assurance Plan (LUCAP):

- Aquifer use controls will be instituted to prohibit future use of the groundwater at Site 3 as a potable water source. Restrictions will remain in place until it is demonstrated that continued attainment of remedial goals has been achieved.
- A Notice of Inactive Hazardous Substance or Waste Disposal Site (Notice) for Site 3 will be filed according to the requirements of North Carolina.

The amended soil remedy selected for Site 3 includes excavation of PAH-contaminated soils and disposal of the soils in a permitted Subtitle D landfill facility. The subsurface soil area of concern, which is considered a source of groundwater contamination at Site 3, would be excavated to a depth of nine feet bgs. Confirmatory soil samples would be taken from the excavation area to ensure that PAH-contaminated soil above the water table has been removed to the acceptable remediation levels. The excavated soil located from 0 to 3 feet bgs (approximately 660 cubic yards) would be tested for semi-volatile organic compounds (SVOCs) and later used as backfill for the excavation area provided the soil does not contain PAHs in excess of the remediation levels. Based upon results from the treatability study, which indicates that the PAH-contaminated soil was non-hazardous, the excavated soil located from 3 to 9 feet bgs (approximately 1340 cubic yards) would be transported to a Subtitle D disposal facility located either on-Base or off-site. Excavated soils must be tested for Toxicity Characteristics Leaching Procedure (TCLP) characteristics to verify the non-hazardous classification prior to disposal in a Subtitle D Landfill.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision Amendment:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 13
ONSLLOW COUNTY, NC
06/20/2000
4WD-FFB

Commanding General
Building 1
Marine Corps Base
Camp Lejeune, North Carolina 28542

SUBJ: Amendment to Record of Decision
Operable Unit 12, Site 3
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

Dear Sir:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document and concurs with the amended selected remedy for the Remedial Action at Site 3. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

The selected soil remedy presented in the Record of Decision on January 6, 1997, included source removal, on-site biological treatment of the PAH-contaminated subsurface soils for the protection of groundwater and institutional controls designed to prevent future potential exposure. The controls include restricting potable well installation, restrictions for future land use and a groundwater monitoring plan. Prior to full scale treatment, a pilot scale treatability study was performed on the PAH contaminated soils. Results of this study indicated that biological treatment of site soils for the protection of groundwater was not effective, therefore, another remedy must be selected.

The amended remedy for the soil at OU12 (Site 3) includes excavation of PAH-contaminated subsurface soils to an estimated depth of nine feet below ground surface and disposal in a permitted landfill. However, the Agency requires that the excavated soils be sampled to verify that the levels are below the “Region 3’s Industrial Risk Base Concentrations (RBCs)” and pass the Resource Conservation and Recovery Act’s “Toxicity Characteristics Leaching Procedure” before disposal into a subtitle D landfill. If the soils fail to meet these levels, they shall be biologically treated until these levels are attained. If the biological treatment of the soil fails to
attain the RBCs, the soils shall be disposed of in a hazardous waste (Subtitle C) landfill.

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 MCB Camp Lejeune 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 MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
    Neal Paul, Camp Lejeune
    Kate Landman, LANTDIV
    Dave Lown, NCDEHNR
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Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kate Landman, LANTDIV
Dave Lown, NCDEHNR

bcc: Allison Abernathy, HQ

GDT:gt:FFB:28538:5-17-00:OU12AROD.CON
AMENDMENT TO RECORD OF DECISION
OPERABLE UNIT NO. 12 (SITE 3)
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA
CONTRACT TASK ORDER 0274
JULY, 1999

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

Under:
LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:
BAKER ENVIRONMENTAL, INC.
Coropolis, Pennsylvania
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**ACRONYMS AND ABBREVIATIONS**

<table>
<thead>
<tr>
<th>ARARs</th>
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<td>Baker</td>
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<td>bgs</td>
<td>Below Ground Surface</td>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
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<td>DoN</td>
<td>Department of Navy</td>
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<td>FS</td>
<td>Feasibility Study</td>
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<td>LUCAP</td>
<td>Land Use Control Assurance Plan</td>
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<td>LUCIP</td>
<td>Land Use Control Implementation Plan</td>
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<tr>
<td>MCB</td>
<td>Marine Corps Base</td>
</tr>
<tr>
<td>mg/L</td>
<td>Milligrams per Liter</td>
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<tr>
<td>mg/kg</td>
<td>Milligrams per Kilogram</td>
</tr>
<tr>
<td>μg/kg</td>
<td>Micrograms per Kilogram</td>
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<td>NCDENR</td>
<td>North Carolina Department of Environment and Natural Resources</td>
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<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
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<tr>
<td>NPW</td>
<td>Net Present Worth</td>
</tr>
<tr>
<td>OHM</td>
<td>OHM Remediation Services Corporation</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
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<td>OU</td>
<td>Operable Unit</td>
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<tr>
<td>PAH</td>
<td>Polynuclear Aromatic Hydrocarbon</td>
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<td>POL</td>
<td>Petroleum, Oil, and Lubricants</td>
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<td>PRAP</td>
<td>Proposed Remedial Action Plan</td>
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<td>Resource Conservation and Recovery Act</td>
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<td>Remedial Investigation</td>
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<td>SSL</td>
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<td>SVOC</td>
<td>Semivolatile Organic Compound</td>
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<td>TBCs</td>
<td>To-Be-Considered Criteria</td>
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<td>TCLP</td>
<td>Toxicity Characteristics Leaching Procedure</td>
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<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>VOC</td>
<td>volatile Organic Compound</td>
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DECLARATION

**Site Name and Location**

Operable Unit No. 12 (Site 3 - Old Creosote Plant)
Marine Corps Base
Camp Lejeune, North Carolina

**Statement of Basis and Purpose**

This Amended Record of Decision (ROD) presents a revision to the selected remedy for polynuclear aromatic hydrocarbon (PAH) contaminated soils at Operable Unit (OU) No. 12 (Site 3) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The Amended ROD is being submitted in accordance with the Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) Section 117 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Section 300.435(c)(2)(ii). The original ROD for this site was submitted on January 6, 1997, signed by Marine Corps Base Camp Lejeune on April 3, 1997, and accepted by the North Carolina Department of Environment and Natural Resources (NC DENR) and the United States Environmental Protection Agency (USEPA) Region IV as the selected remedy for soils at OU No. 12 (Site 3). The remedy presented in the original ROD stipulated source removal and biological treatment using either a new biocell or an existing on-Base biocell. Prior to full scale treatment, a pilot-scale treatability study was performed on PAH-contaminated soils from Site 3. Results of this treatability study indicated that biological treatment of the site soils was not effective. Therefore, an amendment to the original ROD is required to document this fundamental change. In addition to the change in remedy, this ROD amendment incorporates a site-specific LUCIP for Site 3 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the Land Use Control Assurance Plan (LUCAP).

The DoN and the Marine Corps have obtained concurrence from NC DENR and USEPA Region IV on the amended remedy. A copy of the NC DENR approval letter dated May 12, 1999, is provided as Attachment A.

**Description of the Amended Soil Remedy: Source Removal and Off-site Landfill Disposal**

The amended remedy for the soil at OU No. 12 (Site 3) includes excavation of PAH-contaminated subsurface soil to an estimated depth of nine feet below ground surface (bgs) and disposal of the excavated soil in a Subtitle D landfill. More specifically, the amended remedy includes:

- Excavating the soil from zero to three feet bgs (approximately 660 cubic yards) and stockpiling the soil at Site 3 for testing and potential use later as backfill. The excavated soil is not expected to contain PAHs.

- Excavating the subsurface soil from three to nine feet bgs within the area of concern (approximately 1,340 cubic yards), or to just above the water table.

- Transporting the excavated soil to a Subtitle D disposal facility. Based upon preliminary Toxicity Characteristic Leaching Procedure (TCLP) testing conducted in October 1997, the soil appears to be nonhazardous and may be disposed of at a Subtitle D facility. The soil will be tested to reconfirm the nonhazardous status.
• Confirmatory soil sampling in the excavation area to ensure that PAH-contaminated soil located above the water table has been removed to acceptable remediation levels listed in Table 1.

• Backfilling the excavated area with clean soil, including the excavated soil from zero to three feet bgs, and clean soil from an on-Base borrow pit.

The amended remedy addresses the principal threat at OU No. 12 (Site 3) which is the PAH-contaminated subsurface soil. Although the groundwater remedy selected in the original ROD has not been affected by this change to the soil remedy, the following will also be implemented in accordance with the LUCAP:

• Aquifer use controls will be instituted to prohibit future use of the groundwater at Site 3 as a potable water source. Restrictions will remain in place until it is demonstrated that continued attainment of remedial goals has been achieved.

• A Notice of Inactive Hazardous Substance or Waste Disposal Site (Notice) for Site 3 will be filed according to the requirements of North Carolina.

**Statutory Determinations**

The amended remedy for the PAH-contaminated soil is protective of human health and the environment and may be cost-effective if the on-Base Landfill can be used for disposal. Although no chemical-specific applicable or relevant and appropriate requirements (ARARs) apply to the soil at Site 3, the remedy does comply with the to-be-considered criteria (TBCs) established for soil (i.e., soil screening levels established for the protection of groundwater). The statutory preference for treatment will not be satisfied because the soil will not be treated; instead, the soil excavated will be transported to a Subtitle D disposal facility. The remedy will require five-year reviews by the lead agency, at which time the remedial action alternative (RAA) for groundwater will be re-evaluated and further action may be warranted.

Signature (Commanding General, MCB, Camp Lejeune)  
28 July 99  
Date
DECISION SUMMARY

1.0 INTRODUCTION

This Amended Record of Decision (ROD) presents the remedial action plan selected by the Department of the Navy (DoN) for polynuclear aromatic hydrocarbon (PAH) contaminated soils at Operable Unit (OU) No. 12 (Site 3) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. Figure 1 shows the location of Site 3 within MCB, Camp Lejeune. The Amended ROD is being submitted in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 117 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Section 300.435(c)(2)(ii). The original ROD for OU No. 12 was submitted on January 6, 1997 (signed on April 3, 1997) and accepted by the North Carolina Department of Environment and Natural Resources (NC DENR) and the United States Environmental Protection Agency (USEPA) Region IV.

The selected soil remedy presented in the original ROD included source removal and on-site biological treatment of the PAH-contaminated soils. A pilot-scale treatability study was conducted to evaluate the effectiveness of the biological treatment system on the PAH-contaminated soils from Site 3. The results of the treatability study concluded that biological treatment of the site soils was not effective. Therefore, another soil remedy had to be selected for the site. The change in the soil remedy presents a fundamental change to the original ROD, thereby requiring the submittal of this Amended ROD.

This Amended ROD addresses only the fundamental change to the remedy selected for the PAH-contaminated site soils. Included in this document are reasons for the ROD amendment and evaluations of both the original and the amended soil remedies along with statutory determinations regarding the newly selected remedy. Information on site history, previous investigations, and extent of site contamination was presented in detail in the original ROD and will be briefly summarized in this Amended ROD. In addition to the fundamental change in remedy, this ROD amendment also incorporates a site-specific Land Use Control Implementation Plan (LUCIP) for Site 3 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the Land Use Control Assurance Plan (LUCAP).
In accordance with Section 300-825(a)(2) of the NCP, this Amended ROD will become part of the Administrative Record File for Site 3. The Administrative Record File is available for public review at the Onslow County Library during the following hours: Monday - Thursday 9:00 AM to 9:00 PM and Friday - Saturday 9:00 AM to 6:00 PM, and at the MCB, Camp Lejeune Environmental Management Division during the hours of 7:00 AM to 3:00 PM Monday - Friday.
2.0 SITE NAME, LOCATION, AND DESCRIPTION

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 square miles and includes 14 miles of coastline. MCB, Camp Lejeune is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24, and to the west by U.S. Route 17. The town of Jacksonville, North Carolina is located north of the Base.

OU No. 12 is one of 18 OUs located within MCB, Camp Lejeune. Operable units were developed to combine one or more sites that share a common element. OU No. 12 contains only one site, Site 3, which is otherwise known as the Old Creosote Plant. Figure 1 depicts the location of OU No. 12 (Site 3) within MCB, Camp Lejeune.

Figure 2 presents a map of OU No. 12 (Site 3). Located within the Mainside Supply and Storage areas at MCB, Camp Lejeune, Site 3 encompasses an area of approximately five acres and is generally flat and unpaved. Open Storage Lots 201 and 203 (i.e., Site 6) are located nearby along Holcomb Boulevard approximately 1-1/2 miles from Site 3. However, Site 3 itself is not currently used for open storage.

As shown in Figure 2, the site is intersected by two roadways: a dirt path that runs north-south and forms a loop in the southern portion of the site, and a gravel road that runs east-west and leads directly to Holcomb Boulevard. Access to the site via these roadways is currently unrestricted. In addition, the Camp Lejeune Railroad line runs parallel to the site’s western edge and intersects an old railroad spur line at the site's southern extreme. The intersection of these two lines creates a spike formation that points south. Wooded areas lie north and east of the site.
3.0 SITE BACKGROUND

3.1 Site History

The old creosote plant reportedly operated from 1951 to 1952 to supply treated lumber during construction of the Base railroad. Reportedly, an on site sawmill, located in the northern portion of the site, was used to trim logs into railroad ties. The ties were then treated with hot creosote in pressure cylinder chambers. Although the exact treatment procedures that were used are not known, records show that preservatives (i.e., creosote) were stored for reuse in a railroad tank car.

In typical pressure treatment processes, wood ties are placed inside cylindrical chambers which are filled with wood-treating preservatives. Then, hydrostatic or pneumatic pressures, ranging from 50 to 200 pounds per square inch (psi), are applied within the treatment chamber until the wood absorbs the desired amount of preservatives. When the treatment process is complete, a pump removes the excess preservative from the chamber and sends it to a storage vessel for reuse. Excess preservative is then removed from the wood by applying a vacuum, or by allowing the wood to drip dry. In the past, treated wood lay in open areas for several days, allowing preservative to drip. Today, treated wood is typically placed on lined and covered drip pads to collect excess preservative.

The main treatment area at Site 3 was most likely located within and immediately surrounding the dirt path loop in the southern portion of the site. This area contains an abandoned chimney that was probably associated with creosote heating/thinning activities. (Creosote is heated and mixed with fuel oil to create a less viscous consistency.) The 240 foot long concrete pad encircled by the dirt path loop was probably used as a drip track for pressure cylinder chambers or treated wood ties. However, the concrete pad does not contain visual evidence of contamination. South of the pad, evidence of rail lines was observed indicating that a railroad connection may have been located in this area. The railroad connection may have transported creosote or ties to and from the treatment area.
3.2 **Previous Investigations and Enforcement Activities**

Previous investigations conducted at Site 3 include a Site Inspection (1991) and a Remedial Investigation (1994-95). Field activities for these studies/investigations included soil, groundwater, and sediment investigations. In general, these investigations indicated that the most frequently detected organic compounds were PAH. Since creosote is comprised of PAH compounds, the PAHs detected at Site 3 are believed to be associated with past operations at the former wood treatment plant. More detailed information is located in the Site Inspection Report (Halliburton/NUS, 1991) and the Remedial Investigation Report (Baker, 1996). Tables and Figures presenting analytical results and showing sampling locations for soil and groundwater are in the original ROD for Site 3 dated January 6, 1997.
4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Remedial Investigation (RI), Feasibility Study (FS), and original Proposed Remedial Action Plan (PRAP) documents for OU No. 12 (Site 3) were released to the public on November 6, 1996. The Final Amended PRAP and Community Information Sheet were released to the public on August 28, 1998. These documents are available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). The notice of availability of the original PRAP, RI, and FS documents was published in the “Jacksonville Daily News” on November 3, 1996. A public comment period was held from November 6, 1996 to December 6, 1996. In addition, a public meeting was held on November 6, 1996 to respond to questions and to accept public comments on the PRAP for OU No. 12 (Site 3). The public meeting minutes were transcribed and a copy of the transcript is presented in Attachment A of the original ROD document dated January 6, 1997. A copy of the transcript was also made available to the public at the repository locations.

The notice of availability of the Amended PRAP was published in the “Jacksonville Daily News” on August 28, 29 and 30, 1998 and from September 13 through September 19, 1998. The 30-day public comment period began on August 28, 1998 and ended September 26, 1998. A public meeting was not requested and, therefore, a Responsiveness Summary was not prepared. In addition, no written comments or new relevant information was received during the 30-day comment period. Upon signature of this Amended ROD, MCB, Camp Lejeune and the Department of the Navy (DoN) will place this Amended ROD in the information repositories.
5.0 BASIS FOR ROD AMENDMENT

The environmental media at Site 3 were investigated as part of a Remedial Investigation (RI). The Areas of Concern (AOC) for both media are delineated in Figure 3. Remedial Action Alternatives were developed and evaluated as part of a Feasibility Study (FS) conducted for OU No. 12 (Site 3). Based upon the results of the RI and FS, preferred RAAs were identified in PRAP document. Then, the public was given the opportunity to comment on the RI, FS, and PRAP. Based upon comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for soil and groundwater at OU No. 12 (Site 3) and documented in the ROD dated January 6, 1997.

The soil remedy presented in the original ROD included excavation of PAH-contaminated soils and treatment of those soils at either an existing on-Base biocell or a newly constructed biocell. However, prior to full-scale treatment, a pilot-scale treatability study was conducted to determine the effectiveness of biological treatment on the PAH-contaminated soils. The primary objectives of this pilot-scale treatability study were to:

- Determine if biological treatment could render the soil “nonhazardous” by definition, (assuming the soil was originally characterized as hazardous).

- Assess the biological treatment efficiencies of the target PAH contaminants (i.e., naphthalene, 2-methylnaphthalene, carbazole, benzo(a)anthracene, and chrysene) for on-Base remediation in an engineered biocell.

- Develop performance data and design parameters to estimate costs for larger scale operations.

Results from this treatability study met two of the three objectives described above. Based upon the information provided in the treatability study, there was no need to develop performance data and design parameters for the larger scale operations. The results of the study provided the following conclusions:
• The soil sample collected for the treatability study was classified as non-characteristically hazardous following Resource Conservation and Recovery Act (RCRA) Toxicity Characteristics Leaching Procedure (TCLP) testing for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs).

• Solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents.

Results from the treatability study provide the primary reason for the fundamental change to the selected remedy for soils at OU No. 12 (Site 3). However, there are additional reasons for developing this Amended ROD. As stated previously, excavated PAH-contaminated soils were to be treated on-Base at either a newly constructed biocell or at an existing biocell. The existing biocell is currently receiving soils contaminated with petroleum, oil, and lubricants (POLs). Due to reduced capacity in the existing, permitted biocell, it would not be economically feasible to use the remaining capacity by treating the nonhazardous material in the permitted biocell.

Cost effectiveness was also reconsidered in the selection of the remedy. Costs associated with the construction of a new biocell (which as stated above would not fully treat the PAH-contaminated soils) was estimated to be approximately $514,000 (as presented in the original ROD prepared January 6, 1997). Source removal and disposal of the contaminated soil if a Subtitle D landfill was estimated for two scenarios, on-Base and off-site. On-Base disposal would require the contaminated soils to be hauled to the Subtitle D landfill located along Piney Green Road, approximately one mile from Site 3 (see Figure 1). This option was estimated to cost approximately $317,800. The nearest off-site disposal facility is a Subtitle D landfill located within 300 miles of the Base. This option was estimated to cost approximately $864,200 for excavation and disposal. Therefore, the most cost effective soil remedy was determined to be the on-Base disposal of contaminated soils.

The selected groundwater remedy presented in the original ROD, Aquifer Use Controls and Monitored Natural Attenuation, has not been revised and therefore is not described in this Amended ROD. However, Attachment B, the Land Use Control Implementation Plan (LUCIP), is included to formally document controls on land and aquifer use at Site 3.
6.0 SUMMARY OF SITE RISKS

As part of the RI, a human health risk assessment (RA) and an ecological RA were conducted to determine the potential risks associated with the chemical constituents detected at Site 3. The human health RA concluded that unacceptable risk values, per USEPA guidance, were generated for future residents via exposure to groundwater contaminants. The ecological RA indicated that the environmental impacts from the site would be minimal. More details on the risk assessment are available in the original ROD dated January 6, 1997.
7.0 DESCRIPTION OF ORIGINAL AND AMENDED SOIL REMEDIES

The original soil remedy, Source Removal and Biological Treatment, was the chosen alternative for remediation of PAH-contaminated soils located at OU No. 12 (Site 3) as detailed in the ROD dated January 6, 1997. However, due to results from the treatability study, an alternative remedy was chosen for the PAH-contaminated soils. The amended remedy is Source Removal and Off-Site Landfill Disposal. Both remedies (original and amended) are discussed in further detail below.

7.1 Original Soil Remedy: Source Removal and Biological Treatment

The original soil remedy selected for Site 3 included excavation of contaminated subsurface soils and biological treatment of those soils at either an existing on-Base biocell Lot 203 or at a newly constructed biocell at Site 3. The subsurface soil area of concern at Site 3 (Figure 3) would be excavated to a depth of nine feet below ground surface (bgs). Confirmatory soil samples would be collected from the excavation area to ensure that contaminated soil above the water table was removed to acceptable limits (i.e., the remediation levels listed on Table 1). The excavated soil (approximately 1340 cubic yards) would undergo aerobic, solid-phase biological treatment. The biological treatment would be conducted using land farming technology within a controlled unit (the "biocell"). The contaminated soil would be placed in a 12 inch lift underlain by a 24 inch lift of coarse sand, a high density polyethylene geomembrane liner, and a non-woven geotextile fabric. Leachate would be collected by a leachate collection line and sump, and periodically resprayed back onto the contaminated soil. Maintenance of the biocell would consist of periodic leachate collection and respraying, soil tilling, nutrient and fertilizer addition, and soil sampling.

7.2 Amended Soil Remedy: Source Removal and Off-Site Landfill Disposal

The amended soil remedy selected for Site 3 includes excavation of PAH-contaminated soils and disposal of the soils in a permitted Subtitle D landfill facility. The subsurface soil area of concern, which is considered a source of groundwater contamination at Site 3, would be excavated to a depth of nine feet bgs. Figure 3 identifies the location of the soil area of concern. Confirmatory soil samples would be taken from the excavation area to ensure that PAH-contaminated soil above the water table has been removed to the acceptable remediation levels. The excavated soil located from 0 to 3 feet bgs (approximately 660 cubic yards) would be tested for SVOCs and later used as backfill for the excavation area provided the soil does not contain PAHs in excess of the remediation levels.
listed in Table 1. Based upon results from the treatability study, which indicated that the PAH-contaminated soil was non-hazardous, the excavated soil located from 3 to 9 feet bgs (approximately 1340 cubic yards) would be transported to a Subtitle D disposal facility located either on-Base or off site. Excavated soils must be tested for TCLP characteristics to verify the nonhazardous classification prior to disposal in a Subtitle D Landfill. The excavated area would be backfilled with clean fill from an on-Base borrow pit. The location of the on-Base borrow pit is shown on Figure 1.

At Site 3, the subsurface soil area of concern appears to be the main source of groundwater contamination (via contaminant leaching). As a result, source removal alternatives were considered to be more appropriate than leaving the soil in situ and untreated. Under this source removal alternative, contaminants that could potentially leach would be removed from the subsurface and disposed at either an on-Base landfill or an off-site landfill which is appropriately permitted to accept contaminated soil from this site. Although the source area of concern would be removed under this amended remedy, a 5-year review by the lead agency would still be required as long as contaminated groundwater remained at the site.

Monitored natural attenuation and institutional controls are retained from the original ROD as the remedy for groundwater. The institutional controls are outlined in the Land Use Control Implementation Plan (LUCIP, Attachment B). The LUCIP is part of this ROD and an integral part of the remedy.

7.2.1 Estimated Costs

The following cost was estimated for the selected amended soil remedy.

- **Source Removal and On-Base Landfill Disposal**
  
  Capital Cost: $317,800  
  Annual O&M: $0  
  Net Present Worth (NPW): $317,800

- **Source Removal and Off-Site Landfill Disposal**
  
  Capital Cost: $864,200  
  Annual O&M: $0  
  NPW: $864,200

7-2
7.2.2 Remediation Levels

Table 1 presents the remediation levels developed for soil. These levels are based upon North Carolina screening levels that were established to estimate the concentration at which contaminants may leach from soil and create unsafe groundwater conditions.
8.0 EVALUATION OF ORIGINAL AND AMENDED SOIL REMEDIES

This section summarizes the detailed evaluation of the original and the amended soil remedies. During the evaluation, the soil remedies were comparatively evaluated using seven USEPA evaluation criteria: overall protection of human health and the environment; compliance with applicable and relevant or appropriate requirements (ARARs)/ to-be-considered criteria (TBCs); long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost.

8.1 Overall Protection of Human Health and the Environment

This criteria addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

Both the original and amended soil remedies would significantly reduce the human health risks associated with groundwater by completely removing a potential source of the groundwater contamination - the subsurface soil area of concern above the water table. Both of these remedies are source removal alternatives, therefore they would prevent the further leaching of PAH contaminants from the subsurface soil (at 3 to 9 feet bgs) to the groundwater.

Because ecological risks were determined to be insignificant, conditions at Site 3 are already considered to be protective of the environment. As a result, both of the remedies would provide overall protection of the environment. The biocell included under the original soil remedy could potentially present risks to terrestrial receptors. However, if the biocell is properly controlled, these ecological risks would be insignificant.

8.2 Compliance with ARARs/TBCs

This criteria addresses whether or not an alternative will meet the ARARs, TBCs, and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.
No chemical-specific ARARs apply to soil contaminants. Since soil contaminants that exceed the federal soil screening levels would be removed from the subsurface under both of the remedies, soil conditions at the site would meet chemical-specific TBCs. Both soil remedies can be designed to meet all of the location- and action-specific ARARs/TBCs that apply to them.

8.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criteria refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals (remediation levels) have been met.

Both of the soil remedies provide high levels of long-term effectiveness and permanence. Under each of these remedies, the subsurface soil area of concern would be completely removed (to the level just above the groundwater), preventing contaminants from leaching into the groundwater.

8.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

The reduction of toxicity, mobility, or volume through treatment criteria refers to the anticipated performance of the treatment options that may be employed within an alternative.

The original and amended soil remedies each involve the removal and treatment and/or disposal of PAH-contaminated soils. The amended soil remedy (Source Removal and Landfill Disposal) does not satisfy the statutory preference for treatment. Although the original soil remedy would satisfy the statutory preference for treatment, the treatability study indicated the solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents.

8.5 Short-Term Effectiveness

Short-term effectiveness refers to the speed at which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.
Both the original and amended soil remedies will generate potential risks during soil excavation and backfilling activities. The Source Removal and Landfill Disposal remedy could generate potential risks during transportation of the contaminated soil to the disposal facility. The Source Removal and Biological Treatment remedy could generate potential risks during the initial placement of the contaminated soil in the biocell, and during the treatment operation and maintenance (O&M).

The following measures would be taken to provide adequate community and worker protection for both of these remedies: proper materials handling procedures, personal protective equipment, and construction safety fencing. A cover/liner system and periodic maintenance checks would provide additional protection for the treatment cell associated with the original remedy. Neither of the soil remediation alternatives would present significant environmental impacts.

8.6 Implementability

The implementability criteria refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.

Both of the selected remedies are similar in that they involve excavation of contaminated soils. They vary in the treatment/disposal methods. The original remedy includes biological treatment of the soils, which requires mixing of the excavated soil with bulking agents and additives, and long-term O&M of the biocell. However, a treatability study performed to evaluate the effectiveness of the original remedy indicated that the solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents. Therefore, achieving remedial goals with the original remedy may be technically infeasible. The amended soil remedy includes transportation of the contaminated soils to an approved disposal facility, which requires appropriate material handling procedures. The amended remedy would be easier to implement and does not carry the technical feasibility concerns of the original remedy.

8.7 Cost

Cost includes capital and O&M costs for each alternative. For comparative purposes, present worth values are provided.
Costs associated with both of these remedies were estimated at various levels of the investigations. Costs were initially developed for the FS and were presented in the January 1997 ROD. During the development of the Basis of Design report and as new information became available, cost estimates were updated. The biological treatment treatability study provided additional information on the characteristics of the soil, which affected the cost estimates. For the FS cost estimate, the assumption was that the soil was hazardous. However, the treatability study indicated that the soil is nonhazardous. Therefore, instead of disposing the soil in a Subtitle C landfill, the contaminated soil may be disposed of in a Subtitle D landfill, thereby reducing the costs for disposal.

Another factor affecting the cost estimate is the location of the landfill to be used for disposal. Approximately 1,340 cubic yards of PAH-contaminated soil will require disposal in a Subtitle D landfill. There is an on-Base Subtitle D landfill located along Piney Green Road, approximately one mile from Site 3. Costs for disposing of the soil in this landfill is estimated to be $317,800. However, if disposal in the on-Base landfill is not possible, an off-site facility located within 300 miles of the Base would be used for disposal at a cost of approximately $864,200. The estimated cost of implementing the original soil remedy (biological treatment) was approximately $514,000.

Therefore, in a comparison of the original and the amended soil remedies, and depending on which landfill would be used in the landfill disposal alternative, the most cost effective alternative could be either of the two remedies. However, when evaluating each remedy considering the results of the treatability study, it would not be feasible or cost effective to treat the contaminated soil in the biocell since the treatability study proved that solid-phase biological treatment of the PAH-contaminated soil could not achieve all of the treatment criteria for the target PAH constituents.
9.0 STATUTORY DETERMINATIONS

The selected remedy will satisfy the statutory requirements of CERCLA Section 121 which include: (1) protect human health and the environment; (2) comply with ARARs; (3) achieve cost-effectiveness; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element, or provide an explanation as to why this preference is not satisfied. The following paragraphs evaluate the amended soil remedy for OU No. 12 (Site 3) with respect to these requirements.

9.1 Protection of Human Health

Source Removal and Landfill Disposal will protect human health by removing the source area of contamination (i.e, the subsurface soil area of concern) from the site. When this source area is removed, PAH contaminants will no longer leach from the soil to the groundwater. As a result, subsurface soil will no longer be contributing to unacceptable human health risks associated with groundwater.

Because ecological risks were determined to be insignificant, conditions at Site 3 are already considered to be protective of the environment, regardless of any remedy that is implemented.

9.2 Compliance with Applicable or Relevant and Appropriate Requirements

Although there were no chemical-specific ARARs identified for soil at Site 3, the federal soil screening levels were identified as chemical-specific TBCs. Because soil with contaminant levels exceeding these screening levels will be excavated from the subsurface and removed from the site, the selected amended remedy will achieve the soil TBCs.

The selected amended soil remedy will meet all of the location-specific and action-specific ARARs that apply to it.
9.3 Cost-Effectiveness

Compared to the original soil remedy, Source Removal and Landfill Disposal may be less expensive or more expensive than Biological Treatment of the excavated soils depending on the location of the disposal facility. If the contaminated soils can be disposed at the on-Base landfill, the amended soil remedy would be the most cost effective alternative at nearly $200,000 less than Biological Treatment. If the contaminated soils must be hauled to the nearest off-site landfill facility, located approximately 300 miles from the site, then costs for disposal would be greater than the treatment costs by approximately $350,000. However, since the treatability study results indicate that Biological Treatment would not be capable of meeting the soil remediation levels, additional costs would have to be incurred following treatment for subsequent landfill disposal of the partially-treated soil. Therefore, cost effectiveness between the original and amended soil remedies cannot be determined at this time.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected amended remedy will provide a permanent, long-term solution since the source area of contaminated soil will be removed and landfilled.

9.5 Preference for Treatment as a Principal Element

The selected amended remedy will not satisfy the statutory preference for treatment of the soil. A treatment alternative was selected in the original ROD. But as previously stated throughout this Amended ROD, the results of a treatability study determined that the treatment alternative was not capable of meeting the soil remediation levels. Therefore, the treatment alternative would not adequately protect human health and the environment. The amended soil alternative will be protective of human health and the environment since the PAH contaminants will be removed to meet the remediation levels.
10.0 REFERENCES


TABLE 1
SOIL REMEDIATION LEVELS
OPERABLE UNIT NO. 12 (SITE 3)
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>RL</th>
<th>Basis of Goal</th>
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<tr>
<td>Naphthalene</td>
<td>585</td>
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<td>2-Methylnaphthalene</td>
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Notes:

RL = Remediation Level in microgram per kilogram (µg/kg)
NC DENR = North Carolina Department of Environment and Natural Resources
oil to Groundwater (S3: G1)
FIGURE 3

AREAS OF CONCERN
SITE 3 - OLD CREOSOTE PLANT

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

LEGEND

03-MM01 SHALLOW MONITORING WELL LOCATION
03-MM02M INTERMEDIATE MONITORING WELL LOCATION
03-MM03M DEEP MONITORING WELL LOCATION

GROUNDWATER AREA OF CONCERN (SHALLOW AQUIFER)
SUBSURFACE SOIL AREA OF CONCERN

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995
Figure B-1
Boundary of the Site
Site 3 - Old Creosote Plant
Marine Corps Base, Camp Lejeune
North Carolina

Legend:
- Shallow Monitoring Well Location
- Intermediate Monitoring Well Location
- Deep Monitoring Well Location
- Groundwater Area of Concern (Shallow Aquifer)
- Groundwater Flow Direction (Shallow Aquifer)
- Subsurface Soil Area of Concern
- Boundary of Site 3

FIGURE B-2
BOUNDARY OF CURRENT SOIL CONTAMINATION
SITE 3 - OLD CREOSOTE PLANT
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

LEGEND
⊕ SHALLOW MONITORING WELL LOCATION
♀ INTERMEDIATE MONITORING WELL LOCATION
→ DEEP MONITORING WELL LOCATION
≡ BOUNDARY OF CURRENT SOIL CONTAMINATION

BOUNDARY OF CURRENT
SHALLOW GROUNDWATER CONTAMINATION

---

**LEGEND**

- SHALLOW MONITORING WELL LOCATION
- INTERMEDIATE MONITORING WELL LOCATION
- DEEP MONITORING WELL LOCATION
- BOUNDARY OF CURRENT SHALLOW GROUNDWATER CONTAMINATION
- GROUNDWATER FLOW DIRECTION (SHALLOW AQUIFER)

**FIGURE B-3**

BOUNDARY OF CURRENT GROUNDWATER CONTAMINATION
SITE 3 – OLD CREOSOTE PLANT
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

BOUNDARY OF TEMPORARY LAND USE CONTROLS

LEGEND

Shallow Monitoring Well Location
Intermediate Monitoring Well Location
Deep Monitoring Well Location
Subsurface Soil Area of Concern
--- Boundary of Temporary Land Use Controls

FIGURE B-4
BOUNDARY OF TEMPORARY LAND USE CONTROLS
SITE 3 - OLD CREOSOTE PLANT
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995
FIGURE B-6
BOUNDARY OF AQUIFER USE CONTROLS
SITE 3 - OLD CREOSOTE PLANT
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

LEGEND

SHALLOW MONITORING WELL LOCATION
INTERMEDIATE MONITORING WELL LOCATION
DEEP MONITORING WELL LOCATION
GROUNDWATER AREA OF CONCERN (SHALLOW AQUIFER)
SUBSURFACE SOIL AREA OF CONCERN
BOUNDARY OF AQUIFER USE CONTROLS

SOURCE: W.K. DICKSON & CO., INC., JANUARY 1995
Commander, Atlantic Division  
Naval Facilities Engineering Command  
1510 Gilbert Street (Building N-26)  
Norfolk, Virginia 23511-2699  

Attention: Ms. Katherine Landman  
Navy Technical Representative  
Code 1823

Commanding General  
Marine Corps Base  
PSC Box 20004  
Camp Lejeune, NC 28542-004  

Attention: AC/S, EMD/IRD

RE: State Concurrence on the  
Final Amendment to Record of Decision (ROD)  
Operable Unit No. 12 (OU 12), Site 3  
MCB Camp Lejeune, North Carolina

Dear Ms. Landman:

The North Carolina Superfund Section has reviewed of the Final Amendment to the ROD for OU12, Site 3 and concurs with the revised remedy subject to the following conditions:

1. Our concurrence on the ROD Amendment and of the selected remedy for the site is based solely on the information contained in the Amendment. Should we receive additional information that significantly affects the conclusions or remedies contained in the ROD Amendment, we may modify or withdraw this concurrence with written notice to the Navy and MCB Camp Lejeune.

2. Our concurrence on the Amendment to the ROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the Site. The State reserves the right to review, comment, and make independent assessments of all future work relating to this Site.

We appreciate the opportunity to comment on the ROD Amendment and look forward to continuing to work with the MCB Camp Lejeune, the Navy, and EPA to remediate this Site.

Sincerely,

Jack Butler, P.E.  
Section Chief  
Superfund Section

cc: Gena Townsend, US EPA Region IV  
Neal Paul, MCB Camp Lejeune
ATTACHMENT B
LAND USE CONTROL IMPLEMENTATION PLAN
ATTACHMENT B

LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
MCB CAMP LEJEUNE OU NO. 12 (SITE 3)
OLD CRESOSTE PLANT

GENERAL

By separate Memorandum of Agreement dated May 24, 1999, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), the U.S. Environmental Protection Agency (U.S. EPA); the North Carolina Department of Environment and Natural Resources (NCDENR); and the Department of the Navy (Navy) on behalf of U.S. Marine Corps Base, Camp Lejeune, agreed that the Navy and the United States Marine Corps (Marine Corps) shall follow certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP, and, for Site 3, this Land Use Control Implementation Plan (LUCIP). The LUCAP is intended to ensure that all of the Department of the Navy's site-specific selected remedies with land use controls remain protective of human health and the environment. This LUCIP and its requirements are part of the selected remedy within the Final Record of Decision (ROD).

The parties to the LUCAP also agree that the efficacy/protectiveness of the land use controls within this Land Use Control Implementation Plan is contingent upon the Department of the Navy's substantial good-faith compliance with those procedures applicable to the selected remedy. Should such compliance not occur or should the LUCAP be terminated, the parties agree that the protectiveness of the selected remedy may be reconsidered by any party and additional remedial measures may be necessary to ensure the selected remedy remains protective of human health and the environment.

This document is the LUCIP for MCB Camp Lejeune, Site 3, Old Creosote Plant. Site 3 is the sole site comprising Operable Unit (OU) No. 12. This LUCIP is an attachment to and a part of the ROD for the site.

The Navy and the Marine Corps will, pursuant to the LUCAP, include the land use controls set forth in this LUCIP within the Installation's Geographic Information System (GIS) and the base master planning process. Pursuant to the LUCAP paragraph IV. a), the Installation will provide written notification to the State and EPA when the requirements of this paragraph have been met.

All proposed changes to this LUCIP will be submitted to the state and EPA for review and concurrence prior to implementation. Changes to this LUCIP will, if required under the National Contingency Plan, be reflected in changes to the selected remedy made through the appropriate process (e.g., Explanation of Significant Differences, ROD amendment).
The parties agree that the Navy's annual certification of land use control implementation is necessary for as long as the Navy retains ownership of the site. The NCDENR maintains this annual certification is part of the selected remedy. The Navy and Marine Corps maintain this annual certification is a procedure to implement the selected remedy and is not a part of the selected remedy. Nevertheless, all parties agree that a written certification is desirable. Accordingly, pursuant to the LUCAP paragraph V. b), MCB, Camp Lejeune will provide that certification annually to U.S. EPA and the NCDENR that the land use controls within the ROD remain implemented.

SITE BOUNDARY IDENTIFICATION

The geographic boundary of the site is identified in Figure B-1, Boundary of the Site. This boundary indicates the outermost border of all controlled portions of the site (i.e., no areas subject to land use controls lie outside this boundary).

The geographic boundary of the current soil contamination is identified in Figure B-2, Boundary of Current Soil Contamination. This boundary indicates the limits of soil contamination prior to implementation of the remedial action for soil.

The geographic boundary of the current shallow groundwater contamination is identified in Figure B-3, Boundary of Current Groundwater Contamination. This boundary indicates the current limits of groundwater contamination. There are currently no deep groundwater areas of concern.

SITE USE CONTROLS

Construction at Site 3 is temporarily prohibited, except for the implementation of the selected remedy. This control will remain in place only until the selected soil remedy can be implemented. See Figure B-4, Boundary of Temporary Land Use Controls.

Unless specifically excepted by both the NCDENR and the USEPA, intrusive activities (e.g., excavation of soil or insertion of objects into the ground - except for monitoring purposes) are prohibited below the water table within the geographic boundary of the site. See Figure B-5, Boundary of Land Use Controls for Intrusive Activities. These controls are to remain in effect until it can be demonstrated that contaminants no longer remain on site.

AQUIFER USE CONTROLS

Except for monitoring purposes or as specifically excepted by NCDENR or the USEPA, all use of groundwater beneath Site 3 is prohibited. In addition, the installation of any well, other than those constructed for monitoring purposes, is prohibited except as authorized by North Carolina Administrative Code Title 15A, Chapter 2C (as amended), Well Construction. See Figure B-6, Boundary of Aquifer Use Controls. A 1000-foot buffer around areas of known contamination is used to delineate this boundary. These controls are to remain in effect until it can be demonstrated that contaminants no longer remain on site.

SITE ACCESS CONTROLS

There are no controls on site access.
NOTIFICATION

Following the procedures contained within the LUCAFP, MCB Camp Lejeune shall file a Notification of Inactive Hazardous Substance or Waste Disposal Site meeting the requirements of NCGS 130A-310.8.
Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC

EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

USMC CAMP LEJEUNE MILITARY RESERVATION
USMC/LOT 140, HADNOT POINT ARE (SITE 7)
USMC/BLDGS TP452 & TP451 (SITE 10)
USMC/HADNOT POINT BURN DUMP (SITE 3)
USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
USMC/STORAGE LOTS 201 & 203 (SITE 12)
USMC/CAMP GEIGER DUMP (SITE 4)
USMC/BASE SAN LDFL (SITE 5)
USMC/CHM LDFL (SITE 1)
USMC/BLDG PT 37 (SITE 6)
USMC/K-326 RANGE (SITE 8)
USMC/G4A RANGE (SITE 9)
USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/27/2000
Operable Unit: 15
ROD ID: EPA/ROD/R04-00/082

Abstract: NOT AVAILABLE
Remedy: Alternative 69GW-2 - Institutional Controls and Monitored Natural Attenuation

Under this alternative, a groundwater monitoring program, along with land use and aquifer use controls, will be implemented as institutional controls. In addition, remedial actions associated with the in-situ, naturally occurring biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of the VOCs in groundwater are expected in the form of natural attenuation. Existing monitoring wells will be included under this monitoring program. Samples collected from these wells will be analyzed for parameters indicative of natural attenuation as well as for chemical warfare material (CWM) degradation products.

The aquifer use controls will prohibit future use of the shallow and Castle Hayne aquifers, within a 1,000 foot radius of site 69. It should be noted that North Carolina regulations prohibit the installation of water supply wells that draw from the plume even if they are outside the 1,000 foot buffer zone. Details of the site 69 aquifer use controls are presented in Attachment D, the Land Use Control Implementation Plan (LUCIP) for site 69.

To initialize the data collection process, groundwater monitoring at site 69 is currently conducted on an interim semi-annual basis. Details of the monitoring program (number and location of samples collected and analyses performed) are presented in the current Long-Term Monitoring Work Plans for Camp Lejeune. A post-Interim ROD Monitoring Work Plan will be issued that will include quarterly groundwater sampling and analysis of selected shallow, intermediate, and deep wells. The details of the monitoring program will be prepared subsequent to Interim ROD signing. The samples will be analyzed for Target Compound List (TCL) VOCs to monitor contaminant concentrations in the shallow and Castle Hayne aquifers over time. Select groundwater samples will be analyzed for CWM degradation products to detect possible corrosion or rupturing of drums; while select groundwater samples will also be analyzed for inorganics to determine if the inorganic COCs are migrating. For cost estimating purposes, the FS assumed quarterly sampling of 24 wells for years 1 - 5, and semiannual sampling of 12 wells for years 6 - 30. The lead agency will be required to review the effects of this alternative at least once every five years until it can be demonstrated that continued attainment of remedial goals has been achieved. In addition, should the groundwater quality improve, the sampling frequency may be reduced.
Alternative 69SO-2 - Institutional Controls
Under this alternative, institutional controls would be implemented to limit access and control future use of the site. These institutional controls would consist of maintenance of an existing fence and signs which designate the area as a restricted area. Under this alternative, the existing 6-foot high chain-link fencing encompassing the site and warning signs would be maintained to restrict site access. The signs indicate that wastes are buried at the site and that access within the fenced area is prohibited. Under this alternative, the site would be given a land use category in the base master planning process that would prohibit all land uses except for investigative, remediation or monitoring purposes. Details of these controls are included in the LUCIP presented in Attachment D. Because contaminants will be left in place, the lead agency will be required to review the effects of the alternative at least once every five years.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 15
ONSLOW COUNTY, NC
09/27/2000
CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4WD-FFB

Commanding General
Building 1
Marine Corps Base
Camp Lejeune, North Carolina 28542

SUBJ: Interim Record of Decision
Operable Unit 14, Site 69
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

Dear Sir:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document and concurs with the interim selected remedy for the Remedial Action at Site 69. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

An Interim ROD rather than a Final ROD is being implemented at this time due to the reported presence of Chemical Warfare Materiel (CWM) at the site. Discussions with the Design Center for Ordnance and Explosives Team of the Department of the Army Corps of Engineers, have indicated that disposal of such materials is not readily available. EPA’s concurrence on the IROD is based on the understanding that there will be a continuous effort to work with the Army Corps for removal of the CWM within the next five years and groundwater remediation will be implemented within five years.

The selected interim remedial actions address the principle threats associated with the contaminated media at Site 69. The major components of the selected remedy for the soils and groundwater include the following:

- Implementing a groundwater monitoring program targeting VOCs, CWM and inorganics.

- Implementing aquifer use controls to prohibit future use of the shallow and Castle Hayne aquifer within a 1,000 foot radius of the current groundwater plume.

Internet Address (URL) • http://www.epa.gov
• Implementing land use controls to restrict site access and use, and control intrusive activities.

• Filing a Notice of Inactive Hazardous Waste Site ("Notice") for Site 69 at the Onslow County Courthouse.

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 MCB Camp Lejeune 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 MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
    Neal Paul, Camp Lejeune
    Kirk Stevens, LANTDIV
    Dave Lown, NCDEHNR
• Implementing land use controls to restrict site access and use, and control intrusive activities.

• Filing a Notice of Inactive Hazardous Waste Site (“Notice”) for Site 69 at the Onslow County Courthouse.

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 MCB Camp Lejeune 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 MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
    Neal Paul, Camp Lejeune
    Kirk Stevens, LANTDIV
    Dave Lown, NCDEHNR

bcc: Allison Abernathy, HQ

GDT:gt:FFB:28538:8-17-00:OU14IROD.CON
FINAL INTERIM

RECORD OF DECISION
OPERABLE UNIT NO. 14
(SITE 69)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0212

JUNE 2000
FINAL INTERIM

RECORD OF DECISION
OPERABLE UNIT NO. 14
(SITE 69)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0212

JUNE 2000

Prepared for:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania
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ATTACHMENTS

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B  Transcript of Public Meeting
C  Soil to Groundwater Screening Level Calculations
D  Land Use Control Implementation Plan (LUCIP)
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<table>
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<tr>
<th>Acronym</th>
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<td>AOC</td>
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<td>CAIS</td>
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<td>Land Use Control Assurance Plan</td>
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<tr>
<td>LUCIP</td>
<td>Land Use Control Implementation Plan</td>
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<tr>
<td>MCB</td>
<td>Marine Corps Base</td>
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<tr>
<td>MCL</td>
<td>Maximum Contaminant Level</td>
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<tr>
<td>NCAC</td>
<td>North Carolina Administrative Code</td>
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<tr>
<td>NC DENR</td>
<td>North Carolina Department of Environment and Natural Resources</td>
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<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
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<tr>
<td>NCWQS</td>
<td>North Carolina Water Quality Standard</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<tr>
<td>&quot;Notice&quot;</td>
<td>Notice of Inactive Hazardous Substances or Waste Disposal Site</td>
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<tr>
<td>ORP</td>
<td>oxidation-reduction potential</td>
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<td>OU</td>
<td>Operable Unit</td>
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<td>PCBs</td>
<td>polychlorinated biphenyls</td>
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<tr>
<td>PCE</td>
<td>tetrachloroethene</td>
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<tr>
<td>ppt</td>
<td>parts per thousand</td>
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<tr>
<td>PRAP</td>
<td>Proposed Remedial Action Plan</td>
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**LIST OF ACRONYMS AND ABBREVIATIONS**

(Continued)

<table>
<thead>
<tr>
<th>Acronym</th>
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<tr>
<td>RBC</td>
<td>risk-based concentration</td>
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<tr>
<td>RI</td>
<td>Remedial Investigation</td>
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<td>RLS</td>
<td>remediation levels</td>
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<td>ROD</td>
<td>Record of Decision</td>
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<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
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<td>TBC</td>
<td>to be considered</td>
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<td>TCE</td>
<td>trichloroethene</td>
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<td>TCL</td>
<td>Target Compound List</td>
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<tr>
<td>TS</td>
<td>Treatability Study</td>
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<tr>
<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>UVB</td>
<td>Unterdruck Verdampfer Brunnen</td>
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<tr>
<td>VOCs</td>
<td>volatile organic compounds</td>
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<td>ZOI</td>
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DECLARATION

Site Name and Location

Operable Unit No. 14
(Site 69 - Rifle Range Chemical Dump)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purposes

This decision document presents the selected interim remedy for Operable Unit (OU) No. 14 (Site 69) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The selected interim remedy for OU No. 14 was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU No. 14. This Interim Record of Decision (ROD) incorporates a site-specific Land Use Control Implementation Plan (LUCIP) for Site 69 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the Land Use Control Assurance Plan (LUCAP).

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment and Natural Resources (NC DENR) on the selected remedy. A copy of the NC DENR approval letter dated April 14, 2000, is presented in Attachment E. Concurrence from the United States Environmental Protection Agency (USEPA) Region IV is anticipated. Formal USEPA Region IV concurrence is not provided until after the ROD is signed.

Assessment of the Site

Actual or threatened releases of hazardous substances from Site 69, if not addressed by implementing the response actions selected in this Interim ROD, may present potential threats to public health, welfare, or the environment.

An Interim ROD rather than a Final ROD is being implemented at this time due to the reported presence of Chemical Warfare Materiel (CWM) at the site. Records indicate that waste CWM was buried at the site. Monitoring for CWM was performed during the investigation with all intrusive activities for health and safety reasons; no CWM constituents were detected. Soil, sediment, and groundwater samples collected as part of the Remedial Investigation (RI) were analyzed for CWM degradation products. CWM degradation products were detected in the surface soil, and the on-site and drainage area sediment at several locations.

Based on discussions with the Design Center for Ordnance and Explosives Team of the Department of the Army Corps of Engineers, the unearthing of CAIS would require indefinite storage somewhere at MCB Camp Lejeune while waiting for final disposition. Currently, disposal of such materials is not readily available. Transportation and disposal at commercial facilities may soon be available for such wastes generated by military facilities. A concurrence letter from the Army Corps of Engineers is presented Attachment A.
Description of the Selected Remedy

The interim actions to be completed at OU No. 14 for Site 69 are Institutional Controls and Monitored Natural Attenuation.

The selected remedial actions included in this Interim ROD address the principle threats associated with contaminated media at Site 69. The interim remedy addresses the human health and ecological risks due to volatile organic compounds (VOCs) in groundwater and human safety risks due to buried CWM. Natural attenuation, monitoring, and controls on future use of the affected aquifers address the principle threat caused by VOC contaminated groundwater. Land use controls address the principle threats caused by soil contamination and possible presence of CWM. The interim remedy was not intended to address inorganic contaminants in groundwater. However, inorganic contaminants will be monitored and will be addressed further in a Final ROD, if necessary.

The provisions of this Interim ROD shall remain in effect until it is demonstrated that continued attainment of remedial goals has been achieved or until this Interim ROD is superseded by a Final ROD for the site. The major components of the selected remedy for the various media of concern at OU No. 14 include the following:

- Implementing a groundwater monitoring program targeting the VOCs of concern at the site. Natural attenuation processes are anticipated to reduce contaminants in groundwater over time. If remediation levels for groundwater are not achieved or substantial progress towards remedial goals cannot be documented, the alternatives for groundwater remediation will be reevaluated.

- Monitoring of CWM degradation products in groundwater in select wells.

- Monitoring of inorganics in groundwater in select wells.

- Implementing aquifer use controls to prohibit future use of the shallow and Castle Hayne aquifers within a 1,000 foot radius of the current boundary of groundwater VOC contamination at Site 69.

- Implementing land use controls which include controls on shallow and deep aquifer use (discussed above), controls on site access and use, and controls on intrusive activities. These controls are presented in the LUCIP which is included in this document as Attachment D.

- Filing a Notice of Inactive Hazardous Waste Site (“Notice”) for Site 69 at the Onslow County Courthouse.

Statutory Determinations

The selected interim remedy will provide protection of human health by preventing exposure to potential contaminants and wastes at Site 69 through institutional controls and monitored natural attenuation. Institutional controls provide protection of human health by preventing exposure to potential contaminants in site media. Land use controls serve to prevent exposure to contaminated soil and the possible presence of CWM. Aquifer use controls prevent exposure to contaminated groundwater by controlling the use, other than for monitoring purposes, of the
contaminated groundwater by controlling the use, other than for monitoring purposes, of the aquifers within 1,000 feet of the identified groundwater plumes. It should be noted here that the installation of water supply wells that draw contaminated water from the plume, even if the wells are located outside the 1,000 foot buffer, are prohibited by North Carolina regulations. Natural attenuation processes are expected to reduce groundwater contaminant levels, and the associated monitoring program will track the success of such processes and plume movement.

The selected alternative will provide a permanent, long-term remedy through contaminant reduction and provision and enforcement of institutional controls in the base master planning process. In addition, the institutional controls for Site 69 will include recordation of a “Notice” with the Onslow County courthouse.

The selected interim remedy for Site 69 satisfies the preference for treatment by utilizing the alternative treatment technology of monitored natural attenuation. Currently, technological limitations due to the potential presence of CWM prevent the removal of the source of contaminants which may prohibit achievement of State and Federal groundwater standards. A waiver of Federal applicable or relevant and appropriate requirements (ARARs) is possible on the grounds that it may be technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate.

Signature

Major General R.G. Richard
Commanding General
Marine Corps Base, Camp Lejeune

Date

29 JUN 2000
1.0 SITE NAMES AND LOCATIONS

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 square miles and is bisected by the New River. The New River flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the base are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville borders the base to the north.

The MCB, Camp Lejeune complex consists of six geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Greater Sandy Run Area, and the Rifle Range Area. Site 69 is located within the Rifle Range Area.

OU No. 14 is one of 18 Operable Units located within MCB, Camp Lejeune. Figure 1 depicts the location of OU No. 14 within MCB, Camp Lejeune. As shown, OU No. 14 is located within the southwest portion of the base.

The remainder of this Interim ROD is divided into four main sections under the following headings:

- Site 69 - Rifle Range Chemical Dump
- Selected Remedy
- Statutory Determinations
- Responsiveness Summary

The first section of this Interim ROD presents pertinent information related to Site 69’s history, previous investigations including nature and extent of contamination and summary of the site risks, scope and role of remedial action, description of the remedial action alternatives, and a summary of the alternative evaluation and comparative analysis. The second section identifies the selected remedy for Site 69. The statutory requirements are reviewed within the third section; and the fourth and final section documents all public comments as well as the DoN’s responses to the comments received.

All of the tables and figures presented within this Interim ROD are presented at the back of this document. A letter of concurrence acknowledging the conditions at Site 69 and a statement regarding the Army’s practice for CWM removal is presented in Attachment A. The transcript of the public meeting held to review the Proposed Remedial Action Plan (PRAP) on June 30, 1998 is presented in Attachment B. Soil to groundwater soil screening level calculations are shown in Attachment C. This Interim ROD also incorporates a site-specific LUCIP for Site 69 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the LUCAP. The LUCIP is presented in Attachment D. In addition, the Interim ROD approval letter received from the NC DENR is incorporated by reference and is presented in Attachment E.

2.0 SITE 69 - RIFLE RANGE CHEMICAL DUMP

The following information will be presented: site description and history, previous investigations including nature and extent of contamination and summary of the site risks, scope and role of remedial action, summary of the remedial action alternatives, and evaluation of alternatives/comparative analysis.
2.1 Site Description and History

Figure 2 presents a site map of the Rifle Range Chemical Dump (Site 69). Site 69, the Rifle Range Chemical Dump, is located west of the New River in the area of MCB, Camp Lejeune known as the Rifle Range. The site is approximately 14 acres in size and is situated in a topographically high area. The area is overgrown to the point that the boundary of the former dump is not readily noticeable. Three surface water bodies are located within a quarter mile of the site: the New River to the east, an unnamed tributary of the New River to the north, and Everett Creek to the south. The site area is rather secluded. However, training exercises are conducted throughout the surrounding area. Currently, a fence surrounds the site to restrict access.

Site 69 has a reported history of CWM disposal as well as other chemical wastes. During the period 1950 to 1976, the area was used to dispose of chemical wastes including polychlorinated biphenyls (PCBs), solvents, and pesticides. Based on available documentation, the CWM suspected at Site 69 are chemical agent identification sets (CAIS) which contain calcium hypochlorite (an ingredient of mustard gas), high-test hypochlorite (HTH; also known as mustard gas), and other chemical agents.

CAIS were produced in large quantities (110,000 sets) and various configurations by the U.S. Army to train soldiers and sailors in the identification of actual chemical warfare agents and in the proper actions upon identification. The sets contain vials (ampules) or bottles of agent. The agents used in these sets could contain blister agents [mustard (H) and lewisite (L)], nerve agents (GA, GB, and VX), blood agents [hydrogen cyanide (AC) and cyanogen chloride (CK)], and choking agent [phosgene (CG)].

There are several different types of CAIS. Unfortunately, the types of CAIS used at MCB, Camp Lejeune are unknown. In addition, there is a lack of information to properly identify the quantity or disposal methods associated with the CAIS. With respect to disposal, it is not known whether the CWM was destroyed (via burning or detonation) prior to disposal. Existing information, however, does mention that drums were used during disposal. With respect to disposal of other chemical wastes, it is unknown if PCBs, solvents, and pesticides were buried in drums or directly dumped into trenches that exist at the site. Identification of the disposal actions could not be determined during the investigation because of the safety risks associated with the reported buried CWM.

2.2 Previous Investigations

Investigations conducted at Site 69 to date have focused on non-CWM contaminants based on historic disposal of chemical wastes (solvents, PCBs, pesticides, etc.) at the site. Monitoring for CWM was performed during the investigations with all intrusive activities for health and safety reasons, but no CWM was ever detected. However, the investigation was not intended to confirm or deny the presence of CWM.

A letter of concurrence regarding the current status of CWM remedial actions and limitations, as acquired from the U. S. Army Corps of Engineers, is provided in Attachment A.

Because the suspected CWM of concern at Site 69 are primarily CAIS and because of the remote location of Site 69, the Army has determined that Site 69 is a low priority site for CWM issues. The Army’s current recommendation is to minimize disturbance of such sites until the time that
the Army has developed adequate tools to use in the assessment and remediation of such sites and has sufficient personnel to support investigation and clean-up efforts. Due to the Army’s commitment to address high priority sites first, it is anticipated to be several years before Army support may be available. Therefore, the DoN’s Installation Restoration (IR) Program response to date has been restricted to non-CWM investigations with appropriate Army assistance for health & safety issues only.

Pre-Remedial Investigation Studies

Previous investigations conducted under the DoN’s IR Program during the late 1980s and early 1990s at Site 69 focused on shallow groundwater, surface water, and sediment. Eight shallow wells were installed (69-GW01-69-GW08) and only four surface water/sediment samples were collected. No soil samples were obtained prior to the RI. Shallow groundwater exhibited elevated levels of volatile organics in the southern portion of the site, primarily in monitoring well 69-GW02 and 69-GW03. The volatiles included 1,2-dichloroethene (DCE) (11,000 µg/L), trichloroethene (TCE) (67 µg/L), and vinyl chloride (36 µg/L). Surface water samples obtained from on-site standing water in low-lying areas of the site revealed the same constituents as were detected in shallow groundwater, but at much lower levels. These low-lying areas were located in the southern portion of the site near monitoring well 69-GW02.

Remedial Investigation

The RI field investigations were initiated in January 1994 and completed in April 1996. Data collected during the RI were evaluated to assess the extent of contamination in all site media and the potential for human health and ecological risks to occur based on current and future potential exposure at the site.

The following observations and conclusions were made during the RI.

- Shallow groundwater has been impacted with volatile organic compounds by former disposal operations. The VOC contamination, which is dominated by 1,2-DCE, is present in the southern portion of the site, near monitoring wells 69-GW02 and 69-GW15. In this area, VOCs are above Federal and State drinking water standards. VOCs also were detected in offsite shallow wells, but at much lower levels. Off-site contaminant levels are below Federal and State drinking water standards. The horizontal extent of the VOC plume in the shallow aquifer has been defined, and primarily is present under the former disposal area.

- The vertical extent of VOC contamination (i.e., primarily 1,2-DCE) in groundwater appears to be located in the upper portion of the Castle Hayne Aquifer. VOC levels in the upper portion of the Castle Hayne Aquifer appear to decrease rapidly as the plume migrates offsite to the east-southeast. Offsite VOC levels in the upper portion of the Castle Hayne Aquifer are below State and Federal groundwater standards.

- Groundwater quality in the intermediate zone of the Castle Hayne Aquifer has been slightly impacted by the VOCs. Low levels of 1,2-DCE were detected in monitoring wells 69-GW03DW and 69-GW15DW at concentrations below State and Federal drinking water standards. No off-site intermediate zone wells exhibited contamination.
Target VOCs have not migrated to the deep zone of the Castle Hayne Aquifer.

Although VOCs are present in both the shallow and Castle Hayne aquifers, the vertical and horizontal extent of contamination is limited in area. Based on existing data, the plume is estimated to cover an area of approximately three to four acres centering near well cluster 69-GW15.

The source of the VOCs may be associated with buried waste near well cluster 69-GW15. This area contains a significant amount of buried metallic debris, based on the results of the geophysical surveys. It is possible that the source of VOCs are within the fill area and may continue to impact groundwater quality. However, VOC levels in downgradient monitoring wells 69-GW02 and 69-GW03 appear to be decreasing.

Elevated total metals in shallow groundwater are not believed to be indicative of past disposal operations. This conclusion is based on the following: metal concentrations in soil are similar to levels typically encountered throughout MCB, Camp Lejeune; there is no pattern or plume to suggest that the total metals are elevated due to a source; total metals in groundwater are similar to some of the background wells throughout the base; and, dissolved metals in groundwater are not elevated.

Onsite ponded water in the southern portion of the site is contaminated with VOCs. The ponded water appears to be hydraulically connected to the shallow aquifer.

Offsite surface water bodies have not been impacted by the site.

Under current human health exposure scenarios, there are no adverse human health risks mainly because groundwater in this area is not utilized for potable supply, and because access to the site is restricted.

Under future potential human health exposure scenarios involving residential use of the area, adverse human health risks would result due to groundwater exposure. Future residential use of the area is unlikely since the site is suspected of containing buried CWM.

There are no significant ecological risks to aquatic or terrestrial receptors associated with Site 69. Although environmental media concentrations exceeded ARARs/TBCs, aquatic biosurveys indicate fish and benthic macroinvertebrate populations that are representative of typical estuarine and tidal freshwater systems are not adversely impacted by contaminant sources.

Based on the human health and ecological risk assessments, groundwater is a media of concern at Site 69. Although there is no current groundwater exposure pathway that would result in adverse human health risks, VOCs are migrating into the Castle Hayne Aquifer. VOCs and inorganic contaminants were identified as contaminants of concern (COCs) for groundwater. The Castle Rayne Aquifer is utilized extensively throughout MCB, Camp Lejeune and the surrounding communities as a source of water.
Based on the human health and ecological risk assessment, soil is not a media of concern at Site 69. However, there is a safety risk to humans under future land use scenarios due to the potential existence of buried CWM. Further, soil is a suspected source of VOC contamination for groundwater. The location of the source material remains unconfirmed due to the possible presence of buried CWM. Therefore, soil remains a media of concern at Site 69.

**Post RI Treatability Study**

In February 1996, a Treatability Study (TS) was initiated to evaluate an in-situ groundwater treatment technology at Site 69.

The DoN conducted this two phase treatability study to determine the technical and economic feasibility of using an innovative in-well aeration technology at Site 69. Two aeration well systems were installed: a UVB system in the upper Castle Hayne Aquifer; and a KGB system in the shallow aquifer. The objectives of the Phase I study (six months of actual operation) were to show that a groundwater circulation cell could be created at the site which would mobilize and transport contaminants to the UVB and KGB systems for treatment; experimentally (via dye test) determine the zone of influence (ZOI) of each circulation cell; and show that contaminants were being removed by monitoring for target VOCs in the off-gases, and in groundwater.

During six months of operation, the UVB well did not mobilize significant contaminants to the well for treatment. During the same time, the KGB well mobilized and removed at least 10.10 kg of target VOCs by stripping. On average, concentration of target VOCs were reduced by 15% in groundwater monitoring wells within the estimated ZOI of the KGB.

A round of groundwater samples were collected from selected monitoring wells at the end of the Phase I TS. The results show that groundwater in the upper zone of the Castle Hayne Aquifer remain high near the source area.

The following recommendations were made at the end of the Phase I TS:

(i) Relocate the UVB well to the area of high contamination in order to determine its treatment rate and efficiency as a remediation system.

(ii) Continue operation of the KGB system.

(iii) Conduct frequent (every two weeks) sampling and analysis of off-gases from both systems to determine the removal rates of target VOCs.

(iv) Sample groundwater from selected wells in the immediate vicinity of both systems.

The Phase II TS was initiated in June 1997. Plugging problem continued with the KGB system, and in October 1997, it was decided to shut down the KGB system. The UVB system was monitored until December 1997.

The following conclusions can be drawn from the data obtained and field observations made during the Phase II TS:
The KGB System

1. The KGB system failed to operate and perform consistently due to frequent plugging from the sand and sediments. This problem resulted from the formation material being substantially finer than the sand pack.

2. Every time after the well was redeveloped, the KGB system did operate adequately for a period of up to two weeks. Data collected during this period showed that volatile contaminants were being removed in the off-gas.

3. The ZOI of the KGB system could not be determined because it appears to be smaller than the monitoring wells positioned for such measurements.

4. The KGB system failed to meet the objectives of the treatability study.

The UVB-400 System

1. The UVB-400 system was successful in reducing the high concentrations observed in well 15UW after the Phase II TS. Concentrations of target VOCs in the well were reduced by 99%. A high ratio (85%) of recirculated water to fresh water entering the cell from the capture zone is causing excessive dilution of the contaminants, particularly near the UVB well.

2. In its present position, tile UVB system will effectively treat contamination in well 15IW. However, an asymptotic decrease in the concentration of contaminants will not be seen until at least a year of operation. Based on mathematical predictions, it will take a maximum of seven years of operation to reduce the concentrations of target compounds to less than 5 µg/L, in well 151W.

3. The slow treatment rate may be due to two factors: (a) Well 15IW is probably located immediately below the source area, and contaminants are being released from the source at a significant rate, and (b) mobilization of contaminants is being controlled by molecular diffusion from the sand/clay formation.

4. Pressure transducer test conducted at well cluster MW17 indicated that at a minimum, the circulation cell is influencing a radial distance of 56 ft. from the UVB.

5. Off-gas data indicted that the air stripping mechanism of the UVB system maintained a stripping efficiency of 98%. Approximately 8.3 lb of VOCs were removed during the Phase II study.

6. The spread of contamination in the upper Castle Hayne Aquifer is not uniform. Areas of high contamination appear scattered.

7. The groundwater recirculation rate attainable at the UVB-400 site (7.42 gpm) is less than that attainable at the UVB-250 site (20 gpm).

8. The chlorinated hydrocarbons in the area around monitoring well 15IW has been reduced by 16 percent. This is based on laboratory analysis of groundwater sample
showing 9,980 µg/L total volatiles on August 28, 1997 and of 8,400 µg/L on December 12, 1997.

9. All other monitoring areas (except 151W and 17UW) show little or not chlorinated hydrocarbon contamination.

2.3 Highlights of Community Participation

The PRAP for OU No. 14 (Site 69) was released to the public on June 28, 1998. This document is available in an administrative record file at information repositories maintained at Onslow County Public Library and the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 14 (Site 69) mailing list were sent a copy of the Final PRAP. The notice of availability of the PRAP was published in the "Jacksonville Daily News" on June 28, 1998. A public comment period was held from June 28, 1998 to July 28, 1998. In addition, a public meeting was held on June 30, 1998 in order to accept public comments on the PRAP for OU No. 14 (Site 69). The public meeting minutes were transcribed and a copy of the transcript is presented in Attachment B of this Interim ROD document. A copy of the transcript is also made available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this Interim ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this Interim ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the Interim ROD in the local newspaper, and place this Interim ROD in the information repositories.

2.4 Scope and Role of Remedial Action

The results of the baseline human health and ecological risk assessments were evaluated to determine the areas of concern (AOC) within OU No. 14 that may warrant remediation or institutional controls to protect the public health and the environment.

Site 69 Areas of Concern

Shallow and deep groundwater and soil (including the landfill material) are media at Site 69 which could potentially pose unacceptable future human health, ecological, or human safety risks. As mentioned previously, these media do not present unacceptable risks to human health or the environment, at present.

Shallow and deep groundwater have been combined as one area of concern because of their hydraulic connection to one another (the aquifers are interconnected to each other and are contaminated by the same source). Shallow groundwater within the southeast portion of the former disposal area has exhibited elevated VOCs (mainly 1,2-DCE, TCE, and vinyl chloride) and to a limited degree, total metals (mainly iron and manganese). The total metals may be elevated as a result of sampling techniques/geologic conditions and not because of former disposal activities. Although there is no current human receptor associated with groundwater, future potential exposure to groundwater could occur under a residential land use scenario, or via migration of VOCs to potable supply wells in the Castle Hayne Aquifer. Although no base supply wells are in danger of being contaminated, new wells or off-base wells could potentially be contaminated over time.

The following objectives have been identified for groundwater:
Prevent future potential exposure to contaminated groundwater;

Protect uncontaminated groundwater for future potential beneficial use; and

Restore contaminated groundwater for future potential beneficial use.

Soil, including the landfill material, has been identified as the second AOC at Site 69. The soil/landfill material does not currently result in unacceptable human health risks, but may result in unacceptable safety risks under all future potential land use scenarios due to the potential existence of buried CWM. Also, although the detected soil contaminant concentrations do not directly contribute to a current or future human health risk, soil is the presumed source of VOC groundwater contamination.

The following remedial action objectives have been identified for soil at Site 69:

Prevent future potential exposure to contaminated subsurface soil (including landfill materials); and

Prevent potential migration of contaminants to shallow groundwater.

2.5 **Summary of Site Characteristics**

Site 69 is underlain by silty sands from the ground surface to a depth of approximately 18 feet. Beneath the silty sand is a fairly continuous sandy clay, and sand and clay unit, to a depth of approximately 27 feet. This unit could potentially act as a retarding layer. The upper unit of the Castle Hayne Aquifer, which was encountered below the sand and clay retarding layer, consists of silty sand with shell and limestone fragments.

The upper portion of the formation is comprised of silty sand with shelf and limestone fragments with an average thickness of approximately 40 feet. Below the silty sand is a sand unit with trace to little silt. This unit also exhibits a sandy clay/clayey sand layer, with an approximate thickness of 109 feet, at a depth of 145 feet. The deep borings to the bottom of the Castle Hayne Aquifer encountered limestone beds in the lower portion, beneath the sand unit. These limestone beds are identified in the literature as “marker beds” for the bottom of the Castle Hayne Aquifer, and were encountered in the three deep borings performed in March/April 1996 at depths of approximately 207 feet.

Beneath the limestone beds is silty sand with a 4 foot thick silty, sandy clay layer/lenses. At a depth of 245 feet, a silty sand unit was encountered which appeared to be glauconitic. Glauconitic is a descriptive term which refers to a greenish platy material which occurs in sediments of marine origin. A glauconitic sand unit is identified as part of the Beaufort formation, which lies below the Castle Hayne Aquifer and the Beaufort confining unit.

The shallow groundwater is typically encountered within a few feet of ground surface to a depth of approximately 5 feet. Groundwater flow is radial from the site to the low lying areas to the north, south, east, and west. Groundwater flow in the upper portion of the Castle Hayne Aquifer is towards the south/southeast in the southern portion of the site. There would appear to be some interconnection between the shallow water table aquifer and the Castle Hayne Aquifer due to the similar groundwater elevations at some of the monitoring well locations. Groundwater flow in
the deep portion of the Castle Hayne Aquifer is eastward towards the New River. Recharge for the Castle Hayne Aquifer would be from the west, and possibly from the surficial aquifer as the units are separated by a semiconfining layer. The gradient for the deep Castle Hayne Aquifer was calculated to be 0.002 ft/ft, which is flat.

2.6 Summary of Site Risks

Human Health Risk Assessment

The baseline human health risk assessment was based on possible exposure pathways under current and future potential exposure scenarios. Under current conditions, the exposed population considered base personnel who may be exposed to site contaminants during military training operations (Site 69 is in a remote area of the base where military training occurs). The exposure medium is primarily associated with surface soil. Groundwater was not considered as an exposure medium since the base is serviced by a public (base) water supply system. In addition, there are no supply wells which have been impacted by Site 69. Future potential exposure scenarios involved construction personnel and residential use. For the residential scenario, groundwater and surface soil were identified as exposure media. It should be noted that the future residential exposure pathway to soil or groundwater is extremely unlikely given that the site is suspected of containing buried CWM. For the future construction pathway, subsurface soil was identified as the exposure medium.

Given the absence of chemicals of potential concern (COPCs) in the surface soil, current land use (fenced area with restricted access), and that groundwater in this area is not used for potable purposes, there are no current risks posed to any population from this site. Under the future potential risk exposure scenario, the total site incremental carcinogenic risk (ICR) estimated for children (4E-04) and adults (6E-04) exceeded the USEPA’s upper bound risk range (1E-04). The total site ICR estimated for construction workers (6E-08) was less than the USEPA’s lower bound target risk range (1E-06). Additionally, the total site hazard index (HI) for children (28) and adults (11) exceed unity. The total site HI estimated for the construction worker (0.02) did not exceed unity. The total site risk under the future potential exposure scenarios was driven by exposure to shallow groundwater. It should be noted that the estimated ICRs and HIs for exposure to subsurface soil do not account for the possibility of exposure to CWM since CWM-related contaminants could not be quantified during the RI.

Site-specific soil screening levels (SSLs) that estimate a contaminant concentration at which that contaminant is likely to migrate from soil to groundwater were calculated and are presented in Attachment C. These SSLs were calculated based on equations for organics and inorganics obtained from USEPA’s Soil Screening Guidance: Technical Background Document (USEPA, 1996). Site-specific/chemical-specific parameters were input into the equations when available. The target soil leachate concentrations (Cw) for each compound and analyte used in the SSL calculations were the groundwater COC remediation levels (RLs) determined in the Feasibility Study (FS).
Ecological Risk Assessment

Overall, metals and pesticides appear to be the most significant site related COPCs that have the potential to affect the integrity of the aquatic ecosystems at OU No. 14. For the terrestrial ecosystems, metals appear to be the most significant site related COPCs that have the potential to affect terrestrial receptors at OU No. 14.

Potential adverse impacts to threatened or endangered species are low due to the absence of critical habitats or noted observations at the site. Biohabitats maps did not indicate a significant impact to ecological resources on or near Site 69.

Copper and silver exceeded the ARARs or guidelines “to be considered” (TBCs) in surface water. The silver quotient ratio was slightly high. Although silver was above the base-wide and median concentrations, it is not related to the site. This conclusion is based on fish tissue samples collected from Everett Creek and the New River which showed similar contaminant concentrations compared to published background levels and the detection of low surface water silver concentrations within Everett Creek. Silver was not detected in sediment samples collected from Everett Creek or the New River. However, silver was detected in upstream New River surface water samples at concentrations similar to those found in Everett Creek. Additionally cadmium, mercury, benzo(a)pyrene, 4,4’-DDE, 4,4’-DDT, and PCB-1260 exceeded National Oceanic and Atmospheric Administration (NOAA) sediment screening criteria. The sediment exceedances indicated concentrations above the base-wide and median concentration for cadmium, mercury, 4,4’-DDE, 4,4’-DDT, and PCB-1260.

The potential risks to aquatic receptors due to the above exceedances in the surface waters around the site was evaluated by conducting biosurveys and fish tissue analysis. Fish populations were sampled and were representative of estuarine and tidal freshwater systems. The predominant fish species were croaker, Easter mosquito, and pinfish. There were no anomalies observed on tile fish. The fish community appeared healthy, suggesting it was not impacted by site-related or other contaminants.

Fish tissues were sampled and the following were detected: organics (benzene, toluene, and 2-methyl phenol), pesticides (4,4’-DDE and 4,4’-DDD), PCBs (1254 and 1260), and metals (aluminum, beryllium, cadmium, iron, selenium, silver, and zinc). The levels detected in fish tissue were low when compared to published background values, indicating that the fish were not impacted by excess levels of these COPCs due to the site.

Benthic invertebrates were sampled and were representative of estuarine and tidal freshwater species. The predominant species included capitellids followed by tubificids, spionids, goniadids, and bivalves. Diversity and density were characteristic of salinity ranges of zero to 15 parts per thousand (ppt) in regional surface waters.

No COPCs exceeded soil toxicity reference levels and based on the comparison of chronic daily intakes and terrestrial reference values, there does not appear to be an impact to terrestrial organisms including rabbits, deer, quail, fox, and raccoon from the site.
2.7 Summary of Remedial Action Alternatives

A selected remedy should be protective of human health and the environment; be cost effective; comply with applicable statutory laws, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent possible. The remedy also should comply with the same statute that prefers the use of treatment as a principle element for the reduction of toxicity, mobility, or volume of hazardous substance.

Five alternatives were developed to meet the remedial objectives for groundwater and two alternatives were developed to meet the remedial objectives for soil. A short description of these alternatives and a summary of their associated costs are presented below.

2.7.1 Site 69 Groundwater (GW) Alternatives

The groundwater remedial alternatives developed for Site 69 are listed below:

- Alternative 69GW-1 - No Action
- Alternative 69GW-2 - Institutional; Controls and Monitored Natural Attenuation
- Alternative 69GW-3 - Groundwater Extraction and Physical Treatment with Institutional Controls and Monitoring
- Alternative 69GW-4 - Dual-Phase Vacuum Extraction and Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring
- Alternative 69GW-5 - In-Situ Air Striping with Institutional Controls and Monitoring

Alternative 69GW-1 - No Action

Description: Under this alternative, no actions would be taken to contain or treat contaminated groundwater at Site 69. Natural attenuation of contaminants will most likely occur. However, this alternative provides no controls to ensure that it is occurring, nor does this alternative prevent accidental exposure should the plume migrate unnoticed to an exposure point.

Shallow groundwater generally flows radially from the center of the site, whereas deeper groundwater in the Castle Hayne Aquifer flows in a general easterly direction towards the New River. Groundwater on site currently is not used for any purpose. Potable water throughout the base is supplied by wells located in the mid and lower regions of the Castle Hayne Aquifer. The shallow aquifer is not used as a potable water supply on base. However, both the shallow and upper Castle Hayne aquifers are classified as GA waters under the North Carolina Water Quality Standards (NCWQS), which are current or potential sources of drinking water. There are no groundwater production wells located downgradient of the site.

Cost: There are no costs associated with this alternative.
Alternative 69GW-2 - Institutional Controls and Monitored Natural Attenuation

**Description:** Under this alternative, a groundwater monitoring program, along with land use and aquifer use controls, will be implemented as institutional controls. In addition, remedial actions associated with the in-situ, naturally occurring biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of the VOCs in groundwater are expected in the form of natural attenuation. Existing monitoring wells will be included under this monitoring program. Samples collected from these wells will be analyzed for parameters indicative of natural attenuation as well as for CWM degradation products.

The aquifer use controls will prohibit future use of the shallow and Castle Hayne aquifers, within a 1,000 foot radius of Site 69. It should be noted that North Carolina regulations prohibit the installation of water supply wells that draw from the plume even if they are outside the 1,000 foot buffer zone. Details of the Site 69 aquifer use controls are presented in Attachment D, the LUCIP for Site 69.

To initialize the data collection process, groundwater monitoring at Site 69 is currently conducted on an interim semi-annual basis. Details of the monitoring program (number and location of samples collected and analyses performed) are presented in the current Long-Term Monitoring Work Plans for Camp Lejeune. A post-Interim ROD Monitoring Work Plan will be issued that will include quarterly groundwater sampling and analysis of selected shallow, intermediate, and deep wells. The details of the monitoring program will be prepared subsequent to Interim ROD signing. The samples will be analyzed for Target Compound List (TCL) VOCs to monitor contaminant concentrations in the shallow and Castle Hayne aquifers over time. Select groundwater samples will be analyzed for CWM degradation products to detect possible corrosion or rupturing of drums; while select groundwater samples will also be analyzed for inorganics to determine if the inorganic COCs are migrating. For cost estimating purposes, the FS assumed quarterly sampling of 24 wells for years 1-5, and semiannual sampling of 12 wells for years 6-30. The lead agency will be required to review the effects of this alternative at least once every five years until it can be demonstrated that continued attainment of remedial goals has been achieved. In addition, should the groundwater quality improve, the sampling frequency may be reduced.

In an effort to provide additional evidence that natural attenuation is occurring, this alternative incorporates the option of performing an annual contaminant fate and transport model.

**Cost:** The estimated costs of this alternative are as follows:

- **Capital:** $0
- **Annual operation and maintenance:** $63,000 (years 1-5); $24,000 (years 6-30)
- **Net present worth (30-year):** $535,000

Alternative 69GW-3 - Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

**Description:** Under this alternative, a groundwater extraction, treatment, and discharge system would be constructed and operated on site for the shallow and upper Castle Hayne aquifers.
The groundwater extraction system would be used to extract and contain groundwater contaminated above the cleanup goals developed for the shallow and upper Castle Hayne aquifers (i.e., NCWQS). If possible, the system would be operated until groundwater cleanup goals are achieved. However, these levels may be impossible to achieve since it has been demonstrated that groundwater contaminant levels typically reach asymptotic levels, which may exceed NCWQS. Performance curves would be periodically (e.g., annually) developed to monitor the effectiveness of the groundwater remediation system. If the performance curves indicate that asymptotic levels have been reached, which exceed NCWQS for some contaminants, then the cleanup goals would be re-evaluated at that time. In addition, although contaminants detected in the groundwater exceeded State and Federal standards, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards.

Groundwater would be pumped using a series of downgradient well pairs located near the downgradient edge of the contaminant plume and a well pair located near the plume center. Each well pair would consist of a shallow well (approximately 25 feet deep) and an upper Castle Hayne well (approximately 60 feet deep). All pumping wells would be connected to a common header pipe that discharges to a common treatment system. The groundwater treatment system included under this alternative has been sized to accommodate a total flow rate of 100 gallons per minute (gpm).

Based on available data, it appears that a pretreatment system may be needed for the removal of suspended solids and nuisance metals from groundwater, such as iron and manganese, to prevent fouling (clogging) of the air stripper. If necessary, an acid (e.g., sulfuric acid) or sequesterant (e.g., polyphosphate chemicals) addition system could be included which would help keep dissolved iron and manganese in solution, with only a modest increase in capital and operating cost. With this type of system, a low-profile air stripper would be desirable because, if necessary, it could be disassembled and cleaned periodically much easier than could a packed tower.

If a more aggressive pretreatment system is needed for the removal of suspended solids and nuisance metals from groundwater, capital and operating costs would increase by more than twofold. In this case the pretreatment could consist of equalization, flocculation/precipitation, clarification, filtration, and sludge dewatering.

The treated groundwater would be discharged to the New River, which is located approximately 1,200 feet from the site.

Under this alternative, a groundwater sampling program would be initiated for the site. The groundwater sampling program would incorporate the periodic sampling of existing groundwater monitoring wells. Initially, groundwater sampling would be conducted on a semi-annual basis (i.e., two times per year) until a stable or decreasing trend in contaminant levels is observed.

In addition to the environmental monitoring program, institutional controls would be implemented under this alternative to control groundwater usage in the vicinity of the site. The site would be given a groundwater use category in the base master planning process that would prohibit installation of potable water supply wells in the vicinity of the site (e.g., within a 1,000-foot radius).
Cost: The estimated costs of this alternative are as follows:

- Capital: $1,047,000
- Annual operation and maintenance: $67,000
- Net present worth (30-year): $2,088,000

Details of the cost estimate are presented in the FS report.

Alternative 69GW-4 - Dual Phase Vapor Extraction with Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

Description: A groundwater extraction, treatment, and discharge system would be constructed for the upper Castle Hayne Aquifer and operated on site.

Groundwater would be pumped using a series of downgradient wells located near the downgradient edge of the contaminant plume and a well located near the plume center. The downgradient set of extraction wells was developed based on the pumping rate necessary to contain the plume, the number of wells needed to achieve the pumping rate, and the optimum spacing between the wells to capture the groundwater. In addition to capturing groundwater near the downgradient edge of the plume, the groundwater collection system also was designed to pump water from the immediate source area to prevent the spread of the highly contaminated groundwater. The total flow rate for the conceptual pumping well extraction system is 76 gpm.

In addition, under this alternative, an area approximately 100 feet by 300 feet (30,000 square feet) of contaminated soil and shallow groundwater would be remediated using a dual-phase vacuum extraction (DPVE) system, which removes contaminated soil gas and shallow groundwater for subsequent treatment.

DPVE is a method to remediate soil and groundwater using only a single extraction system. This method is well-suited for shallow aquifers with low hydraulic conductivities and for sites with high water tables (shallow vadose zones), such as Site 69.

The DPVE and treatment system would consist of several major components. The extraction system would include the extraction wells (each 20 feet deep) and underground interconnecting well piping. Three extraction wells and a radius of influence of 50-feet were assumed for costing purposes. Radii of influence can range from about 20 feet to more than 100 feet. In addition, it was assumed that the DPVE system would produce 9 gpm from each extraction well, compared to 3 gpm using a conventional submersible pump. A DPVE pilot test would be required to determine the actual radius of influence (i.e., optimum well spacings) and groundwater yield for Site 69.

The DPVE treatment system would include the following major components:

- Air/water separator system
- Liquid ring vacuum pump system with associated air/water separator and heat exchanger
- A vapor-phase carbon adsorption system with associated pre-treatment heat exchanger
The groundwater treatment system included under this alternative has been sized to accommodate a total flow rate of 125 gpm. However, during a remedial design phase, additional capacity for potential future increases in groundwater flow rates could be designed into the system.

Based on available data, it appears that a pretreatment system may be needed for the removal of suspended solids and nuisance metals from groundwater, such as iron and manganese, to prevent fouling (clogging) of the air stripper. An acid (e.g., sulfuric acid) or sequesterant (e.g., polyphosphate chemicals) addition system would be included in the system with only a modest increase in capital and operating cost, which would help keep dissolved iron and manganese in solution. With this type of system, a low-profile air stripper would be desirable because, if necessary, it could be disassembled and cleaned periodically much easier than could a packed tower.

If a more aggressive pretreatment system is needed for the removal of suspended solids and nuisance metals from groundwater, capital and operating costs would increase by more than twofold. In this case, the pretreatment could consist, of equalization, flocculation/precipitation, clarification, filtration, and sludge dewatering.

As with Alternative 69GW-3, a groundwater sampling program and institutional controls would be initiated for the site.

Cost: The estimated costs of this alternative are as follows:

- Capital: $1,238,000
- Annual operation and maintenance: $98,200
- Net present worth (15-year): $2,337,000
- Net present worth (30-year): $2,748,000

The estimated cost does not include the cost of performing an on-site pilot test, which would most likely range from approximately $100,000 to $200,000. Details of the cost estimate are presented in the FS report.

**Alternative 69GW-5 - In-Situ Air Stripping with Institutional Controls and Monitoring**

Description: In-situ air stripping is an innovative technology that was developed and patented by IEG Technologies Corporation in 1992. IEG’s in-situ stripping technology is called UVB (German: Unterdruck Verdampfer Brunnen), which in English is translated as vacuum vaporizer well. A treatability study for two in-situ aeration systems (UVB and KGB) was conducted to determine the technical and economic feasibility of each system. The KGB system study was discontinued because it was technically infeasible for the sandy formation at Site 69. The system was frequently plugged by sand and sediments making operation impractical. Therefore, even though the UVB system showed some removal of VOCs from groundwater, it is still considered to be a possible remediation technology option.

The UVB in-situ air stripping process consists of a specialty adapted vacuum vaporizer well that contains a vacuum reactor, an aboveground blower, and an off-gas treatment system. The offgas treatment system typically consists of activated carbon units.
The vacuum vaporizer well has two separate screen segments, one at the well bottom where groundwater enters the well and one above the vacuum reactor. The groundwater entering the well through the lowered screened segment is drawn upward through the well, is stripped of volatile contaminants, and returns to the aquifer through the upper screened segment. This pumping action generates a three dimensional circulation flow of groundwater within the area surrounding the well. In some wells, an additional pump is installed to enhance the pumping effect of the air bubbles. The contaminated air is transported upward within the well by the induced vacuum and is then drawn to the off-gas treatment system.

The conceptual pumping well arrangement includes three UVB systems to remediate groundwater in the upper Castle Hayne Aquifer. The three wells would be positioned near the plume center.

As with Alternatives 69GW-3 and 69GW-4, a groundwater sampling program and institutional controls would be initiated for the site.

**Cost:** The estimated costs of this alternative are as follows:

- Capital: $246,000
- Annual operation and maintenance: $39,000
- Net present worth (30-year): $853,000

Details of the cost estimate are presented in the FS report.

**Site 69 Soil (SO) Alternatives**

The soil remedial alternatives developed for Site 69 are listed below:

- Alternative 69SO-1 - No Action
- Alternative 69SO-2 - Institutional Controls

No containment alternatives were proposed due to the undesireable implementability of a cap at the site. A capping alternative was eliminated during the screening process because of the risk of uncovering CWM during clearing and regrading activities required for installation of a cap.

**Alternative 69SO-1 - No Action**

**Description:** The No Action Alternative is required by the NCP to provide a baseline comparison for other remediation alternatives. Under the No Action Alternative, no remedial action would be performed to reduce the toxicity, mobility, or volume of soil contamination or waste at Site 69.

**Cost:** There are no costs associated with this alternative.

**Alternative 69SO-2 - Institutional Controls**

**Description:** Under this alternative, institutional controls would be implemented to limit access and control future use of the site. These institutional controls would consist of maintenance of an existing fence and signs which designate the area as a restricted area.
Under this alternative, the existing 6-foot high chain-link fencing encompassing the site and warning signs would be maintained to restrict site access. The signs indicate that wastes are buried at the site and that access within the fenced area is prohibited.

Under this alternative, the site would be given a land use category in the base master planning process that would prohibit all land uses except for investigative, remediation or monitoring purposes. Details of these controls are included in the LUCIP presented in Attachment D. Because contaminants will be left in place, the lead agency will be required to review the effects of the alternative at least once every five years.

Cost: The estimated costs of this alternative are as follows:

- Capital: $0
- Annual operation and maintenance: $900
- Net present worth (30-year): $13,800

Details of the cost estimate are presented in the FS report.

2.8 Evaluation of Alternatives/Comparative Analysis

This section summarizes the detailed analysis of alternatives that was conducted for the Site 69 soil and groundwater remedial alternatives, including the following seven USEPA evaluation criteria: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Table 1 provides definitions of each evaluation criterion.

Overall Protection of Human Health and the Environment

With respect to groundwater, Alternative 69GW-1 (No Action) would not contain or remediate groundwater, nor would this alternative prevent future potential exposure to groundwater. Natural attenuation processes will most likely occur, but will be unconfirmed. The remaining four groundwater alternatives all involve groundwater remediation in different forms, and groundwater monitoring and institutional controls to prevent exposure to groundwater. Monitoring will provide a warning system against contaminants that have migrated to unsafe locations and contaminant concentrations that have increased to unsafe levels, so that human exposure can be avoided. Alternative 69GW-4 would involve the most aggressive form of remediation since some reduction in soil contamination would also be expected to occur. (Although the elevated soil contaminant concentrations do not pose current or future potential human health or ecological risks, contaminated soil has the potential to act as a source of groundwater contamination.) None of the alternatives are believed to represent a permanent solution to restoring groundwater for future consumption or use since the source of the groundwater contamination can not be removed due to the reported presence of CWM under the site.

With respect to soil, Alternative 69SO-1 would not be protective of human safety (due to reported buried CWM) if the site is used for other purposes in the future. However, under Alternative 69SO-2, site controls can be imposed to prevent the use of the area and prevent exposure to CWM.
Compliance with ARARs

With respect to groundwater, onsite groundwater quality exceeds State and Federal standards for drinking water or the protection of groundwater. Offsite groundwater quality has been shown to be below drinking water standards in both the shallow aquifer and the Castle Hayne Aquifer. With long-term groundwater treatment, either through monitored natural attenuation (Alternative 69GW-2) or active processes (Alternatives 69GW-3 through 69GW-5), groundwater contaminant levels on site may achieve these standards over time. However, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARARs is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate.

With respect to soil, there are no chemical-, location-, or action-specific ARARs since no active remediation would be undertaken with either alternative.

Long-Term Effectiveness and Permanence

Regarding groundwater, Alternatives 69GW-2 through 69GW-5 would all be effective in preventing exposure to groundwater through the use of institutional controls such as land use controls, aquifer use controls, and groundwater monitoring. Under Alternative 69GW-1 (No Action), there would be no controls to prohibit future use of the aquifer and possible exposure to site contaminants. Alternatives 69GW-2 through 69GW-4 would only be effective as long as the plume could be contained while the applicable systems were operating. The effectiveness of the UVB system (Alternative 69GW-5) could be limited as indicated by the results of the treatability study.

Regarding soil, Alternative 69SO-2 would provide a long-term permanent solution by implementing institutional controls to restrict future use of the land in order to prevent exposure to site contaminants.

Reduction of Toxicity, Mobility, or Volume Through Treatment

With respect to groundwater, no reduction of toxicity, mobility, or volume would be provided by Alternative 69GW-1. Alternative 69GW-2 would provide some reduction due to remediation via natural attenuation. Alternatives 69GW-3 through 69GW-5 would provide the most aggressive reduction in toxicity, mobility, or volume since these alternatives involve operating systems.

With respect to soil, neither Alternative 69SO-1 or 69SO-2 would meet this criterion since neither alternative involves remediation of the soil contaminants. Alternative 69GW-4 would provide some reduction in toxicity, mobility, or volume of soil contamination via the DPVE treatment system.

Short-Term Effectiveness

With respect to groundwater, the No Action alternative would be the only alternative where no short-term risks would be expected since no activities would be implemented. Under the remaining alternatives, there would be potential risks to workers during the installation of the treatment systems, or during groundwater monitoring. Tasks involving intrusive activities such
as installing extraction wells or treatment units would require the assistance of the U.S. Army Technical Escort Unit for purposes of monitoring the site for the presence of chemical warfare agents and their degradation products. No impacts to base personnel are expected with any of the alternatives due to the remote location of the site.

With respect to soil, neither alternative would involve any remedial actions that would pose a risk to human health or the environment during implementation.

**Implementability**

With respect to groundwater, Alternatives 69GW-1 and 69GW-2 can be easily implemented. Alternatives 69GW-3 through 69GW-5 would require coordination with the U.S. Army during intrusive activities. The drilling and construction activities associated with Alternatives 69GW-3 through 69GW-5 would all involve similar levels of difficulty. In addition, the remote location of the site and the ability to check and monitor the systems would result in greater implementability concerns for Alternatives 69GW-3 through 69GW-5 than with Alternative 69GW-2.

With respect to soil, there would be no implementability concerns with either alternative.

**Cost**

The net present worth costs of the five groundwater alternatives are provided below in order from least expensive to most expensive, each considering 30 years of operation (excluding 69GW-1):

- Alternative 69GW-1 $0
- Alternative 69GW-2 $535,000
- Alternative 69GW-5 $853,000
- Alternative 69GW-3 $2,088,000
- Alternative 69GW-4 $2,748,000

The net present worth costs for the soil alternatives are provided below in order from least expensive to most expensive, considering 30 years of operation for 69SO-2:

- Alternative 69SO-1 $0
- Alternative 69SO-2 $13,800

**3.0 SELECTED REMEDY**

The proposed alternatives best suited to meet the remedial action objectives for groundwater and soil, based on the overall evaluation of the NCP criteria, are:

- Alternative 69GW-2 (Institutional Controls and Monitored Natural Attenuation)
- Alternative 69SO-2 (Institutional Controls)
Based on available information and the current understanding of the conditions at Site 69, the selected remedy appears to provide the best balance with respect to the USEPA evaluation criteria previously described. The selected remedial actions identified for Site 69 are expected to meet the following site-specific objectives that were developed for groundwater in the FS document:

- Prevent future potential exposure to contaminated groundwater.
- Protect uncontaminated groundwater for future potential beneficial use.

Soil, including the landfill material, has been identified as the second AOC at Site 69. The soil/landfill material does not currently result in unacceptable human health risks, but may result in unacceptable risks under a future potential scenario involving residential land use or construction. The fact that the site is suspected to contain CWM results in a risk from a safety as well as a health standpoint.

The selected remedial actions identified for Site 69 are expected to meet the following site-specific objective developed for soil:

- Prevent future potential exposure to contaminated subsurface soil (including landfill materials).

3.1 Summary of Selected Remedy for OU No. 14

The selected remedy for OU No. 14 consists of groundwater alternative 69GW-2, Institutional Controls and Monitored Natural Attenuation and soil alternative 69SO-2, Institutional Controls. A summary of each remedy component is provided below.

3.1.1 Groundwater - Institutional Controls and Monitored Natural Attenuation

A groundwater monitoring program, along with aquifer use controls, will be implemented as institutional controls. In addition, remedial actions associated with the in-situ, naturally occurring biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of the VOCs in groundwater are expected in the form of natural attenuation. “Natural attenuation” refers to the processes that occur naturally in soil and groundwater environments without human intervention that reduce the mass, toxicity, mobility, volume, or concentration of organic contaminants in these media.

The purpose of the groundwater monitoring program is to track the groundwater VOC contaminant plume’s migration over time, to evaluate any fluctuations in contaminant levels in the groundwater, and to identify the amount of contaminant reduction that has occurred over time. Select groundwater samples will also be analyzed for CWM degradation products to determine if buried CWM has been released. Select groundwater samples will also be analyzed for inorganics to determine if the contaminants are migrating. For cost estimating purposes, the FS assumed 5 years of quarterly sampling of 24 wells, followed by 25 years of semiannual sampling of 12 wells. In turn, the cost estimate for this alternative also incorporates the reduction of analytical and labor costs starting in the sixth year of the program. The lead agency will be required to review the effects of this alternative at least once every five years until it can be demonstrated that continued attainment of remedial goals has been achieved. In addition, should the groundwater quality improve, the sampling frequency may be reduced. Details of assumptions made for the cost estimate are found in the FS report.
The monitoring wells preliminarily selected during the FS for this alternative are identified on Figure 3. A total of 24 wells have been preliminarily identified for inclusion in the monitoring program. As shown on Figure 3, the wells will monitor: the shallow aquifer; and, the upper zone, intermediate zone, and deep zone of the Castle Hayne Aquifer. Monitoring wells also are positioned to evaluate the source area (near well clusters GW15 and GW17), upgradient areas, and downgradient areas (including offsite). All samples collected from the monitoring wells will be analyzed for VOCs. The location and number of samples collected may change according to analytical results. The actual wells initially selected for sampling following approval of this Interim ROD will be presented in Long-Term Monitoring Work Plans for Site 69. Samples have already been collected from 14 wells on a semiannual basis. The details of the current sampling program can be found in the existing Long-Term Monitoring Work Plan for Camp Lejeune.

For purposes of evaluating the effectiveness of natural attenuation, groundwater samples also will include laboratory analyses of nitrate, sulfate, methane, ethane, ethene, and chloride. Field analyses will be conducted on groundwater samples to determine the levels of oxygen, iron II, alkalinity, oxidation-reduction potential (ORP), pH, temperature, conductivity, and major cations. Over time, the results will be used to predict the kind and amount of contaminant reduction that has occurred, as well as, the amount of contaminant reduction that is expected.

Additional monitoring wells may be added to the program, if necessary. Likewise, if the analytical results indicate that the groundwater quality has improved, the monitoring program may be refined to include fewer sampling locations or less frequent sampling events.

Biodegradation may occur as an aerobic, anaerobic, or cometabolic process. Aerobic processes involve oxidation-reduction reactions in which oxygen is the electron receptor. Anaerobic processes involve iron-reducing, denitrifying, and sulfate-reducing reactions. Cometabolic processes involve carbon dioxide-reducing reactions and result in the accumulation of methane as a final product. Technical literature indicates that chlorinated solvent contamination can undergo natural attenuation through one or a combination of these biodegradation processes. At Site 69, the following evidence suggests that natural attenuation processes are successfully degrading the chlorinated solvent contamination in the shallow and upper portion of the Castle Hayne aquifers:

- Tetrachloroethene (PCE), TCE, DCE, and vinyl chloride have all been detected within the estimated boundary of contaminated groundwater at Site 69 which indicates that natural degradation is taking place (degrading from PCE to TCE to DCE to vinyl chloride).
- The locations and concentrations of the chlorinated compounds within each well are positioned as to suggest that the daughter products detected are the direct result of the VOC degradation. Laboratory analyses of the breakdown products show that contaminant levels decrease as the plume extends from the source area.

Based upon this information, the natural attenuation alternative appears to be a justiciable remedial option for the chlorinated solvent contamination detected in the surficial and upper portion of the Castle Hayne aquifers. In an effort to provide additional evidence that natural attenuation is occurring, remedial alternative 2 incorporates the option of performing a contaminant fate and transport model. The cost estimate accounts for annual modeling as new results become available.
Aquifer use controls will be implemented to prohibit future use of the shallow and Castle Hayne aquifers within a 1,000 foot radius of Site 69. The installation of water supply wells that draw from the plume are prohibited by North Carolina regulations even if they are outside the 1,000 foot buffer zone. Controls will remain in place until it is demonstrated that continued attainment of remedial goals has been achieved. A "Notice" for Site 69 will be filed at the Onslow County Courthouse. Cancellation of the "Notice" may not occur until it is demonstrated that continued attainment of remedial goals has been achieved. In addition, the base master planning process will provide controls on the use of the site. Additional details of the land use controls are provided in the LUCIP presented in Attachment D.

Until RLs are met, the NCP [40 Code of Federal Regulations (CFR) 300.430(f)(4)] requires the lead agency to review the effects of this alternative no less often than once every five years.

3.1.2 Alternative 69SO-2 - Institutional Controls

Under this alternative, institutional controls would be implemented to limit access and control future use of the site. These institutional controls would consist of maintenance of the existing fence and signs that designate the area as a limited-use area. No remedial action would be performed to reduce the toxicity, mobility, or volume of soil contamination or waste at the site.

Under this alternative, the existing 6-foot high chain-link fencing encompassing the site and warning signs would be maintained to control site access. The signs indicate that wastes are buried at the site and that all land use, other than those for investigative, remediation, or monitoring purposes, is prohibited.

The site currently is not used for residential purposes, and there are no plans to convert the area to residential use. However, there currently is no official land use category for the site within the base master planning process. Under this alternative, the site would be given a land use category within the base master planning process that would prohibit all use of the area except for investigative, remediation, or monitoring purposes. Land use controls are described in more detail in the LUCIP presented in Attachment D.

3.2 Remediation Levels

Table 2 presents the RLs developed for groundwater. These levels are based on State groundwater standards, Federal Maximum Contaminant Levels (MCLs), or risk-based concentrations (RBCs) calculated specifically for Site 69. No RL was developed for CWM in groundwater or soil, but groundwater will be monitored for CWM degradation products to detect any accidental release from buried drums. Groundwater will also be monitored for inorganics to determine if the inorganic COCs are migrating. No RLs were developed for soil because no human health or ecological COCs were identified for soil. Land use controls will remain in effect until the CWM is removed or other site conditions warrant additional actions at Site 69 that would supercede the actions presented in this Interim ROD.
4.0 STATUTORY DETERMINATIONS

A selected remedy must satisfy requirements of CERCLA, Section 121, including: protection of human health and the environment; compliance with ARARs; cost effectiveness; utilization of permanent solutions and alternative treatment technologies or resources recovery technologies to the maximum extent practicable; and preference for treatment that reduces toxicity, mobility, or volume as a principle element (or provide an explanation as to why this preference is not satisfied).

As described in Section 3.0 of this Interim ROD, OU No. 14, Site 69 requires remedial action. The evaluation of how the selected remedy for Site 69 satisfy the CERCLA requirements is presented below.

4.1 Protection of Human Health and the Environment

Monitoring and institutional controls would provide protection of human health by preventing exposure to potential contaminated groundwater by controlling the future use of the groundwater (except for monitoring purposes) at Site 69. Although contaminants in the groundwater do not appear to be creating unacceptable ecological risks, the institutional controls identified for Site 69, along with the passive treatment of VOC contaminants via natural attenuation, are expected to provide protection to the environment. Groundwater monitoring for inorganics will protect human health by tracking migration and warning of possible exposure. Human safety will also be protected through land use controls that will prevent possible exposure to CWM reportedly buried at the site.

Based on the non-residential use and the lack of development, human health risks associated with contaminated groundwater at Site 69 are considered minimal. Treatment via natural attenuation of VOCs would provide protection of human health, while any adverse impacts to ecological receptors are expected to be low.

Institutional controls and monitored natural attenuation will protect human health by preventing future human exposure to potential contaminants in the groundwater. Aquifer use controls will prevent future human exposure by prohibiting the use of the shallow and Castle Hayne aquifers within a 1000-foot radius of Site 69. The groundwater monitoring program will prevent future human exposure by providing a warning system should contaminant concentrations increase to unsafe levels. Controls on land use will also be enforced to prevent exposure to safety risks posed by buried CWM.

4.2 Compliance with Applicable or Relevant and Appropriate Requirements

There are no location-specific ARARs associated with the selected remedy for Site 69. However, the remedial actions at the site must comply with the action-specific ARAR identified for use with the monitored natural attenuation alternative [North Carolina Administrative Code (NCAC) 2L.0106(l)].

With respect to groundwater, onsite groundwater, quality does not meet State and Federal standards for drinking water or the protection of groundwater. Off site groundwater quality has been shown to achieve drinking water standards in both the shallow and the Castle Hayne aquifers. With groundwater treatment through natural attenuation (Alternative 69GW-2) groundwater contaminant levels on site may achieve these standards over time. However, the
presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARAR is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate. Regardless, the remedy provides adequate controls, in the form of land use and aquifer use controls, and monitoring. These controls together effectively manage the untreated groundwater that will remain on site.

With respect to soil, there are no chemical-, location-, or action-specific ARARs since no active remediation actions would be undertaken with Alternative 69SO-2.

4.3 Cost Effectiveness

Monitoring and institutional controls provide a cost-effective remedy for Site 69. Only minimal costs associated with administrative efforts and implementation are anticipated. Land use and aquifer use controls provide a cost-effective remedy since there are no significant costs, other than administrative-type efforts, associated with their implementation. Based on the nature and extent of contamination at Site 69, as well as the site’s current and expected future use, the other treatment alternatives developed for these sites would not provide significantly more protection of human health and the environment; whereas the present-worth costs estimated for these alternatives are higher than the selected groundwater alternative.

4.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected alternative for groundwater would provide a permanent, long-term remedy through treatment by natural attenuation, and the provision and enforcement of groundwater monitoring and institutional controls (aquifer use restrictions and “Notice” recordation requirements) at Site 69.

Although contaminants detected in the groundwater have not met Federal and State standards, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARARs is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this is reserved for future application in the Final ROD only if appropriate.

4.5 Preference for Treatment as a Principal Element

The selected groundwater remedy for Site 69 satisfies the preference for treatment by utilizing the alternative treatment technology of monitored natural attenuation. However, the source of groundwater contamination cannot be removed due to the presence of CWM. CWM (CAIS) can feasibly be removed by the Design Center for Ordnance and Explosives Team. However, final disposal facilities for such waste generated by military bases are not readily available. Therefore, should the CWM be excavated, it would have to be stored indefinitely at Camp Lejeune. Commercial transportation and disposal facilities for military generated CWM waste may be available in the near future. A concurrence letter from the Army Corps of Engineers supporting the decision in this Interim ROD is presented in Attachment A.
5.0 RESPONSIVENESS SUMMARY

5.1 Overview

The Final PRAP (May 1998) addressed Site 69, the Rifle Range Chemical Dump, OU No. 14. Groundwater contaminated with chlorinated solvents makes up OU No. 14. At the time of the public comment period, MCB, Camp Lejeune and the DoN selected Institutional Controls and Monitored Natural Attenuation as the preferred alternative for the contaminated shallow and upper portion of the Castle Hayne aquifers. The preferred alternative presented in the Final PRAP is the same alternative presented in this Interim ROD.

Comments received at the public meeting indicate some concerns about certain aspects of the selected alternative, but no objection to its implementation. No written comments were received during the public comment period.

The purpose of this responsiveness summary is to identify the comments and concerns of the local community regarding the selected remedy, and to document how MCB, Camp Lejeune/DoN considered these comments and concerns during the selection of the remedy. The remainder of this responsiveness summary discusses the background on community involvement, and presents a summary of the comments received during the public meeting and public comment period along with their corresponding responses.

5.2 Background on Community Involvement

No past community interest in the contamination at Site 69 has been documented. This may be due to the fact that the site is located within an isolated, heavily wooded area at the MCB.

5.3 Summary of Comments and Responses

Comments raised during the Site 69, OU No. 14 public comment period and the public meeting are discussed below. The comment period was held between June 19, 1998 and July 20, 1998. No written comments were received during this comment period. The public meeting was held on June 30, 1998. Comments were received from private citizens at this meeting and are summarized in the following paragraphs along with MCB, Camp Lejeune’s response. The actual transcript from the public meeting is provided in Attachment B.

Two private citizens made comments at the public meeting. The general topics raised by their questions include costs of alternatives; budget and duration of groundwater monitoring; sample locations; rationale for choosing the selected alternatives; fate and transport of contaminants; and site review and contingency plans. The questions and answers are paraphrased below.

Costs of Alternatives:

Question:
What are the costs of each alternative? What is the difference between capital costs and net present worth costs?
The costs of each alternative are presented in the PRAP and in the public meeting transcript.

A capital cost is a cost required for the design and the construction of the remedial action alternative. This includes the costs of materials, labor, and equipment. The net present worth cost includes the capital costs and the annual operation and maintenance costs. The annual operation and maintenance costs are defined for the first year of operation in terms of the value of the dollar in the current year. These costs include the cost of material, labor, and equipment required to operate and maintain the alternative over a course of 30 years. The 30 year duration was assumed only for costing purposes but could be longer or shorter, depending on how long it takes for natural attenuation processes to break down the contaminants.

**Budget and Duration of Groundwater Monitoring:**

Question:
What duration of groundwater monitoring is included in the budget? What happens at the end of 30 years?

Answer:
For costing purposes, groundwater monitoring was assumed to be for a period of 30 years. However, monitoring will probably be forever. The subsurface investigation was not as thorough as usual because of the site access restrictions imposed by the Army due to the risk of encountering chemical agent test kits. Because of the possible release from barrels and test kits that have not yet corroded, it is impossible to tell what will happen in the future. Therefore, even if the groundwater monitoring indicates that it is clean for several years, the site cannot be categorically considered clean. At the end of 30 years, more money would have to be budgeted for the monitoring of the site. As long as the test kits remain in the ground, the site will have to be monitored.

**Sample Locations:**

Question:
What are the locations of Everett Creek and the New River? Is there another canal near the site?

Answer:
Everett Creek is about a quarter of a mile south of the site. The New River is a little closer - about 200 yards away. The canal [on the slide shown at the meeting] is an intermittent natural drainage way. There are actually two intermittent natural drainage ways. One flows to Everett Creek and the other flows north to an unnamed tributary. Water samples were taken from both areas and nothing was found at either of them. In the 1980s water samples were taken from small ponds which showed low levels of volatile organic compounds. These ponds are believed to be connected to the water table.

**Rationale for Choosing Alternative:**

Question:
Why can’t the barrels and test kits be removed and disposed off-site? Does the Navy consider removal of the contaminant source a good or a bad alternative? Is it Army policy not to remove the contaminant source?
The Army is responsible for the manufacture, distribution, and clean up of chemical agents. The Army has a policy of not disturbing sites that do not pose imminent risk to human health and the environment. A risk may be posed if the contaminated area were to be disturbed. Currently, this site is not considered to pose an imminent risk. Therefore, it is Army policy not to disturb the site. Further, the Navy does not have the technology to monitor for the chemical agents and therefore, cannot do anything at this site without the Army’s assistance. The Army would be the agency that would have to contract the work, not the Navy.

[Note: This answer was based on the information available to the Navy at the time of the Public Meeting. For clarification on the role of the Army in the cleanup of sites with buried CWM, see the concurrence letter presented in Attachment A of this document.]

**Fate and Transport of Contaminants:**

Question:
What happens to the contaminants in the groundwater? Are the shallow, intermediate, and deep aquifers connected? Are the contaminants being broken down or just diluted as they disperse through the groundwater? Will the dropping of the aquifer level (due to high use of the aquifer) spread the contaminants?

Answer:
The contaminants were found from 30 to 40 feet up to 60 to 70 feet all in one area. The contaminants are believed to bind to the clayey-type soil so they don’t move. The waste has been buried at the site since 1950 through 1976 and it hasn’t moved very far, most likely due to the clay. The groundwater moves but the contaminants are staying in a small area.

There is interconnection between the aquifers. The shallow aquifer is separated from the intermediate aquifer by a semi-permeable layer of clays, silts, and sands. Contaminants spread from the shallow to the deep aquifer because the separating layer is semi-permeable.

The solvents are broken down and diluted. Both of the effects act together to decrease the contaminant levels.

When the water table drops below the contaminated area, the groundwater will no longer be in contact with the contaminants. Therefore, if the water level drops, the contaminant levels will not be able to increase because the source of groundwater contamination will effectively be “removed”. The contaminants will not spread.

**Site Review and Contingency Plans:**

Question:
What happens if the contaminant levels don’t decrease?

Answer:
It is possible that contaminant levels might increase if some barrels rust through. But so far, contaminant levels detected only a couple of hundred feet from the site have decreased to levels that are nondetectable. If contaminant levels start to increase, some action would have to be reconsidered, such as a groundwater barrier outside the site (because no disturbance would be allowed inside the site boundary without the Army’s assistance). The monitoring program is
designed to detect such releases and to determine if natural attenuation is occurring or not. The monitoring program will ensure that the contaminants won’t escape from the site and cause a risk of exposure.

6.0 REFERENCES

TABLE 1
GLOSSARY OF EVALUATION CRITERIA
MCB, CAMP LEJEUNE, NORTH CAROLINA

- **Overall Protection of Human Health and the Environment** - addresses whether or not an alternative provides adequate protection and describes how risk posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

- **Compliance with ARARs/TBCs** - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs), criteria to-be-considered (TBCs), and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.

- **Long-Term Effectiveness and Permanence** - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment overtime once cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume Through Treatment** - refers to the anticipated performance of the treatment options that may be employed within an alternative.

- **Short-Term Effectiveness** - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.

- **Implementability** - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.

- **Cost** - includes capital and operation and maintenance costs. For comparative purposes, net present worth-values are provided.
TABLE 2
GROUNDWATER REMEDIATION LEVELS AT SITE 69
INTERIM RECORD OF DECISION, CTO-0212
MCB CAMP LEJEUNE, NORTH CAROLINA

<table>
<thead>
<tr>
<th>Contaminant of Concern</th>
<th>RL(^{(1)})</th>
<th>Basis</th>
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<tbody>
<tr>
<td>Trichloroethene</td>
<td>2.8</td>
<td>NCWQS(^{(2)})</td>
</tr>
<tr>
<td>Total 1,2-Dichlorethene</td>
<td>70</td>
<td>NCWQS</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>0.015</td>
<td>NCWQS</td>
</tr>
<tr>
<td>Beryllium</td>
<td>4</td>
<td>MCL(^{(3)})</td>
</tr>
<tr>
<td>Chromium</td>
<td>50</td>
<td>NCWQS</td>
</tr>
<tr>
<td>Lead</td>
<td>15</td>
<td>NCWQS</td>
</tr>
<tr>
<td>Manganese</td>
<td>50</td>
<td>NCWQS</td>
</tr>
<tr>
<td>Vanadium</td>
<td>110</td>
<td>Risk-Ingestion</td>
</tr>
<tr>
<td>Zinc</td>
<td>2,100</td>
<td>NCWQS</td>
</tr>
</tbody>
</table>

Notes:  
\(^{(1)}\) RL=Remediation Level  
Groundwater RLs expressed as Fg/L (ppb).  
\(^{(2)}\) North Carolina Water Quality Standard  
\(^{(3)}\) Maximum Contaminant Level
FIGURE 1
OPERABLE UNITS AND SITE LOCATIONS AT
MARINE CORPS BASE CAMP LEJEUNE
RECORD OF DECISION CTO - 0212

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA
FIGURE 2
SITE MAP
SITE 69 – RIFLE RANGE CHEMICAL DUMP
RECORD OF DECISION CTO – 0212

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA
DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF:

14 September 1999

Design Center for Ordnance
and Explosives Team

Baker Environmental, Incorporated
ATTN: Ellen Bjerklie
Airport Office Park, Building 3
420 Rouser Road
Coraopolos, Pennsylvania 15108

Dear Ms. Bjerklie,

As requested by the Department of the Navy, I have commented on the Interim Record of Decision for Operable Unit No. 14 (Site 69, Rifle Range Chemical Dump) Marine Corps Base, Camp Lejeune. Although I cannot speak for "the Army", I have discussed this issue with members of my Chemical Warfare Materiel Team and with staff members in the Office of the Deputy Assistant Secretary of the Army, Installations and Environment. The conclusions that were reached are as follows.

As there are currently no indications of exposed Chemical Agent Identification Sets (CAIS) and there is security and control of the site, there does not appear to be an imminent and substantial hazard readily accessible. The unearthing, of CAIS would require indefinite storage somewhere on the installation, while awaiting disposition, which may not be readily forthcoming. Transporting CAIS to a commercial facility for disposal may be more acceptable in the near future based on studies by the National Research Council.
I therefore agree with your Interim Record of Decision pending additional capability by the Department of the Army in dealing with Recovered Chemical Warfare Materiel.

Respectfully,

Charles L. Twing
Chemical Warfare Materiels
Team Leader, U.S. Army
Corps of Engineers
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MR. MICK SENUS: It’s about ten after seven, so I suppose we can get started. I think everybody that’s coming is here.

I’d like to welcome everybody to the public meeting for the proposed remedial action plan for OU 14 and OU 6. First I’ll make some introductions of base representatives and people from the State that are here. If you could just raise your hand or hi sign. I’ll first start. My name is Mick Senus, and I’m a base employee. I work for the Environmental management Office Installation Restoration Division.

Mr. Scott Brewer is the Deputy to the Assistant Chief of Staff at EMD. Neal Paul is the Installation Restoration Director. Brian Marshburn also works in Installation Restoration as a Project Manager. And Tom Morris, Installation Restoration Project Manager.

From North Carolina Department of Environment and Natural Resources, Superfund Section, is Dave Lown and Jack Butler.

From LANTDIV Kate Landman is here and Maritza Montegross.

Our environmental contractors from Baker Environmental, Tom Trebilcock is here. He’s Program Manager for Camp Lejeune. Ray Wattras is here who is a Project Manager for OU 14. Rich Bonelli is here for OU 6; he’s Project Manager.
And Kathy Chavara is here as Project Engineer.

The purpose of the meeting is to disseminate information on OU 6 and OU 14. The first presentation will be OU 14, and followed by Rich Bonelli and Kathy Chavara on OU 6. If there’s anybody that has any questions throughout the presentation, those questions are welcome. We do like to ask you to state your name for the record so that our court reporter, Julie, can have your names accurately and we’re able to respond to your questions after this meeting and after tonight.

One last thing is the public comment period opened on June 28th, this past Sunday, and will go for 30 days, until July 28th.

The PRAP, if you don’t have one already, for both OUs is on the corner of the stage. And for anyone else, there is one in our office at Camp Lejeune, Building 58. Any questions, the phone number is 451-5068. You can ask for myself or Neal Paul.

And if there’s no questions, we can move into the presentation of Ray Wattras, OU 14.

MR. RAY WATTRAS: Thank you, Mick. I’m Ray Wattras; I’m the project manager for Operable Unit Number 14, which is Site 69. Rich, if you can go to the next slide.

Site 69 is referred to as the -- you may not be able to read this. It’s referred to as the Rifle Range Chemical
Dump. It’s located south of the rifle range area at Marine Corps Base, Camp Lejeune. It’s located about 200 yards from the New River and just north of Everett Creek. Everett Creek flows right here into the New River; the site being up in this area.

Next slide, please.

The site has a recorded history dating back to about 1950 through 1976 where a variety of wastes were taken up to the site and disposed of, typically in the trench and fill operation. These wastes included PCBs; solvents which were used in degreasing operations; pesticides; and what makes this site unique is the fact that it’s reported that chemical agent training kits were taken up to this site. Now, that’s important to know because these training kits, most of them contain small doses of chemical agents, blister-type agents. They would use that in training of the military personnel. So, because of that we had to approach this site a lot differently than we do most sites; the main point being we have to study this site in conjunction with the U.S. Army. The U.S. Army policy was if you have chemical agents, even the test kits, in test kit small doses, they don’t want to, basically, uncover it unless it presents an imminent danger to human health and the environment. In this case it doesn’t up at this site.

This site is located in a remote area. This is a historical photograph taken back in 1956. It just shows you pretty much the outline of the site. This is just disturbed
ground. Here it shows the trench in this area; another trench up in this area. They’ll point out different things like a possible staining area, mounded material; that could be anything from just a pile of dirt that they dug out. The same thing up here it says mounded material. From the aerial photograph, especially taken back in 1956, you really can’t tell exactly what it is. So, they tried their best, and it helps us to study this site, gives us a feel for how the wastes were disposed of and so forth.

Back in the ‘80s is when the first investigations began. They started off with just a series of about eight shallow monitoring wells to see if the groundwater was impacted. And what we found was the groundwater in the southern part of the site, south central part of the site, had some very high levels of volatile organics such as trichloroethene; and I’ll refer to that in this presentation as TCE. That’s the acronym that you’ll hear myself and probably others refer to TCE and vinyl chloride. Those are pretty common constituents of the solvents that they used.

We began studying this site in about 1993-1994. We started by doing a geophysical survey and using instruments to try to detect where the buried material might be. We did have reports, you know, that the material was taken up in drums. So, we tried to locate that, and we did find quite a bit of buried material throughout -- mainly throughout the central part and
southern part of the site we found a lot of anomalies with the instruments.

Our objective was to let’s find out how contaminated the groundwater is, you know, has it migrated off site. We did know, as I mentioned previously, that two wells in this area showed some high levels of TCE and vinyl chloride. So, what we tried to do is to determine has it migrated off site. Then we established -- we put some wells down in this area, down in the southeast part of the area, pretty much surrounded the site. We put a cluster of wells between the site and the New River, which is off the photo here, as well as some deeper wells.

Not only did we need to find out has it migrated in the shallow aquifer, but we wanted to know did it actually go and infiltrate into the Castle Hayne aquifer, which is the drinking water aquifer. So, we put in a series of wells. Our deepest well went down to about 230 feet. That’s at the very bottom of the drinking water aquifer.

We also took soil samples, but we had to be careful here. We just couldn’t go in with backhoes and start looking because the Army policy was leave it be, you don’t want to create a major danger or anything like that. So, we did drill a number of bore holes with the assistance of the U.S Army, and as we would drill a bore hole, we would go down about two feet; the Army would put in their instruments to see if they detected any chemical agents coming up from the bore hole. And we didn’t
detect any chemical agents, by the way, and we put quite a
number of holes throughout the landfill, mainly to try to find
out is the soil contaminated. We put in a series of monitoring
wells, again, just to find out what is the extent of this
contamination.

With respect to soil, most of the soil samples were
taken above the water table. And really, with the exception of
one boring in this area, we really didn’t find much in the soil,
which kind of, you know, you would expect that if they buried it
in a trench, and they may have dug down to the water table; when
they hit the water table, they probably stopped digging the
trench, and then they put their waste in there and covered it
up. So, once we hit the water table, you can’t really get the
soil sample anymore. So, from the standpoint of soil
contamination, the surface is pretty -- it really didn’t show
anything of significance. Like I said, only one subsurface
boring showed some contamination with volatile organics, the TCE
that I mentioned previously.

We did a study of surface water and sediments. Again,
we took samples from down below here. South of this site is
Everett Creek. There is an unnamed tributary to the New River
that’s north of this site, and we also sampled surface water and
sediments in the New River, both upstream adjacent to this site
and downstream from this site.

We didn’t find really any contamination in any of
those surface water bodies that could be attributed to Site 69. We didn’t find the TCE or the vinyl chloride or anything like that.

There is one, or two, real small ponds on site. They’re always -- from every time I’ve visited this site, they’ve always been present, and they’re really -- how would I describe this up here -- these ponds are probably not much bigger than the screen, but we believe that they’re connected with the shallow water table, that they’re hydraulically connected. And we have found low levels of volatiles in those surface ponds, I’ll call them; although the levels were below what’s called ambient water quality criteria, which is -- there are both federal and state standards for water quality; and although we had volatiles, they were below those levels.

Let me talk a little bit about the extent of contamination. If you can go to the next slide, Rich. What we really found was -- let’s start with the shallow aquifer. And if you can see this blue dotted line, this is pretty much the extent of shallow groundwater contamination above what I’ll call groundwater standards, the State standards for protection of groundwater. The red circle is what we’re calling our suspected VOC source area. That’s based on everything from the geophysical study as well as the groundwater results. We had the highest levels in groundwater up in this Well Cluster 15. You can’t read that on this figure here, but we had TCE and
vinyl chloride in the parts per million range, which is quite high. But its groundwater flow -- groundwater flow is in the southeast direction. This arrow depicts that. When you get to the wells down in this area of this site, we really picked up very, very low levels of TCE and vinyl chloride. So, we’ve had a lot of breakdown of the products, for various reasons. The contamination could be hung up with a lot of clayey material meaning it’s not really migrating that far. The drums could have opened up over the years by being underground. But the wastes from them have not impacted the groundwater significant from the standpoint of migration. It’s pretty much you get out into this area with these wells down in this area, and they’re all low. They’re either non-detectable, which means we didn’t detect anything in those samples, or they’re very, very low levels below groundwater protection standards. So, that’s pretty clean.

The green dotted line, though, represents the Castle Hayne aquifer which underlies the shallow aquifer. We did find, again, especially up in this well 15 cluster, we had very high levels of TCE and vinyl chloride at a depth of about 30 to 40 feet below ground surface. And that’s called -- we refer to that as the top of the Castle Hayne aquifer. We put another series of wells in just a little bit deeper than that, say 60 to 70 feet, and we found -- we still found TCE and vinyl chloride, but at much lower levels.
Now, all of the Castle Hayne wells that are in this area, it’s down gradient and outside, at least the fence line. It’s beside a boundary. We really didn’t find anything in the Castle Hayne aquifer, which is good.

So, what we have here, the problem with this site is the fact that we do have a probable source area that we cannot get to because we cannot uncover this material. It is impacting groundwater, but in a very localized area. So, it hasn’t really migrated too far from the original source area.

From a standpoint of what are the risks to human health that this site presents, the site, number one, is in a remote area of the base. It’s really isolated. Other than perhaps trespassers, there is no activity; there is no residential housing nearby; there’s no commercial or industrial operations going on nearby. They do train in the area. We’ve seen vehicles and training maneuvers. There is a fence around this site, and the fence has signs posted on it with, you know, "warning," "(no) trespassing." So, from a current standpoint the site isn’t really presenting any type of risk.

The groundwater, although it’s contaminated, the nearest supply well is more than a mile away from the site. And again, we have a pretty good handle on the fact that it’s not contaminated, you know, within a couple hundred feet from the site. So, currently the site doesn’t really present a risk to human health. Obviously if somebody came in-here and decided to
develop this site, there would be potential health impacts; number one, if you drank -- if somebody installed a well here, it would not be a good idea, because they would be drinking contaminated water. So, from a future risk standpoint, there are risks associated with groundwater ingestion. It’s obviously fairly unlikely. The base is on a public water supply and has been. And the well, as I said, the nearest supply well is more than a mile way. In fact, if I’m not mistaken, it’s up near the rifle range, which is pretty far up gradient with respect to groundwater flow.

So, what we decided, we have -- you know, we defined the problem at this site, and now it’s a point in time to say well, what are we going to do about this problem.

We looked at soil first, and we said, well, you know, we have a barrier, the fact that we can’t do anything invasive here. There are two soil alternatives. One alternative is to do nothing, which is called the no action alternative. And that alternative is always used to measure against other alternatives.

The second alternative with soil is to implement institutional controls where the base would be restricted from developing this area. They would not, obviously -- we’d want the fence to be kept up because we have buried material there. The restrictions would not permit any type of building or anything like that around the site, and that institutional
control would be documented in the Base Master Plan. So, those are the two soil alternatives.

We couldn’t consider anything like capping, and there’s really no great need to cap the site. As I mentioned before, the surface soil is not the problem here. It’s the buried material. Capping would require us to do some grading, remove all of the trees from this site, and therefore, we’d probably have a problem with disturbing the contents. So, we pretty much ruled out capping as being a feasible alternative.

So, with respect to soil, the best thing and the recommended alternative is to just implement some institutional controls to keep the people out from digging up the area or building on it and so forth.

Now, with respect to groundwater, there are five alternatives. Again, the first one is always no action, meaning we would do nothing with the groundwater. In that case, that means no monitoring, no nothing. That alternative presents a little bit of a problem here because we know we have contaminated water, and we want to keep an eye out on that. So, the no action alternative is pretty much ruled out.

The second alternative is called institutional controls and monitored natural attenuation. Now, natural attenuation is a remedial action. It’s done in situ. It’s done naturally.

Natural attenuation is the natural biodegradation of
the contaminants, the TCE and the vinyl chloride. They break down into other products. It involves dispersion, meaning a dilution. As the plume moves away from the site, those levels are expected to get lower and lower.

When we say monitored natural attenuation, what we mean is we’re going to take samples from a series of monitoring wells, both within the source area or the hot area, as well as down gradient. And we want to check those levels over time and see if the level will decrease.

Now, as I mentioned before, this site has been studied since the mid-1980s, and we have seen decreases in the contaminant levels over the last 10 or 12 years. So, we believe there is some natural attenuation that is occurring already, as well as we’ve seen the breakdown of products that we would normally see from TCE all the way down to the vinyl chloride.

So, that’s alternative number two. I believe the net present worth cost of that alternative is around $535,000. That’s based on 30 years of monitoring. The first five years you would have to monitor these wells every quarter; and then, after five years, our cost is based, I believe, on sampling the wells twice a year. And then, it also involves a modeling study where we will try to predict, you know, where the plume could be moving or the contaminants migrating or what levels they would be. So, it does involve really a continued study so that you can track what’s going on with this plume.
The third alternative involves putting in a series of extraction wells, both in the shallow aquifer and in the Castle Hayne aquifer. We’d want to install one pair of extraction wells near the probable source area, and a series of extraction wells along the boundary. It would require the construction of an on-site treatment plant that would have a capacity of about 100-150 gallon per minute flow. Groundwater would be extracted from the ground from the wells, piped to a treatment facility; treated by using -- you’d have to pretreat to get rid of some of the metals. You have iron that could clog up the air stripper. And you would also treat using air stripper and carbon adsorption. The water would be discharged, piped to the New River. That’s the only place -- really to pipe it that’s the closest point to pipe it.

That alternative, again, we would -- with that alternative we would still implement institutional controls so that people cannot use the groundwater and put in additional supply wells or anything like that. It would also involve monitoring the groundwater over time just to make sure the plume is not moving, make sure that the extraction wells are contained within the plume. The cost of that alternative is about a little over two million dollars.

The fourth alternative is pretty much what I just described, with the exception of we would install what’s called dual phase vapor extraction wells. Vapor extraction wells,
basically, you draw up the soil gas and treat the soil gas. We would most likely install the vapor extraction wells within the probable source area.

The downside of both that last alternative that I mentioned as well as this one we’re using, the vapor extraction wells, the source, whatever has caused this groundwater contamination, would always remain there. We cannot physically go in there and remove it like we can at other sites. We’re restricted from that because of the chemical agent test kits.

So, using dual phase vapor extraction, the only thing that it does a little bit more than the previous alternative, it will help clean up some of the contaminated soil that is up in this area, but it will not remediate the bulk waste. There’s just no practical way that a technology can do that.

That alternative using the vapor extraction has a present worth cost of about 2.7 million dollars.

Finally, the last alternative is referred to as in situ air stripping. In situ air stripping involves installing what looks like a monitoring well. It has a treatment system inside the well. The well creates a circulation of groundwater, and as the water is being circulated from the bottom of the well to the top, there is pretty much -- if you could picture an air stripper inside that well head.

We did a treatability study of that technology. We thought it had some promise. The treatability study had mixed
results. We did see a decrease in -- first of all, it didn’t work in the shallow aquifer. We had two different wells. We installed one pilot study well in the shallow aquifer down pretty much around this area, and we installed the one in the top of the Castle Hayne aquifer. We couldn’t get a circulation cell to form in the shallow aquifer. It did not work.

Now, in the upper portion of the Castle Hayne aquifer, we were able to form a circulation cell, and we saw some reduction in levels at the well itself; but we didn’t really see that much of a reduction in levels in other monitoring wells surrounding it. Part of that theory is if there’s a lot of clayey material there, it’s possible that a lot of the contaminants, a lot of the waste, bound itself with that clay, and we couldn’t move it towards that -- although the circulation cell was formed, it was not moving towards that well. It was bound too tightly to clay. So, we had some mixed results with that treatability study.

At the well itself we did see a reduction, but not too far away. We got 20-25 feet away from that well, we weren’t seeing really anything significant happening with respect to lowering the levels of contamination. But anyway, we included that as an alternative.

What we propose doing in this case would be you’d install, we said, a series of wells all in the source area; we would let them operate for maybe two to three months, shut them
down, let them stay shut down for a month or two, start them
back up sort of a like a pulse reaction to try to move the
contaminants towards that well.

So, we did add that alternative even though the
treatability study had mixed results. And that alternative had
a present worth cost of about $800,000.

So, in summary, the recommended alternatives for this
site: for soil, it’s to implement institutional controls to
prohibit building and use of the land; and for groundwater, it’s
institutional controls and monitored natural attenuation. We
feel that, from a standpoint of the current risks that the site
presents as well as effectiveness of the other technologies,
that this would be the most feasible way to approach this site
for this time being.

Are there any questions? Yes, sir.

MR. JOE BARNETT: What was this cost? I wasn’t
sure again. Capital costs, annual, I wasn’t sure what that
comes to.

MR. WATTRAS: Okay. For which particular
alternative?

MR. BARNETT: Just any of them. I wasn’t
sure.

MR. WATTRAS: Okay. Let’s start with soil.

Obviously no action there’s no cost. And I apologize, I do not
have a slide. I think Rich has a slide for his costs, but I did
not prepare one.

For institutional controls with soil, there is no capital cost, but there’s an annual operation and maintenance cost, and that’s really just upkeeping of the fence and so forth. That’s about $900 a year. And the net present worth cost was just under $14,000 total. That’s for soil.

MR. BARNETT: What’s net present worth cost mean? Is that like a one-time cost?

MR. WATTRAS: Yeah, that would be one-time cost, and we’ll put that money aside today, and that should be enough, based on $900 a year for 30 years, to last at a, I think, interest rate of six percent.

For groundwater, again, no action has no costs. Okay? For the recommended alternative which is institutional controls and natural attenuation, there is no capital cost, again, with that one, because we feel we have enough wells out there we would not need to put any more in. But we do have an annual operation and maintenance cost which is mainly the collection of samples, the analysis of those samples. $63,000 a year for the first five years, because I believe we’re going -- we propose to monitor that quarterly. And for years 6 through 30 it would be $24,000 a year because we’re only sampling, I believe, twice a year. And the net present worth, again, was $535,000 for that alternative.

Now, the alternatives, beginning with groundwater
alternative number three, that’s where we would have to install
some extraction wells and a treatment facility, the capital cost
is $1,047,000. The annual O&M cost would be $67,000. And that
had a net present worth cost of $2,088,000.

The alternative which is very similar to that one, to
the extraction and treatment, that’s the dual phase vapor
extraction, that had a capital cost of $1,238,000; and it had an
annual maintenance, O&M cost, of about $98,000.

And finally, the last alternative, that was the in
situ air stripping, had a capital cost of $246,000, and an
annual O&M cost of $39,000.

MS. KATE LANDMAN: Did that answer your question
on the definition of --

MR. BARNETT: Okay. Except for the only
question I had, the capital costs and net present worth costs, I
wasn’t sure what the difference in that was.

MR. WATTRAS: Capital costs would be if we
have to put in a treatment plant, you have to install it,
construct it, that’s the capital cost; whereas the net present
worth cost includes your O&M costs extended over a period of 30
years.

MR. BARNETT: So, that’s kind of like the
total cost, then, isn’t it?

MR. WATTRAS: Yes, exactly. That is the
total cost.
MS. KATE LANDMAN: Okay. So, it’s the capital cost which is the amount I’d have to lay out today to construct a building, plus if I have to spend $63,000 a year every year for 30 years, then that all brought back at a six percent interest rate to today’s dollar is the net present.

MR. BARNETT: I got it.

MR. JIM SWARTZENBERG: Jim Swartzenberg is my name.

Let me ask a series of questions. I’m trying to follow what you’re saying, and I read over this. How close is Everett Creek?

MR. WATTRAS: I think it’s about -- I think it’s in there, but

MR. SWARTZENBERG: Roughly, I mean.

MR. WATTRAS: About a quarter mile south.

MR. SWARTZENBERG: Quarter mile? It’s not as far as -- I think you said New River was --

MR. WATTRAS: The New River is actually a little closer.

MR. SWARTZENBERG: New River is closer.

MR. WATTRAS: It’s about 200 yards away.

MR. SWARTZENBERG: Isn’t there a canal? Didn’t I see a canal on something?

MR. WATTRAS: Go back one. What you saw here was a natural drainage...

MR. SWARTZENBERG: Yeah.
MR. WATTRAS: ...which is a swell. It’s not -- I would call it intermittent. In fact --
MR. SWARTZENBERG: Oh, it was on this picture, yes.
MR. WATTRAS: You’ll see ponded water in here, you know, not this time of year...
MR. NEAL PAUL: It’s seasonally drained.
MR. WATTRAS: ... according to the way the weather’s been around here, but it’s not a brief flowing stream. It’s basically a drainage channel or a swell, as I would call that. And that will lead down to Everett Creek, by the way. That goes all the way down to Everett Creek.
MR. SWARTZENBERG: Has that ever been tested, the water in that ever been tested?
MR. WATTRAS: We pulled -- I’m trying to think. We did test it, but we used -- what the heck did we do there? I want to say the water has been tested. We didn’t find anything in there, but I don’t have that full report in front of me. Nothing rings a bell that that was a problem.
MR. SWARTZENBERG: Okay.
MR. WATTRAS: And there’s actually another one more -- you can see it -- barely see it on here.
MR. SWARTZENBERG: Yeah.
MR. WATTRAS: There’s another drainage swell that flows north to that unnamed tributary. We pulled
samples from that area. And I don’t believe we found anything in that water also.

The only water, as I mentioned, though, even back in the mid-1980s when we studied this site, and there were a few on site real small ponds, we took samples from those ponds, again, and they still had low levels of volatile organics. And we feel pretty confident that those ponds are tied into the water table. They were pretty low, and probably what we saw there was the water table in those ponds. So, this water puddles, it formed when it rained; every time I’ve been out there I’ve seen the ponds. There’s always some water in it, and they did have low levels of volatiles in there.

MR. SWARTZENBERG: Why can’t you go in there and just dig out where these barrels and training kits were put in there and load them on a truck and send them off to Indiana or somewhere else?

MR. WATTRAS: Well, it’s basically, the way I could describe it would be the U.S. Army policy is not to disturb that if it doesn’t create an imminent risk to human health and the environment. And right now in the realm of things, this site is very, very low priority for the U.S. Army. They have a lot bigger problems with major quantities of mustard gas and blister agents at other sites throughout the nation. And they basically say don’t dig it up unless you have to, because you do run a risk in doing that, obviously. And we
don’t want to create a risk where we don’t have one right now. That is part of the theory behind it, I think, is they don’t want to create a risk if you don’t have one right now; nor do they foresee this site creating a risk like other sites that they have, which might be literally next to a residential area and they have to do something. So, that’s pretty much --

MR. SWARTZENBERG: The reason you’re saying that you’re not considering that as an alternative is because of the Army policy.

MR. WATTRAS: That’s correct.

MR. SWARTZENBERG: Not because it’s a good or bad alternative. You’re just not considering it, period, because of the Army policy, right?

MR. WATTRAS: Pretty much so, and it does not create -- there is no risk being created right now from the stuff that’s buried there, the chemical agents that are buried there.

MR. SWARTZENBERG: I understand that, but what you’re telling me is that you’re not considering it because it’s the Army policy.

MR. WATTRAS: Pretty much so.

MR. PAUL: And that policy is done by DoD, and that’s something we can’t challenge.

MR. SWARTZENBERG: Okay.

MR. WATTRAS: Yeah.
MS. LANDMAN: Kate Landman, from LANTDIV.

I just want to add here that we don’t have the technology to go out to this site and do anything safely without the Army’s assistance. Therefore, it’s not feasible for us to go out and do something to this site because we can’t do it. We don’t have the technologies to monitor for the agents. Every time we drilled a hole in the ground just to test the water, we had to have the Army come out to sniff for us. And we literally don’t have any way of going after anything at this site without their assistance.

MR. WATTRAS: And correct me if I’m wrong, we -- the Navy, I say “we” -- the Navy, we are not permitted to go after it. It’s the U.S. Army’s...

MS. LANDMAN: That’s right.

MR. WATTRAS: ... property. They were responsible for the manufacturing of it, the distribution of it, and the clean-up of it. So, even if we wanted to go in there, if we did, it would not -- it would be a problem. It is their responsibility, and they -- I don’t want to use the word "own it," but they’re responsible for that, and that is their policy, and that’s why we, you know, we couldn’t do anything there. And understand how that -- you know, the policy, to some extent, makes some sense because it’s not a high risk site. And like I said before, with all the other sites that they have --

MR. SWARTZENBERG: But even if it were, you
couldn’t do anything about it?

MR. WATTRAS: The Army would have to assist us.

MS. LANDMAN: Not today.

MR. WATTRAS: In fact, the Army would say it’s illegal --

MR. SWARTZENBERG: You can’t contract something like that out?

MR. WATTRAS: Pardon me?

MR. SWARTZENBERG: You can’t contract that out?

MR. WATTRAS: The army would -- they wouldn’t even let us do that. They would contract it out.

MR. SWARTZENBERG: They would contract it.

MR. WATTRAS: That’s a special type of waste that you have to have special expertise in dealing with it, and the Army’s involved with all of those clean-ups.

MR. SWARTZENBERG: Okay.

MS. LANDMAN: This is one site that is never going -- in our lifetime it’s not going to go away as a site. I mean, there are contaminants out there. We don’t know completely what’s out there. All we have are written reports that these chemical agent test kits are buried out there. We have records that say that. We have not encountered any in our investigation. so, our investigation has not been -- the subsurface investigation has not been as thorough as a normal
site would be because of the limitations imposed on us by the
Army.

MR. SWARTZENBERG: So, you’re going to monitor
this for 30 years.

MS. LANDMAN: No, we’re going to monitor it
probably forever or until the Army moves us up on their list,
technology changes, we have accessibility. This is one site
that is not, you know, monitor until you reach a clean state and
then be able to say it’s clean. We could have clean readings
multiple years in a row, and we couldn’t categorically say the
site is clean.

MR. SWARTZENBERG: But what you’re budgeting for
is monitoring for 30 years.

MR. WATTRAS: Yes. The 30 years --

MR. SWARTZENBERG: At the end of 30 years you’ve
got to budget more money, is that it?

MR. WATTRAS: Well, that’s what you would
have to do. And every five years, I believe -- well, every year
you would really -- we’d have a report coming out every year,
basically, showing the progress or lack of progress that the
natural attenuation is taking. But as long as it’s there, the
Navy will have to monitor it.

MR. SWARTZENBERG: What happens if the -- and
maybe you’ve already answered this. What happens if these
levels don’t decrease? And maybe you’ve already answered this.
They probably won’t, right?

MR. WATTRAS: Well, we hope that they decrease. We’re seeing, fortunately -- you want to hit the next slide, Rich. They’ve decreased to levels that are non-detectable only a couple of hundred feet from the site.

Now, say five years from now we start seeing that the levels are starting to increase here, then we would probably have to, you know, consider -- we might have to consider doing something at that point, containing the flow of groundwater.

But for right now there’s been 10-12 years of data showing that we really haven’t seen -- we’ve actually seen levels in these wells and in these wells increase significantly over the last ten years. So, but you never know what can happen.

MR. SWARTZENBERG: These could be in some barrels that...

MR. WATTRAS: Exactly.

MR. SWARTZENBERG: ... haven’t rusted through yet.

MR. WATTRAS: Exactly. That could be the case.

MR. SWARTZENBERG: When they do, then you could --

MR. WATTRAS: That could be the case.

MS. LANDMAN: So, five years from now -- our monitoring program was designed so that we can detect if,
say, a big new slug were to come out from the source area. And if that were the case and we started to see a significant plume starting to migrate off site, we might have to do something in the form of a barrier, which would be outside the site because we can’t do anything within the site.

MR. WATTRAS: But there’s nothing suggesting that yet.

MS. LANDMAN: So, we would have to reevaluate that situation as it arose because it wouldn’t do any good to put -- we might decide to install a protective barrier system right now, and it might be in the wrong place. We don’t know. And as long as we have a relative equilibrium at the site right now, and contaminants don’t appear to be leaving the site, it appears that what contaminants have been released at the site are naturally attenuating before they make it off site. And as long as that equilibrium is maintained, we won’t really have a problem regarding risks for contaminants escaping the site. And part of the monitoring program is to insure that those conditions don’t change, and if they do change, it will alert us early enough so that we can take action to prevent any exposure.

MR. SWARTZENBERG: One last question.

MR. WATTRAS: Sure.

MR. SWARTZENBERG: Maybe Katherine can answer this. I don’t know, I mean, whatever. You said you dug wells. Some of these wells detected high levels of TCE at 30 to 40
feet; that’s what you had said.

MR. WATTRAS: That’s what we call the upper
zone of the Castle --

MR. SWARTZENBERG: So, they are in the aquifer?

MR. WATTRAS: Yes, they are.

MR. SWARTZENBERG: What happens to that water,
because the water evaporates, right?

MR. WATTRAS: Well, groundwater is moving.

Part of the theories, although we have it at 30 to 40 feet, we
even have it at 60 to 70 feet, but it’s only in this one area,
okay? We have wells out here that are 60 to 70 feet. We have
wells out here that are 60 to 70 feet and deeper; we haven’t
seen it out here. Part of the theory is we believe there’s a
lot of clayey-type soil up at this site, and contaminants will
bind to that clay, you know, it will bind them and they won’t
move as readily as, say, sandy-type soil.

So, that’s part of the theory, but we have to
remember, this waste has been buried since 1950 through 1976,
and it’s somewhat surprising that it hasn’t moved much further
off site, which is good, and we think the reason for it might
have to do with the type of material, the geologics of the clays
and stuff like that that might be binding that contaminant from
the groundwater.

MR. SWARTZENBERG: You really don’t know?

MR. WATTRAS: You can’t tell for certain.
MR. SWARTZENBERG: A lot of guesses.

MR. WATTRAS: That’s a theory. We do know -- the facts are it’s clean out here, so it’s not moving. I mean, it has not been detected out here.

Groundwater is always moving, obviously, but the contamination has stayed pretty much -- here’s the Castle Hayne, this green color is the drinking water aquifer. This is pretty much our estimated extent of contamination in the drinking water aquifer, and this is our estimated extent of contamination in the shallow aquifer.

Yes, sir?

MR. BARNETT: Joe Barnett. That Castle Hayne, the shallow and the deep and intermediate, is it like a big bathtub and it’s all the same water?

MR. WATTRAS: The shallow aquifer is, separated by a semi-permeable layer of clays, silts and sands. It’s not totally isolated. I’m not sure at Camp Lejeune, I mean, there are a lot of aquifers around the country that are -- you can have a shallow aquifer, then you can have two or three feet of clay, and you can have another aquifer underneath, and they’re not interconnected hydraulically.

We feel pretty certain from the testing that we did out here, we do have -- it’s a fact that we have contamination in the shallow and in the deeper Castle Hayne. There is an interconnection between the aquifers.
MR. BARNETT: I personally think your alternative is probably the best one, but what I’m wondering, what else -- I mean, if you have some pollution like in one end of the bathtub, it just disperses enough, does it break them down or is it just getting diluted and your wells don’t detect it because it’s...

MR. WATTRAS: It’s a little bit of both.

MR. BARNETT: ... diluted so much you can’t detect it?

MR. WATTRAS: It’s a little bit of both.

It’s dilution as well as just the break-down of the solvent itself.

MR. BARNETT: But it does break down some of it?

MR. WATTRAS: It does break down, yeah.

MR. BARNETT: And another question is, you know, I keep reading about -- I brought this up a long time ago, but supposedly as our aquifers -- you know, we’re using a lot of it and it’s dropping, will that tend to spread it more?

MR. WATTRAS: Actually if the shallow -- you know, if your water table dropped below where your wastes are, that’s actually good, in a way, because now there’s no -- you know what I’m saying?

MR. BARNETT: Okay. So, it might -- except where the --
MR. WATTRAS: You might have a better condition if your shallow water table dropped because there’s no longer any contact with that waste material. Okay?

We haven’t studied the site -- I mean, we haven’t looked at those groundwater levels over time to try to get any type of pattern. There are seasonal fluctuations in groundwater. Maybe Rich can help me here. I don’t think they fluctuate more than a foot or two out, out at this site, from what I recall.

So, to answer your question about the water levels, if anything if the water levels go down, that would actually be better because you’d have your wastes that would now be above the water table and no longer in contact. But they do fluctuate seasonally.

MR. BARNETT: So, what’s already in the water, though, that might get dispersed more.

MR. WATTRAS: Yes.

MR. BARNETT: But what’s not in the water, it might keep it from getting in the water?

MR. WATTRAS: That’s correct.

MR. BARNETT: Except when it rains, then it might.

MR. WATTRAS: Rain would cause some infiltration.

MR. SENUS: Ray, can I interject? It’s
been about an hour already. Does anybody have any objections if we move to OU 6? We have five more sites to do. In the interest of time. If there are any questions about site 69 we can entertain that at the end, either formally or informally, depending on how much time is left.

MR. WATTRAS: Or written comments, I guess there’s -- on the back of the sheets there’s an address if you have any other questions, feel free to write those questions in and we’ll answer them.

Thank you. And I apologize for taking more than 15 or 20 minutes.

(This CONCLUDES THE PUBLIC MEETING FOR OPERABLE UNIT NO. 14, MARINE CORPS BASE, CAMP LEJEUNE.)
STATE OF NORTH CAROLINA
COUNTY OF PENDER

CERTIFICATE

I, J.R. RYAN, CERTIFIED COURT REPORTER-NOTARY PUBLIC, DO HEREBY CERTIFY THAT THE FOREGOING 34 PAGES CONSTITUTE A TRUE AND CORRECT TRANSCRIPT OF THE PRESENTATION, QUESTIONS AND COMMENTS HEARD AT THE PUBLIC MEETING REGARDING OPERABLE UNIT NO. 14, MARINE CORPS BASE, CAMP LEJEUNE.

I DO FURTHER CERTIFY THAT I AM NOT COUNSEL FOR, OR IN THE EMPLOYMENT OF ANY OF THE PARTIES, NOR AM I FINANCIALLY INTERESTED IN THE RESULTS OF THIS ACTION.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS 12TH DAY OF JULY 1998.

J.R. RYAN
NOTARY PUBLIC FOR THE STATE OF NORTH CAROLINA

MY COMMISSION EXPIRES: JANUARY 8, 2002
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<td>1/25</td>
<td>0</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>0.082</td>
<td>0.003J</td>
<td>1/25</td>
<td>0</td>
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<tr>
<td>Beryllium</td>
<td>3.2</td>
<td>ND</td>
<td>0/25</td>
<td>0</td>
</tr>
<tr>
<td>Chromium(1)</td>
<td>1</td>
<td>3.6 (1.6 min.)</td>
<td>18/25</td>
<td>18</td>
</tr>
<tr>
<td>Lead</td>
<td>NA(3)</td>
<td>12.5</td>
<td>25/25</td>
<td>--</td>
</tr>
<tr>
<td>Manganese</td>
<td>NA(3)</td>
<td>15.5</td>
<td>22/25</td>
<td>--</td>
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<tr>
<td>Vanadium</td>
<td>110</td>
<td>5.3</td>
<td>3/25</td>
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<tr>
<td>Zinc</td>
<td>130.6</td>
<td>66</td>
<td>12/25</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:
(1) The soil to groundwater screening level was calculated for chromium VI.
(2) This is the lowest soil to groundwater screening level of cis- and trans- 1,2-dichloroethene.
(3) A soil to groundwater screening level could not be calculated because there is no soil-water partition coefficient (Kd) for this contaminant.

ND = not detected
J = estimated value
Equation: \[ C_{\text{soil}} = C_{GW} K_s + \left[ \frac{(n_w + n_a H')}{P_b} \right] \text{df} \]

Calculation Input Table

<table>
<thead>
<tr>
<th>Definition</th>
<th>Units</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_{\text{soil}} ) - Calculated soil concentration for soil</td>
<td>mg/kg</td>
<td></td>
<td>Calculated</td>
</tr>
<tr>
<td>( C_{GW} ) - Applicable groundwater target concentration</td>
<td>mg/L</td>
<td>0.07</td>
<td>NC 2L Standard</td>
</tr>
<tr>
<td>1,2-Dichloroethene (total)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trichloroethene</td>
<td></td>
<td>0.0028</td>
<td></td>
</tr>
<tr>
<td>df - Dilution Factor</td>
<td>unitless</td>
<td>1</td>
<td></td>
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<tr>
<td>( K_s ) - Soil-water partition coefficient</td>
<td>L/kg</td>
<td>11.005</td>
<td>--</td>
</tr>
<tr>
<td>1,2-Dichloroethene (total)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Trichloroethene</td>
<td></td>
<td>29.233</td>
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<tr>
<td>( K_{oc} ) - Soil organic carbon-water partition coefficient</td>
<td>L/kg</td>
<td></td>
<td>USEPA 1996, Soil</td>
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<tr>
<td>1,2-Dichloroethene (total)</td>
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<td>35.5</td>
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<td>Trichloroethene</td>
<td></td>
<td>94.3</td>
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<tr>
<td>( f_{oc} ) - Fraction organic carbon in vadose zone soil</td>
<td>g_{carbon}/g_{soil}</td>
<td>0.31</td>
<td>site specific value</td>
</tr>
<tr>
<td>( n_w ) - Water filled soil porosity (vadose zone soil)</td>
<td>L_{water}/L_{soil}</td>
<td>0.3</td>
<td>See “( K_{oc} )” Source</td>
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<tr>
<td>( n_a ) - Air filled soil porosity (vadose zone soil)</td>
<td>L_{air}/L_{soil}</td>
<td>0.13</td>
<td>See “( K_{oc} )” Source</td>
</tr>
<tr>
<td>( H' ) - Henry’s Law Constant</td>
<td>unitless</td>
<td>0.167</td>
<td>See “( K_{oc} )” Source</td>
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<tr>
<td>1,2-Dichloroethene (total)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Trichloroethene</td>
<td></td>
<td>0.37392</td>
<td></td>
</tr>
<tr>
<td>( P_b ) - Bulk Density</td>
<td>kg/L</td>
<td>1.51</td>
<td>OU</td>
</tr>
</tbody>
</table>

Note: Chemical/physical properties of cis-1,2-dichloroethene were used as surrogate values for 1,2-dichloroethene (total).
# USEPA SOIL TO GROUNDWATER SCREENING GUIDANCE
## CALCULATION OF SITE-SPECIFIC SOIL SCREENING LEVELS FOR INORGANICS
### SITE 69
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

## Calculation Input Table

<table>
<thead>
<tr>
<th>Definition</th>
<th>Units</th>
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<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_{\text{soil}} ) - Calculated soil concentration for soil</td>
<td>mg/kg</td>
<td>--</td>
<td>Calculated</td>
</tr>
<tr>
<td>( C_{\text{GW}} ) - Applicable groundwater target concentration</td>
<td>mg/L</td>
<td>0.004</td>
<td>MCL</td>
</tr>
<tr>
<td>Beryllium</td>
<td>mg/L</td>
<td>0.04</td>
<td>MCL</td>
</tr>
<tr>
<td>Chromium (VI)</td>
<td>mg/L</td>
<td>0.05</td>
<td>NC 2L Standard</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/L</td>
<td>0.015</td>
<td>NC 2L Standard</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>0.05</td>
<td>NC 2L Standard</td>
</tr>
<tr>
<td>Vanadium</td>
<td>mg/L</td>
<td>0.11</td>
<td>Site Specific Risk - Ingestion</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>2.1</td>
<td>NC 2L Standard</td>
</tr>
</tbody>
</table>

### Soil Screening Levels (mg/kg)

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Beryllium</td>
<td>3.2</td>
</tr>
<tr>
<td>Chromium (VI)</td>
<td>1.0</td>
</tr>
<tr>
<td>Lead</td>
<td>NA</td>
</tr>
<tr>
<td>Manganese</td>
<td>NA</td>
</tr>
<tr>
<td>Vanadium</td>
<td>110.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>130.6</td>
</tr>
</tbody>
</table>

## Equation

\[
C_{\text{soil}} = C_{\text{GW}} K_d + \left( \frac{n_w + n_a H'}{P_b} \right) df
\]

### Notes
- **NA** = value not available.
- **Source**:
  - MCL: Maximum Contaminant Level
  - NC 2L Standard: North Carolina 2L Standard
  - Site Specific Risk - Ingestion
  - USEPA 1996, Soil
LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
MCB CAMP LEJEUNE OU NO. 14 (SITE 69)
RIFLE RANGE CHEMICAL DUMP

GENERAL

By separate Memorandum of Agreement dated May 24, 1999, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), the U.S. Environmental Protection Agency (USEPA); the North Carolina Department of Environment and Natural Resources (NCDENR); and the Department of the (Navy) on behalf of U.S. Marine Corps Base, Camp Lejeune, agreed that the Navy and the United States Marine Corps (Marine Corps) shall follow certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP, and, for Site 69, this Land Use Control Implementation Plan (LUCIP). The LUCAP is intended to ensure that all of the Department of the Navy's site-specific selected remedies with land use controls remain protective of human health and the environment. This LUCIP and its requirements are part of the selected remedy within the final Record of Decision (ROD).

The parties to the LUCAP also agree that efficacy/protectiveness of the land use controls within this Land Use Control Implementation Plan is contingent upon the Navy's substantial good-faith compliance with those procedures applicable to the selected remedy. Should such compliance not occur or should the LUCAP be terminated, the parties agree that the protectiveness of the selected remedy may be reconsidered by any party and additional remedial measures may be necessary to ensure the selected remedy remains protective of human health and the environment.

This document is the LUCIP for MCB Camp Lejeune, Site 69, Rifle Range Chemical Dump. Site 69 is the sole site comprising Operable Unit (OU) No. 14. This LUCIP is an attachment to and a part of the ROD for the site.

The Navy and the Marine Corps will, Pursuant to the LUCAP, include the land use controls set forth in this LUCIP within the Installation’s Geographic Information System (GIS) and the base master planning process. Pursuant to the LUCAP paragraph IV. a), the Installation will provide written notification to the State and USEPA when the requirements of this paragraph have been met.

All proposed changes to this LUCIP will be submitted to the State and USEPA for review and concurrence prior to implementation. Changes to this LUCIP will, if required under the National Contingency Plan, be reflected in changes to the selected remedy made through the appropriate process (e.g., Explanation of Significant Differences, ROD amendment).

The parties agree that the Navy’s annual certification of land use control implementation is necessary for as long as the Navy retains ownership of the site. The NCDENR maintains this annual certification is part of the selected remedy. The Navy and Marine Corps maintain this annual certification is a procedure to implement the selected remedy and is not a part of the selected remedy. Nevertheless, all parties agree that a written certification is desirable. Accordingly, pursuant to the LUCAP paragraph V. b), MCB Camp Lejeune will provide that certification annually to USEPA and the NCDENR that the land use controls within the ROD remain implemented.
SITE BOUNDARY IDENTIFICATION

The geographic boundary of the site is identified in Figure D-1, Boundary of Site 69. This boundary indicates the outermost border of all controlled portions of this site (i.e., no areas subject to land use controls lie outside this boundary). The current boundary is driven by aquifer use controls.

The geographic boundary of the current shallow groundwater contamination is identified in Figure D-2, Boundary of Current Shallow Groundwater Contamination. The geographic boundary of the current deep groundwater contamination is identified in Figure D-3, Boundary of Current Deep Groundwater Contamination.

SITE USE CONTROLS

Unless specifically excepted by both NCDENR and USEAP, all land uses and intrusive activities at the site (e.g. training, recreation, construction, grading, excavation of soil, or insertion of objects into the ground), except for monitoring purposes, are prohibited. See Figure D-4, Boundary of Land Use Controls. All exceptions for intrusive activities (including intrusive activities for monitoring purposes) are required to have assistance from an Army Technical Escort Unit (or equivalent) to monitor for potential encounters with buried CWM. These controls are to remain in effect until either (a) it can be demonstrated that contaminants (including CWM) no longer remain on site, or (b) the land use controls of this Interim ROD are superceded by a Final ROD.

AQUIFER USE CONTROLS

Except for monitoring purposes or as specifically excepted by NCDENR or the USEPA, all use of groundwater beneath Site 69 is prohibited. In addition, the installation of any well, other than those constructed for monitoring purposes, is prohibited except as authorized by North Carolina Administrative Code Title 15A, Chapter 2C (as amended), Well Construction. See Figure D-5, Boundary of Aquifer Use Controls. A 1,000-foot buffer around areas of known contamination is used to delineate this boundary. These controls are to remain in effect until either (a) it can be demonstrated that contaminants (including CWM) no longer remain on site, or (b) the aquifer use controls of this Interim ROD are superceded by a Final ROD.

SITE ACCESS CONTROLS

Access to Site 69 is controlled via a chain link fence and locking gate. The fence is currently installed along the perimeter of the Site 69 boundary of land use controls. Warning sings are posted on the fence, gate, and signs will be maintained as long as land use controls are required.

NOTIFICATION

Following the procedures contained within the LUCAP, MCB Camp Lejeune shall file a Notification of Inactive Hazardous Substance or Waste Disposal Site meeting the requirements of NCGS 130A-310.8
Commander, Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Building N-26)
Norfolk, Virginia 23511-2699

Attention: Ms. Katherine Landman
Navy Technical Reprepredstative
Code 1823

Commanding General
Marine Corps Base
PSC Box 20004
Camp Lejune, NC 28542-0004

Attention: AC/S, EMD/IRD

RE:
State Concurrence on the
Interim Record of Decision (ROD)
Operable Unit No. 14 (OU14), Site 69
MCB Camp Lejune, North Carolina

Dear Ms. Landman:

The North Carolina Superfund Section has reviewed the Interim ROD for OU14, Site 69 and concurs with the remedy subject to the following conditions:

1. Our concurrence on the Interim ROD and of the selected remedy for the site is based solely on the information contained in the ROD. Should we receive additional information that significantly affects the conclusions or remedies contained in the ROD, we may modify or withdraw this concurrence with written notice to the Navy and MCB Camp Lejune.

2. Our concurrence on the Interim ROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the Site. The State reserves the right to review, comment, and make independent assessments of all future work relating to this Site.

We appreciate the opportunity to review this ROD and look forward to working with MCB Camp Lejune, the Navy, and EPA to remediate this Site.

Sincerely,

Grover Nicholson, Head
Federal Facilities Branch
Superfund Section

cc: Gena Townsend, US EPA Region IV
    Neal Paul, MCB Camp Lejune
CAMP LEJEUNE MILITARY RES. (USNAVY)

Site Information:

Site Name: CAMP LEJEUNE MILITARY RES. (USNAVY)
Address: ONSLOW COUNTY, NC
EPA ID: NC6170022580
EPA Region: 04

Site Alias Name(s):

- USMC CAMP LEJEUNE MILITARY RESERVATION
- USMC/LOT 140, HADNOT POINT ARE (SITE 7)
- USMC/BLDG TS 452 & TP 451 (SITE 10)
- USMC/HADNOT POINT BURN DUMP (SITE 3)
- USMC/FIRE FIGHTING TRAINING PIT (SITE 11)
- USMC/STORAGE LOTS 201 & 203 (SITE 12)
- USMC/CAMP GEIGER DUMP (SITE 4)
- USMC/BASE SAN LDFL (SITE 5)
- USMC/CHEM LDFL (SITE 1)
- USMC/BLDG PT 37 (SITE 6)
- USMC/K-326 RANGE (SITE 8)
- USMC/G4A RANGE (SITE 9)
- USMC CAMP LEJEUNE

Record of Decision (ROD):

ROD Date: 09/28/2001
Operable Unit: 10
ROD ID: EPA/ROD/R04-01/566

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 10
ONSLLOW COUNTY, NC
09/28/2001
Final Record of Decision
Operable Unit No. 9
(Site 65)

Marine Corps Base
Camp Lejeune, North Carolina

Prepared For

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-95-D-6007
CTO-0130

August 2001

Prepared by

CH2M HILL
Federal Group, Ltd.
Baker Environmental, Inc.
CDM Federal Programs Corp.
Revised Draft

Record of Decision for Operable Unit No. 9 (Site 65) at Marine Corps Base, Camp Lejeune, North Carolina

Contract Task Order Number - 0130
Contract Number N62470-95-D-6007
Navy CLFAN II Program

Prepared by BAKER ENVIRONMENTAL, INC
Coraopolis, Pennsylvania
June, 2001

Approved by: M. Schulze
Project Manager (CH2M HILL) Date: 6-7-01

Approved by: S. Bailey
Activity Manager (CH2M HILL) Date: 6-7-01

Approved by: R Bonelli
Project Manager (BAKER ENV., INC.) Date: 6-7-01
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<td>Summary of Site Contamination – Post RI Sampling</td>
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<td>Summary of Human Health COPCs in Each Media of Concern</td>
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<td>Ecological Contaminants of Concern in Each Media</td>
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<td>Glossary of USEPA Remedial Alternative Evaluation Criteria</td>
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**LIST OF FIGURES**

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<td>Conceptual Site Model for Current and Future Human Receptors</td>
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<td>Conceptual Exposure Model for Ecological Receptors</td>
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<td>Groundwater Contour Map – Castle Hayne Aquifer</td>
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<td>Supply Well Location Map</td>
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<td>A</td>
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<td>B</td>
<td>Public Meeting Transcript</td>
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<tr>
<td>C</td>
<td>Letter from North Carolina Department of Health and Human Services Toxicologist</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
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<td>ARAR</td>
<td>Applicable or Relevant and Appropriate Requirements</td>
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<td>Baker</td>
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<tr>
<td>bgs</td>
<td>below ground surface</td>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation and Liability Act</td>
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<tr>
<td>COPC</td>
<td>contaminant of potential concern</td>
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<tr>
<td>CT</td>
<td>central tendency</td>
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<td>DoN</td>
<td>Department of the Navy</td>
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<tr>
<td>FS</td>
<td>Feasibility Study</td>
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<tr>
<td>ft/ft</td>
<td>feet per foot</td>
</tr>
<tr>
<td>gpm</td>
<td>gallons per minute</td>
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<tr>
<td>HI</td>
<td>hazard index</td>
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<tr>
<td>IAS</td>
<td>Initial Assessment Study</td>
</tr>
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<td>ICR</td>
<td>incremental cancer risk</td>
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<td>LANTDIV</td>
<td>Naval Facilities Engineering Command, Atlantic Division</td>
</tr>
<tr>
<td>MCB</td>
<td>Marine Corps Base</td>
</tr>
<tr>
<td>MCL</td>
<td>Maximum Contaminant Level</td>
</tr>
<tr>
<td>msl</td>
<td>mean sea level</td>
</tr>
<tr>
<td>µg/kg</td>
<td>micrograms per kilogram</td>
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<td>NC DENR</td>
<td>North Carolina Department of Environment and Natural Resources</td>
</tr>
<tr>
<td>NCP</td>
<td>National Contingency Plan</td>
</tr>
<tr>
<td>NCWQS</td>
<td>North Carolina Water Quality Standards</td>
</tr>
<tr>
<td>OU</td>
<td>operable unit</td>
</tr>
<tr>
<td>PAH</td>
<td>polynuclear aromatic hydrocarbons</td>
</tr>
<tr>
<td>PCB</td>
<td>polychlorinated biphenyl</td>
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<tr>
<td>POL</td>
<td>petroleum, oil, and lubricant</td>
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<tr>
<td>PRAP</td>
<td>Proposed Remedial Action Plan</td>
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<tr>
<td>PRG</td>
<td>Preliminary Remediation Goal</td>
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<td>RA</td>
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<td>Risk Based Concentration</td>
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<td>Remedial Investigation</td>
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<td>Record of Decision</td>
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<td>SI</td>
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<tr>
<td>SSL</td>
<td>soil screening level</td>
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<tr>
<td>SSSV</td>
<td>surface soil screening value</td>
</tr>
<tr>
<td>SSV</td>
<td>sediment screening value</td>
</tr>
<tr>
<td>SVOC</td>
<td>semivolatile organic compound</td>
</tr>
<tr>
<td>SWSV</td>
<td>surface water screening value</td>
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TBC to-be-considered
USEPA United States Environmental Protection Agency
VOC volatile organic compound
WAR Water and Air Research, Inc.
DECLARATION

Site Name and Location

Operable Unit No. 9
Site 65
Marine Corps Base (MCB)
Camp Lejeune, North Carolina

Statement of Basis and Purpose

This document presents the selected remedy for Operable Unit (OU) No. 9 (Site 65) at MCB, Camp Lejeune, North Carolina. OU No. 9 was originally comprised of two sites, Sites 65 and 73, because of their geographical proximity. Because groundwater contamination exists at Site 73 that will require an active remedy, these sites were separated into different OUs. Accordingly, this decision document has been prepared to address only Site 65. The selected remedy for Site 65 was chosen 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). This decision document is based on the Administrative Record for OU No. 9, Site 65.

Assessment of the Site

The lead agency has determined that no action is necessary at OU No. 9 (Site 65) to protect public health and welfare or the environment from actual or threatened releases of pollutants to the environment.

Description of the Selected Remedy

The selected remedial alternative for OU No. 9, Site 65 is No Action. This alternative involves taking no remedial actions at this site. The environmental media will be left as they currently exist at the site. No institutional or engineering controls will be implemented. Five-year reviews are not required for this site because it has been determined that constituents at the site are present at levels that will allow for unlimited use and unrestricted exposure to site environmental media.

Statutory Determinations

The United States Environmental Protection Agency (USEPA) believes that the No Action decision is justifiable, as the present conditions at OU No. 9 are protective of human health and the environment. No remedial action is necessary at Site 65 to ensure this protection. The North Carolina Department of Environmental and Natural Resources has reviewed and concurs with the No Action decision. A concurrence letter from the NC DENR is presented in Appendix A.

Data Certification Checklist

The following information is included in the Decision Summary sections of this Record of Decision (ROD). Additional information can be found in the Administrative Record file for this OU.
• Chemicals of potential concern and their respective concentrations from the environmental investigations conducted at this site are discussed in Section 5.7.

• The quantitative human health and ecological risk assessments conducted for Site 65 are summarized in Sections 7.1 and 7.2, respectively.

• Cleanup levels were not established for Site 65 because no remedial actions are required.

• There are no source materials constituting a threat at this site. The environmental media will be left as they currently exist.

• No restrictions apply to land or groundwater use at this site.

• The No Action decision for Site 65 is evaluated using USEPA criteria as described in the Decision Summary section.

• The No Action alternative requires no capital or annual operation and maintenance costs. No Action will be effective upon approval of this ROD.

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Commanding General
Marine Corps Base, Camp Lejeune

Richard D. Green, Director
Waste Management Division
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This Record of Decision (ROD) document presents the final remedial action plan selected for Operable Unit (OU) No. 9 (Site 65) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The environmental media at this site were investigated as part of a Remedial Investigation (RI) (Baker, 1997) and Post-RI sampling (Baker Environmental, Inc. [Baker], 2001a). Based on the results of the RI, a No Action alternative was identified as the preferred alternative for Site 65 in a Proposed Remedial Action Plan (PRAP) document (Baker, 2001b). The public was given the opportunity to comment on the RI and PRAP. Based on comments received during the public comment period, and any new information that became available in the interim, a final remedial action plan was selected for OU No. 9 (Site 65).

This ROD document presents the final selected remedy along with a summary of the remedy selection process. The selected remedial action alternative for OU No. 9 (Site 65) is No Action. No Action was the only alternative considered for this site because the extent and level of contamination was not significant enough to warrant remedial action. It should be noted that there have been no enforcement activities conducted or required for OU No. 9. With the signing of this ROD, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requirements for this OU will be satisfied.
1.0 SITE NAME, LOCATION AND DESCRIPTION

OU No. 9 is one of 21 OUs located within MCB, Camp Lejeune. Figure 1 depicts the location of OU No. 9 within MCB, Camp Lejeune. As shown, OU No. 9 is located within the southern portion of the Base.

Figure 2 presents a site map of Site 65, the Engineer Area Dump. Site 65 is primarily a wooded area located immediately west and north of the Marine Corps Engineer School, which occupies property between Site 65 and Courthouse Bay. The school is used for maintenance, storage, and operator training of amphibious vehicles and heavy construction equipment. The school also utilizes a several acre parcel located just east of Site 65 to conduct heavy equipment training activities. Two ponds, Courthouse Bay Pond and Powerline Pond, are located east of the Heavy Equipment Training Area.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site 65 reportedly was used for waste disposal from 1952 to 1972. Two separate disposal areas were originally reported including: (1) a battery acid disposal area; and (2) a liquids disposal area where petroleum, oil, and lubricant (POL) products were reportedly disposed. There are no historical maps or figures which depict the location of the disposal areas, and neither area is currently discernible due to heavy vegetative growth. Base maps are available which indicate the location of a former burn area (Figure 2). Like the disposal area, the location of the burn area is not currently discernible from the surrounding landscape. Historical aerial photographs depict disturbed areas east of the Engineer School, which represent perhaps the best available means for approximately locating the site.

No enforcement activities have been conducted or required to date at Site 65. Previous investigations conducted at Site 65 include an Initial Assessment Study (IAS) (Water and Air Research, Inc. [WAR], 1983), a Site Inspection (SI) (Baker, 1994a), an RI (Baker, 1997) and Post-RI sampling (Baker, 2001a). The following paragraphs briefly describe these investigations.
2.1 **Initial Assessment Study**

In 1983, an IAS was conducted at MCB, Camp Lejeune. The IAS evaluated the potential hazards at various sites throughout the facilities, including Site 65. The evaluation included a review of historical records, aerial photographs, inspections, and personnel interviews. Sampling of environmental media was not conducted. The IAS concluded that Site 65 did not require further confirmation; however, a decision to perform an SI was subsequently made by the Department of the Navy (DoN) in 1991.

2.2 **Site Inspection**

The SI was conducted for Site 65 in July and August, 1991. The SI consisted of the following field activities: the installation of three shallow monitoring wells; the advancement of five, 15-foot deep soil borings; the collection of soil samples from each soil boring; groundwater sampling; and the collection of three surface water/sediment samples from two on-site ponds and an adjacent marshy area. Contaminants detected during the SI included metals and pesticides in groundwater; low levels of polynuclear aromatic hydrocarbons (PAHs) and pesticides in surface soil; low levels of pesticides and polychlorinated biphenyls (PCBs) in subsurface soil; metals in surface water; pesticides and metals in marsh sediment; and phenolic constituents in pond sediment. Based on the findings of the SI, an RI/Feasibility Study (FS), including a human health and ecological Risk Assessment (RA), was recommended to further evaluate the nature and extent of soil, sediment, surface water, and groundwater contamination. Also, further characterization of upgradient and downgradient surface soil, evaluation of debris piles, and surface water, sediment, fish, benthic community and groundwater sampling was recommended.

2.3 **Remedial Investigation**

From April 3 through May 25, 1995, an RI was conducted at Site 65. The RI consisted of the following field activities: a soil investigation; a groundwater investigation; surface water and sediment, and ecological investigations. The findings of the RI are presented in Section 5.0 of this document.
2.4 **Post-RI Sampling**

Surface and subsurface soil, sediment, surface water, and groundwater samples were collected on April 25, 27, and 29, 2001 to evaluate potential site impacts from a newly discovered (January 2001) pile of discarded drums. The findings of this sampling event are also presented in Section 5.0 of this document.

3.0 **HIGHLIGHTS OF COMMUNITY PARTICIPATION**

The PRAP document for OU No. 9 was released to the public on July 11, 2001. This document is available in an administrative record file at information repositories maintained at the Onslow County Public Library and at the Installation Restoration Branch Office (Building 58, MCB, Camp Lejeune). This document was made available to the public at the information repositories maintained at the Onslow County Public Library and the MCB Camp Lejeune Library.

A public comment period regarding OU No. 9 was held from July 11, 2001 through August 10, 2001; and a public meeting was held on July 18, 2001. An advertisement for the public meeting was published in the Jacksonville Daily News on July 18, 2001. During this public meeting, representatives from the DoN and the Marine Corps discussed the preferred remedial action under consideration. Community concerns were also addressed during the public meeting.

Community comments regarding the preferred remedial action, and the response to the comments received during the noted comment period are included in the Responsiveness Summary section of this ROD.

4.0 **SCOPE AND ROLE OF RESPONSE ACTION**

No Action is the selected response action for OU No. 9, Site 65. The No Action decision is the final recommended action for OU No. 9, Site 65. This decision is based on the findings of the RI field investigation, along with the results of the baseline human health and ecological RAs. In addition, justification of this decision is based on evaluation of the No Action alternative with respect to the USEPA criteria for evaluating remedial actions and remedy selection. Evaluation of the No Action decision with respect to each of the criteria is presented below. Table 5 provides a glossary of the USEPA evaluation criteria.
Overall Protection of Human Health and the Environment: The No Action alternative is protective of human health and the environment because site-related contaminant concentrations are generally below, or only slightly exceed, screening criteria considered protective for residential land use. In addition, exceedances are not prevalent and do not impact a large area of the site.

Compliance with ARARs/TBCs: Applicable or relevant and appropriate requirements (ARARs) for groundwater are North Carolina Water Quality Standards (NCWQS) and Federal Maximum Contaminant Levels (MCLs). Risk-based concentrations (RBCs) for soil and groundwater, and soil screening levels (SSLs) for soil are criteria to be considered (TBCs). Surface water data was compared to USEPA Water Quality Criteria for human health (water and organism consumption). Sediment data was compared to average upstream sediment concentrations from the White Oak River Basin Study. A comparison of site data to ARARs/TBCs is presented in Section 5.7 and in Tables 1 and 2.

Long-Term Effectiveness and Permanence: Because of the isolated occurrences and generally low concentrations of site-related contaminants, the No Action alternative will be protective of human health and the environment over the long term.

Reduction of Toxicity, Mobility, or Volume through Treatment: No treatment is required at this site to protect human health and the environment.

Short-Term Effectiveness: The No Action decision is protective to human health and the environment in the short term because no action is required to be protective.

Implementability: No Action is easily implemented.

Cost: No costs will be incurred with implementation of the No Action alternative.
5.0 SITE CHARACTERISTICS

5.1 Conceptual Site Model

Conceptual site models were developed for human and ecological receptors for the RI report. These models identified all potential exposure pathways via all media and the likelihood that an exposure would occur given site conditions, contaminant migration pathways, land use patterns, etc. The models for human and ecological exposure are presented on Figures 3 and 4, respectively.

5.2 Topography and Surface Features

The generally flat topography of MCB, Camp Lejeune is typical of the North Carolina Coastal Plain. Elevations on the Base vary from sea level to 72 feet above mean sea level (msl). The elevation of Site 65 is between 20 and 40 feet msl.

Site 65 is situated in a topographically high area that is gently pitched to the south-southeast with an average elevation of about 40 feet above msl. Due to the sandy surface soils, there is relatively little storm water runoff. The limited surface water runoff tends to drain radially to the east, south, and west, away from the site or collect in local surface depressions. Immediately east of Site 65 is the equipment training area which occupies the area between Site 65 and two small ponds located to the southeast. Portions of the area surrounding the ponds are marshy.

5.3 Geology

Subsurface soils encountered during drilling at Site 65 are representative of undifferentiated and River Bend Formations. Numerous borings were advanced within the study area during the field investigations conducted by Baker. Soil conditions are generally uniform throughout the study area. In general, the shallow soils consist of unconsolidated deposits of sand and silty sand. These soils represent the Quaternary age "undifferentiated" deposits which overlay the River Bend Formation.

Underlying the previously described soils is a loose to medium dense, greenish gray, fine sand containing little clay (approximately 10-35%) and trace silt. This soil unit constitutes the Belgrade Formation in the semi-confining unit separating the Quaternary sediments from the
Castle Hayne aquifer. The semi-confining unit appears to be approximately 7.5 to 15 feet thick, generally thickening toward the north. Beneath this unit resides the River Bend Formation. Borings were only advanced 10 to 15 feet into this formation during the RI, therefore providing limited knowledge of specific details regarding the condition of the River Bend beneath the study area. The upper portion of the River Bend was described as a partially cemented, gray, fine sand with some shell fragment and limestone fragments encountered periodically.

5.4 Hydrogeology

Hydrogeologic characteristics in the vicinity of the site were evaluated by reviewing existing information and installing a network of shallow and deep monitoring wells.

Groundwater was encountered at varying depths during the drilling program. This variation is primarily attributed to topographical changes. In general, the groundwater was encountered between 7.5 and 11 feet below ground surface (bgs) during field activities performed at the site.

Three rounds of groundwater level measurements were obtained on April 20, 23 and August 21, 1995, from the shallow and deep monitoring wells within the study area. Groundwater contours for the surficial aquifer are depicted on Figure 5. The data indicates that the groundwater flow is toward the south-southwest, with an average gradient of $9.7 \times 10^{-3}$ ft/ft. The southwestern portion of the site has a steeper gradient (an average of $1.2 \times 10^{-2}$ feet per foot [ft/ft]) than the rest of the site (an average of $8.2 \times 10^{-3}$ ft/ft).

Groundwater elevations and flow patterns for the upper portion of the Castle Hayne aquifer are depicted on Figure 6. Given the limited number of points, groundwater flow direction and gradient is estimated to flow in a southern to southwestern direction with a gradient of $2.3 \times 10^{-3}$ to $2.7 \times 10^{-3}$ ft/ft.

5.5 Identification of Water Supply Wells

Five active groundwater supply wells are located within a one-mile radius of Site 65 (BB44, BB47, BB218, BB220, and BB221). All of the water supply wells utilize the Castle Hayne aquifer. The Castle Hayne aquifer is highly permeable, semi-confined aquifer that is capable of yielding several hundred to 1,000 gallons per minute (gpm) in municipal and industrial wells in the MCB, Camp Lejeune area. Figure 7 identifies the locations of these supply wells within a one-mile radius of the site.
No contamination was indicated in any of the five active supply wells (Geophex, 1991). Production well BB44 is located approximately 1,200 feet from the site. The total depth of this well is 62 feet bgs and is screened from 32 to 62 feet bgs. This well was suspected to potentially have been impacted by surficial groundwater infiltration due to its relatively shallow screen. However, drilling logs for this well indicate the presence of confining units above the shallow screened interval, thus, well is not likely affected by surface waters (Geophex, 1991). Production well BB-44 was sampled in January and June 1997. For these sampling events, all volatile organic compounds (VOCs) tested for by USEPA method 524.2 were below the analytical laboratory’s stated detection limit of 0.5 micrograms per kilogram (µg/kg).

5.6  Ecology

During May 15 to 24, 1995, Baker conducted a qualitative habitat evaluation of the terrestrial environment at Site 65. The site and surrounding areas are dominated by a mixed forest composed of pine and deciduous trees. Cleared, sandy areas are located to the south and southeast of the site. Buildings, mowed grass, and paved surfaces are located to the west, and an earth moving training area is located east of Site 65. Mixed forest extends across Site 65, and is interspersed around the aforementioned zones. Topography is primarily broad and flat with scattered depressions.

Four habitat types are present at Site 65. These include forested areas, two separate wetland areas, and a low-lying drainage area. Wetlands at the site were classified as Palustrine systems, with unconsolidated bottom class and a permanently flooded water regime.

One threatened or endangered plant species (rough-leaf loose strife) and one state candidate plant specie (Blackfruit Spikerush) were identified at the site.

5.7  Nature and Extent of Contamination

5.7.1 Remedial Investigation

Table 1 summarizes the RI analytical results. Detected contaminant concentrations were compared to screening criteria appropriate for each media. Surface soil screening criteria include USEPA Region III RBCs for residential land use, and two times base background concentrations (inorganics only). Base background levels for inorganics were established by compiling surface
Soil investigations from samples that were collected from areas known to not have been used for site operations or disposal activities. The comparison criteria for groundwater are Federal MCLs and NCWQS. Inorganics in groundwater were also screened against base background levels (not presented in Table 1 for groundwater). Base background levels for inorganics in groundwater were established by compiling groundwater concentrations from samples collected from monitoring wells installed in areas known not to have been impacted by site activities, or upgradient of site activities across the Base (Baker, 1994b). Surface water contaminant concentrations were compared to freshwater screening values for human health (water and organism consumption) including USEPA Region IV Water Quality Standards or NCWQS, and upstream background concentrations from the White Oak River Basin Study (analytical results are presented in the RI). Sediment contaminant concentrations were compared against the average upstream background sediment concentrations from the White Oak River Basin Study. Fish tissue contaminant concentrations were compared to USEPA Region III RBCs for human ingestion of fish. Criteria reported in the table have been updated since the publication of the RI.

Soil Investigations

A total of 13 surface soil samples were collected at Site 65. Six of the samples were collected near the waste piles and burn area. The remaining samples were collected from other locations potentially impacted by historical activities at the site. VOCs, semivolatile organic compounds (SVOCs), pesticides, and inorganics were detected in surface soil. The analytical results from the surface soil samples are summarized below:

- Six VOCs were detected in the surface soil samples, although four of the compounds were determined to be laboratory contaminants because all detected concentrations were less than 10 times the maximum concentrations detected in the Quality Assurance/Quality Control (QA/QC) blanks. The two remaining VOCs detected at low levels in surface soils were ethylbenzene and total xylenes. The concentrations of these compounds did not indicate a specific source, but may have originated from vehicles and heavy equipment passing through the site.

- The most widespread SVOC detected was bis(2-ethylhexyl) phthalate, which was encountered at nine locations. This phthalate is a common plasticizer in rubber and
plastic products, such as tires. All of the sample locations with estimated concentrations of these phthalates are near roads or equipment training areas.

- PAH constituents were detected in three samples, all near existing or previously existing debris piles. The suspected source of the PAH contamination are the debris piles and historical burning areas at the site. Di-n-butyl phthalate was detected at two locations near the waste piles, but a specific source for this contaminant cannot be identified.

- Pesticides were detected in all areas of the site. The levels detected in the samples are similar to base-wide concentrations from the historical use of pesticides at Camp Lejeune.

- The PCB Aroclor 1260 was detected at one location near the burn area and the southernmost debris piles. Historical records do not indicate the disposal of PCBs; however, PCBs were detected in a subsurface soil sample collected during the 1991 Site Inspection. The detection of PCBs within the vicinity of the debris piles indicates that some product containing PCBs may have been spilled or disposed at the site.

- Surface soil sample analytical results for inorganics were compared to a screening level of two times average background concentrations. Seven of 13 sample locations exceeded two times the average base background for one or more inorganic. The detections were observed in the heavy equipment training area and the southernmost debris pile. The distribution of the inorganics indicates that they may be the result of rusting metal debris disposed at the site and the heavy equipment used for training.

A total of 13 subsurface soil samples were collected from the same locations as the surface soil sample locations. VOCs, SVOCs, and inorganics were detected in subsurface soil. The analytical results from the subsurface samples are summarized below:

- Five VOCs were detected in the subsurface soil samples, although four of the contaminants were determined to be laboratory-related because all detected concentrations were less than 10 times the maximum concentrations detected in the QA/QC blanks. Xylenes, a constituent of petroleum products which may have been deposited by heavy equipment, was the only non-laboratory related VOC detected.
• The most widespread SVOC detected was bis(2-ethylhexyl) phthalate. The source of this contaminant is assumed to be the same as for detections in surface soil, although this compound is also commonly a laboratory and field contaminant.

• Di-n-butyl phthalate was detected in the subsurface soil at the same two locations where it was detected in the surface soils. The remaining 14 SVOCs, all PAH constituents, were detected at the same sampling location where they were detected in the surface soil.

• Pesticide detections in subsurface soils mainly occurred in areas where the soils have been either disturbed by excavation or disposal. The occurrence of pesticide contamination may be attributed to the historical use of pesticides at MCB, Camp Lejeune.

• PCBs were not detected in the subsurface soil samples collected during the RI.

• Nine of 13 subsurface soil sample locations exceeded two times the average base background for one or more inorganic constituent. The majority of the inorganics occurred in either the heavy equipment training area or the debris piles. The suspected source of inorganics is rusting metal.

• A total of six subsurface soil samples were collected from test pits near the waste piles and burn area. Three VOCs were detected in the soil samples from the test pits, although all of the compounds were determined to be laboratory contaminants. The most widespread SVOC detected was di-n-butyl phthalate, which was detected at all six test pit locations. Pesticide results for subsurface test-pit soil samples included detections at four of six locations. All six test pit sample locations exceeded two times the average base background for two or more inorganics. The suspected source of the inorganics is the rusting debris disposed of in these piles.

**Groundwater Investigation**

Groundwater samples were collected from three existing wells, and seven wells installed during the RI. VOCs, SVOCs, and inorganics were detected in groundwater. The analytical results are summarized below:
• Five VOCs were detected in groundwater samples collected at the site. Four were
determined to be laboratory contaminants because detected concentrations were less than
10 times the maximum concentrations in QA/QC samples. Carbon disulfide was the only
VOC detected in the groundwater samples that was not determined to be a laboratory
contaminant. It was detected in one upgradient sample location at a low concentration.

• The SVOC naphthalene was detected in one upgradient sample location at a low
concentration.

• Groundwater samples collected from the monitoring wells contained no detectable
concentrations of pesticides or PCBs.

• Inorganic concentrations were, on average, one or two orders of magnitude below the
base background levels for groundwater. Only two of the inorganics, iron and
manganese, were detected at concentrations that exceed the screening criteria. Neither
iron nor manganese concentrations, however, exceeded the federal standard in any of the
samples collected at the site, and these inorganics are normally found at similar
concentrations in groundwater throughout the Base.

Surface Water and Sediment Investigations

Two surface water samples were collected, one each from Powerline Pond and Courthouse Bay
Pond. VOCs and inorganic compounds were detected. The analytical results are summarized
below:

• Two organic compounds were detected in surface water and were attributable to
laboratory contamination because detected concentrations were less than 10 times the
maximum concentration in QA/QC samples.

• A total of 13 inorganics were detected in the surface water samples. Aluminum, barium,
copper, iron, lead, manganese, vanadium and zinc exceeded the lowest surface water
screening value. All of the detected inorganic concentrations, except iron, exceeded the
average reference station concentration established at Camp Lejeune. The only sources
of recharge for the ponds are groundwater and stormwater runoff. Since groundwater
was not found to be significantly impacted, water evaporation and soil erosion are the suspected causes of elevated inorganics in the ponds.

A total of four sediment samples were collected at Site 65; two samples from each surface water sample location (0-6 inches and 6 to 12 inches). VOCs, SVOCs, pesticides, and inorganics were detected in sediment. The analytical results are summarized below:

- Carbon tetrachloride and tetrachloroethene were the only two VOCs detected in sediment that were not attributable to laboratory contamination. The other four VOCs were detected below, or only slightly above 10 times the maximum concentrations in QA/QC samples. The specific sources of carbon tetrachloride and tetrachloroethene have not been determined, but are suspected to have originated from various site operations. The detected levels did not exceed sediment screening values.

- Only one SVOC, di-n-butylphthalate, was detected in the sediment samples, but it is believed to be the result of laboratory contamination because it was detected at less than 10 times the maximum concentration in the QA/QC samples.

- Pesticides, including beta-BHC, 4,4'-DDD, and 4,4'-DDE, were detected in all of the sediment samples collected. All of these pesticides exceeded the lowest sediment screening value (SSV) and the average reference concentration. These concentrations are similar to the concentrations detected in the surface soils across the site.

- Thirteen inorganics were detected in the sediment. Copper, lead and zinc were detected at concentrations exceeding the lowest SSV only one time; however, all of these inorganics exceeded the average reference concentration (White Oak River Basin Study) at least one time. The inorganics are suspected to be the result of metals precipitation accumulated within the surface water as evaporation occurs.

**Fish Tissue**

Organics and inorganics were detected in fish tissue. Four fish-tissue samples were collected for fillet analysis, and five fish-tissue samples were collected for whole-body analysis. The analytical results are summarized below:
• Only two organics, acetone and 4,4'-DDD, were detected in the fillet samples.

• Twelve inorganics were detected in the fillet samples: aluminum, barium, calcium, copper, magnesium, manganese, mercury, potassium, selenium, sodium, thallium, and zinc.

• Four VOCs were detected in the whole-body samples, but they were all determined to be laboratory contaminants.

• There were no SVOCs detected in the whole-body samples.

• There were two pesticides, 4,4'-DDD and 4,4'-DDE, detected in the whole-body samples.

• Seventeen inorganics were detected in the whole-body samples: aluminum, antimony, arsenic, barium, beryllium, calcium, copper, iron, lead, magnesium, manganese, mercury, potassium, selenium, sodium, thallium, and zinc. Because mercury was not detected in any media with the exception of fish tissue, mercury contamination does not appear to be related to Site 65 or the local environment. Other potential sources for mercury in fish could be that the fish were transported to the ponds from off-site sources, or that bioaccumulation is occurring through a food chain.

5.7.2 Post-RI Sampling

Post-RI sampling was conducted near Site 65 to determine if contaminants were released from dissolved drum piles that were discovered in early 2001. The piles are located the wooded area to the south of Courthouse Bay Pond along its tributary to Courthouse Bay. A site walk was conducted in March 2001 and the location of piles was verified.

This area was not in the original Site 65 boundary, but is included under this OU because activities similar to those conducted in the original Site 65 boundary were conducted in this area.

Soil, surface water, sediment, and groundwater samples were collected from the area shown on Figure 8 in April 2001. Table 2 summarizes the post-RI sampling analytical results. Detected contaminant concentrations were compared to screening criteria appropriate for each media. Surface soil screening criteria include USEPA Region III RBCs for residential land use, USEPA
Region IX Preliminary Remediation Goals (PRGs) for residential land use, and two times average base background concentrations (inorganics only) as described for the RI. The comparison criteria for groundwater are Federal MCLs and NCWQS. Surface water contaminant concentrations were compared to USEPA Tier II freshwater screening values for human health (water and organism consumption), and NCWQS for fresh surface water, and average upgradient surface water values from the White Oak River Basin Study (Baker, 1994c), representing average background conditions. Sediment contaminant concentrations were compared to USEPA Region IV ecological screening levels for freshwater and average upgradient sediment values from the White Oak River Basin.

Soil Investigations

Two surface soil and four subsurface soil samples were collected at Site 65 in April of 2001 and were analyzed for VOCs, SVOCs, pesticides, PCBs, herbicides, and metals. VOCs, SVOCs, pesticides, herbicides, and metals were detected in the surface soil samples. None of the detected concentrations for VOCs, SVOCs, pesticides, PCBs, or herbicides exceeded any screening criteria. The inorganics aluminum, copper, and sodium were detected at concentrations exceeding both Region III RBCs and Region IX PRGs. Thirteen inorganics were detected at concentrations exceeding two times base background concentrations.

VOCs, SVOCs, pesticides, herbicides, and inorganics were also detected in subsurface soils. None of the detected concentrations of VOCs, SVOCs, pesticides, or herbicides exceeded screening criteria. The inorganic arsenic was detected at concentrations exceeding both Region III RBCs and Region IX PRGs. The essential nutrients calcium and sodium were detected at concentrations exceeding two times base background concentrations.

The source of inorganics in surface and subsurface soils at Site 65 is believed to be rusting metal debris disposed of at the site.

Groundwater Investigation

Groundwater samples were collected from three temporary wells. VOCs, total, and dissolved metals were detected in groundwater. None of the detected concentrations of VOCs exceeded screening criteria. Of the inorganics that were detected, concentrations of iron and manganese
exceeded NCWQS. These inorganics are normally found at similar concentrations in groundwater throughout the Base.

*Surface Water and Sediment Investigations*

Three surface water and sediment samples were collected. VOCs and metals were detected in surface water. None of the detected concentrations of VOCs exceeded screening criteria. The metals arsenic, chromium, copper, iron, lead, manganese, thallium, and zinc were detected at concentrations exceeding EPA Tier II freshwater screening values and/or NCWQS for surface water. Maximum detected concentrations of aluminum, barium, calcium, iron, magnesium, and sodium exceeded average concentrations detected in upgradient areas of the White Oak River Basin. Water evaporation and soil erosion are suspected to be the source of elevated inorganics in the surface water.

VOCs, SVOCs, pesticides, herbicides, and metals were detected in sediment. There are no sediment screening values for the six VOCs that were detected in sediment. Of the four SVOCs that were detected in sediment, only one has an established screening criteria that the detected concentration it can be compared to. This contaminant concentration did not exceed the sediment screening criteria. The pesticides 4,4’-DDD, 4,4’-DDE, 4,4’-DDT, alpha chlordane, dieldrin, endrin, endrin aldehyde, endrin ketone, and gamma chlordane were detected at concentrations exceeding Region IV ecological screening levels for freshwater. The levels detected in these samples are similar to base-wide concentrations from the historical use of pesticides at Camp Lejeune. Maximum detections of the pesticides 4,4’-DDD, 4,4’-DDE, 4,4’-DDT, endrin aldehyde, and p,p’-methoxychlor exceeded average concentrations detected in sediments in upgradient areas of the White Oak River Basin. There are no screening criteria for herbicides in sediment. The inorganics barium, copper, and lead were also detected at concentrations exceeding Region IV ecological screening levels for freshwater. Each of these inorganics and aluminum, arsenic, calcium, chromium, iron, magnesium, manganese, selenium, vanadium, and zinc were detected at concentrations exceeding average concentrations in upgradient areas of the White Oak River Basin. The inorganics are suspected to be the result of metals precipitation accumulated within the surface water as evaporation occurs.
6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Site 65 is a primarily wooded area located immediately east of the Marine Corps Engineer School which occupies property between Site 65 and the bay. The school is used for maintenance, storage, and operator training of amphibious vehicles and heavy construction equipment. The school also utilizes a several acre parcel located just east of Site 65 to conduct heavy equipment training activities. Two surface ponds are located immediately east of the training facilities that have recreational fishing available, and are stocked by the base fishing commission. Also, there are some physical fitness trails and exercise stops that run throughout the site and surrounding areas. Several wide, cleared trails for tanks and heavy equipment cross the site. The current land use is unlikely to change in the immediate future.

As discussed in the Site Characteristics section of this document, five active groundwater supply wells are located within a one-mile radius of the site. It is likely that these wells will continue to be used in the immediate future.

7.0 SUMMARY OF SITE RISKS

As part of the RI, human health and ecological RAs were conducted to determine the potential risks associated with the chemical constituents detected at Site 65. The RAs are based only on the RI data because the post-RI work was conducted subsequent to the RAs. The following subsections briefly summarize the findings of the human health and ecological RAs.

7.1 Human Health Risk Assessment

A quantitative human health RA was conducted for Site 65. This included identification of contaminants of potential concern (COPCs), and calculation of potential carcinogenic and non-carcinogenic risk for different human receptors.

7.1.1 Selection of COPCs

During the human health RA, chemicals of potential concern (COPCs) were selected for surface soil, subsurface soil, groundwater, surface water, sediment, and fish tissue as shown on Table 3. The selection of COPCs was based on methodology described in the USEPA Risk Assessment Guidance for Superfund (USEPA, 1989a, 1989b, 1991a, 1991b, 1995). COPCs were selected by
comparing detected concentrations to contaminant-specific screening criteria, as well as by
evaluation of site and contaminant characteristics. Criteria used in selecting a detected
contaminant as a COPC included historical information, background and naturally occurring
levels, field and laboratory blank data, USEPA Region III Contaminants of Concern, prevalence,
federal and state criteria and standards, toxicity, anthropogenic levels, persistence, and mobility.

As shown on Table 3, no detected VOCs, pesticides, or PCBs exceeded screening criteria and
were not retained as COPCs in surface soil. Two SVOCs, benzo(a)pyrene and dibenzo(a,
h)anthracene, were retained as a COPCs because the maximum concentrations exceeded the
residential soil screening values. Manganese and thallium were the only inorganics that were
retained as surface soil COPCs because they exceeded the residential soil screening values.

For subsurface soil, no VOCs, pesticides, or PCBs were retained as COPCs. Benzo(a)anthracene,
benzo(a)pyrene, aluminum, iron, and manganese were retained as COPCs because their
maximum concentrations exceeded residential soil screening levels. Lead was retained as a
COPC because its maximum concentration exceeded the lead action level. Antimony, arsenic,
copper, nickel, and thallium were retained as subsurface soil COPCs because their concentrations
exceeded background and/or residential soil screening levels.

For groundwater, no SVOCs, pesticides, or PCBs were retained because their concentrations did
not exceed the tap water screening values and/or the blank sample concentration. Carbon
disulfide, manganese, and iron were retained as COPCs because their concentrations exceeded tap
water screening criteria. It should be noted that 1,2-dichloroethane, bis(2-ethylhexyl)phthalate,
and aluminum were not retained as COPCs because their concentrations did not exceed blank
contamination (organics), or naturally occurring levels (aluminum).

For surface water, no VOCs, SVOCs, pesticides, or PCBs were retained as COPCs because their
concentration did not exceed the North Carolina Water Quality Standards, and/or blank sample
concentrations. Copper, iron, lead, and zinc were detected at concentrations greater than
corresponding NCWQS and were retained as COPCs. There were no NCWQS for aluminum,
barium, manganese, and vanadium, so these inorganics were also retained as surface water
COPCs.

For sediment, no VOCs, SVOCs, pesticides, or PCBs were retained as COPCs because their
concentrations were less than the respective residential soil screening values and/or blank sample
concentrations. Aluminum, antimony, chromium, and iron were detected at concentrations that exceeded corresponding soil RBCs. Therefore, these inorganics were retained as sediment COPCs.

No VOCs, SVOCs, pesticides, or PCBs were retained as COPCs for fish tissue. Mercury and thallium were the only constituents retained as COPCs for fish tissue because their concentrations exceeded fish tissue screening levels. However, it should be noted that the North Carolina Department of Health and Human Services was contacted regarding the constituents detected in fish and crab tissue. The state toxicologist concluded that consumption of fish and crab found at this site should not pose a significant health risk (see Appendix C).

7.1.2 Quantification of Exposure

For each COPC, incremental cancer risk (ICR) and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks, respectively. An ICR is a value that indicates the probability of developing cancer when exposed to certain contaminants. The USEPA has established an acceptable range of carcinogenic risk is 1x10^{-6} to 1x10^{-4}. This means that the acceptable range is between one person in a million and one person in ten thousand getting cancer in one’s lifetime due to exposure to contaminants. A HI is an index that compares the site contaminant concentrations to reference concentrations (federal guidelines and literature values), if exceeded, could cause non-carcinogenic health risk. An HI greater than 1.0 indicates a potential human health risk due to exposure to a contaminant.

7.1.2.1 Current Scenario

Under the current exposure scenario, military personnel (trainee), military personnel (recreational user), adult and child fisherman receptors were evaluated as potential receptors, and risk values were calculated for exposure to surface soil (military personnel - trainee and recreational user); subsurface soil (military personnel - trainee); inhalation of particles (military personnel - trainee and recreational user); and surface water, sediment and fish tissue (fisherman). ICR values did not exceed the USEPA acceptable risk range of 1x10^{-4} to 1x10^{-6}. Thus, there are no unacceptable carcinogenic current risks associated with any media at Site 65. The HI values for the child- and adult fisherman receptor (HI = 6.1 and 1.3, respectively) exceeded unity due to the ingestion of fish tissue. The elevated HI values associated with fish tissues are primarily due to mercury which does not appear to be site related for the following reasons: (1) mercury was detected only
in fish tissue and not in any other site media; (2) the ponds where mercury was detected are not located near the heavy equipment training area which prevents them from being impacted by Site 65 surface runoff; and (3) the ponds were stocked with fish from off-site sources. However, upon review of site data, the North Carolina state toxicologist concluded that consumption of fish and crab tissue from this site would not pose a significant threat to human health (see Appendix C).

7.1.2.2 Future Scenario

Under the future scenario, child and adult residents were evaluated as potential receptors, and risk values were calculated for exposure to surface soil, subsurface soil, groundwater, surface water, and sediment. ICR values did not exceed the USEPA acceptable risk range of $1 \times 10^{-4}$ to $1 \times 10^{-6}$. Thus, there are no unacceptable carcinogenic future risks associated with any media at Site 65. The HI values for the child resident receptor ($HI = 3.0$) exceeded unity due to the ingestion of iron in groundwater. However, iron is still considered an essential nutrient, and toxicity criteria have not been finalized by the USEPA. Further, the central tendency (CT) exposure scenarios calculated for the child resident showed no unacceptable risk.

7.2 Ecological Risk Assessment

During the ecological RA, ecological COPCs were selected for surface water, sediment, surface soil, and fish tissue, as shown in Table 4. Criteria used to select ecological COPCs included historical information, prevalence, toxicity, federal and state criteria and standards, field and laboratory blank data, background and naturally occurring levels, and anthropogenic levels.

For surface soil, six VOCs (methylene chloride, acetone, trichloroethene, toluene, ethylbenzene, and xylenes) were detected in the surface soil. Methylene chloride, acetone, and toluene were not retained as COPCs because they are common laboratory contaminants and they were detected at less than 10 times the concentration in the blank samples. Trichloroethene, ethylbenzene, and xylenes were retained as COPCs. Nineteen SVOCs were detected in the surface soil. Acenaphthene, 2,4-dinitrophenol, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, ideno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluorene, phenanthrene, di-n-butylphthalate, fluoranthene, pyrene, and bis(2-ethylhexyl)phthalate were retained as COPCs. Five pesticides were detected in the surface soil. Endosulfan II, 4,4'-DDE, 4,4'-DDT, 4,4'-DDD, and heptachlor epoxide were retained as COPCs. Aroclor 1260 was detected in one of the surface soil samples.
and was retained as a COPC. Fifteen metals were detected in the surface soil. Calcium, magnesium, potassium, and sodium were not retained as COPCs. Copper was not retained as a COPC because it was detected at a concentration of less than five times the concentration in the blank sample. Aluminum was not retained as a COPC because it was detected at concentrations of less than twice base background. Barium, chromium, iron, lead, manganese, nickel, thallium, vanadium and zinc were retained as COPCs.

Two VOCs (acetone, and 1,2-dichloroethane) were detected in the surface water. Neither contaminant was retained as a COPC for aquatic and terrestrial receptors because they are common laboratory contaminants and were detected at a concentration of less than 10 times the concentration in the blank sample. No SVOCs, pesticides, or PCBs were detected in the surface water samples. Thirteen metals were detected in the surface water samples. Calcium, magnesium, potassium, and sodium were not retained as COPCs for aquatic or terrestrial receptors. Chromium was not retained as a COPC for aquatic receptors because detected concentrations do not exceed the surface water screening values. However, chromium was retained as a COPC for terrestrial receptors. Aluminum, barium, copper, iron, lead, manganese, vanadium, and zinc were retained as COPCs for both aquatic and terrestrial receptors.

At each station, sediment samples were collected from two depths, zero to six inches and six to 12 inches. Six VOCs were detected in the sediment. Acetone, chloroform, and toluene were not retained as COPCs because they are common laboratory contaminants and were detected at a concentration of less than 10 times the concentration in the blank sample. Carbon tetrachloride, 2-butanone, and tetrachloroethene were not retained as COPCs because they were detected at concentrations below sediment screening values (SSVs). One SVOC (di-n-butylphthalate) was detected and retained as a COPC in sediment. Three pesticides were detected in the sediment. Beta-BHC, 4,4’-DDE, and 4,4’-DDD were all retained as COPCs. Fifteen metals were detected in the sediment. Calcium, magnesium, potassium, and sodium were not retained as COPCs. Barium, chromium, iron, and manganese were not retained as COPCs because they did not exceed their respective SSVs. Aluminum, antimony, cobalt, copper, lead, vanadium, and zinc were retained as COPCs.

For the fish-fillet sample, one VOC (acetone) was detected and retained as a COPC in the fish fillet tissue. No SVOCs were detected in the fish fillet samples. One pesticide (4,4’-DDD) was detected and retained as a COPC. For the whole-body fish samples, four VOCs were detected in the fish, whole-body tissue. Acetone, 2-butanone, methylene chloride, and toluene were retained
as COPCs. No SVOCs were detected in the fish, whole-body samples. Two pesticides were detected in the fish, whole-body tissue. Pesticides 4,4’-DDD and 4,4’-DDE were retained as COPCs. Seventeen metals were detected in the fish, whole-body tissue. Calcium, magnesium, potassium, and sodium were not retained as COPCs. The remaining thirteen metals (aluminum, antimony, arsenic, barium, beryllium, copper, iron, lead, manganese, mercury, selenium, thallium, and zinc) were retained as COPCs.

Following the selection of ecological COPCs, the potential ecological risks associated with each COPC were evaluated. The paragraphs that follow summarize the conclusions made for aquatic and terrestrial receptors at Site 65.

7.2.1 Aquatic Ecosystem

There is a moderate potential risk to aquatic life in Courthouse Bay Pond, with most of the risk associated with the non-site-related inorganics in the surface water. There is only a slight risk to aquatic life in Powerline Pond; however, these risks are due to non-site-related contaminants (4,4’-DDD and 4,4’-DDE). Based on the ecological RA, no further investigations are deemed necessary.

7.2.2 Terrestrial Ecosystem

Some potential impacts to soil invertebrates and plants may occur as a result of site-related contaminants. It should be noted that there is much uncertainty in the Surface Soil Screening Values (SSSVs) used to assess this impact. In addition, a potential decrease in the terrestrial vertebrate population from site-related contamination is not expected based on the terrestrial intake model that is included in the RI ecological RA.

8.0 EXPLANATION OF SIGNIFICANT CHANGES

The PRAP presents the No Action remedy as the preferred alternative for Site 65. No significant changes to the remedy detailed in that document have been made.
9.0 REFERENCES


RESPONSIVENESS SUMMARY

The selected remedy for Site 65, OU No. 9, is No Action.

The USEPA Region IV and NC DENR are in support of the selected remedy outlined herein for OU No. 9. A concurrence letter from the NC DENR is included in Appendix A.

Based on comments received from the audience of the July 18, 2001 public meeting, the public supports the selected remedy for OU No. 9. No additional comments were made during the public comment period which ended on August 10, 2001. The public meeting consisted of a presentation of OU Nos. 9 and 17, and question and answers. OU No. 9 was presented during the first half of the public meeting. The transcript for the public meeting is provided in Appendix B. The entire public meeting transcript has been reproduced in this ROD because both presentations were included in the same legally sealed and certified report document.

The attendees of the public meeting included representatives from Naval Facilities Engineering Command, Atlantic Division (LANTDIV); MCB Camp Lejeune Environmental Management Division (EMD); NC DENR Superfund Section; USEPA Region IV; Restoration Advisory Board (RAB) Community Members; and Baker. In attendance were:

Laura Baker RAB Community Member
Ellen Bjerklie Hanna Baker
Rich Bonelli Baker
Thomas Burton MCB Camp Lejeune EMD
Heather Govenor Baker
Carrie Anne Hayward RAB Community Member
Bart Herpel Community Member
Ray Humphries RAB Community Member
David Lown NC DENR, Superfund Section
Steve Martin LANTDIV
Rick Raines MCB Camp Lejeune EMD
Kirk Stevens LANTDIV
Jim Swartenberg RAB Community Chairperson
Gena Townsend USEPA Region IV
Karren Wood Baker

In general, the meeting attendees asked about mercury in fish samples, the safety of eating fish from the ponds at Site 65, and sampling methods. All questions asked at the meeting were resolved so no follow up on any issue is required.
<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction</th>
<th>Detected Organics/Inorganics</th>
<th>Comparison Criteria</th>
<th>Site Contamination</th>
<th>Number of Detections Above Comparison Criteria I</th>
<th>Number of Detections Above Comparison Criteria II</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>Location(s) of Maximum Concentration</td>
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<td></td>
<td></td>
<td></td>
<td>Number of Detections Above Comparison Criteria I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Number of Detections Above Comparison Criteria II</td>
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<td>Surface Soil</td>
<td>Volatiles</td>
<td>Methylene Chloride</td>
<td>8.5 X 10^4</td>
<td>NA</td>
<td>2J</td>
<td>2J</td>
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<tr>
<td></td>
<td></td>
<td>Acetone</td>
<td>7.8 X 10^5</td>
<td>NA</td>
<td>10J</td>
<td>10J</td>
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<tr>
<td></td>
<td></td>
<td>Trichloroethylene</td>
<td>5.8 X 10^4</td>
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<td>1J</td>
<td>1J</td>
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<tr>
<td></td>
<td></td>
<td>Toluene</td>
<td>1.6 X 10^6</td>
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<td>1J</td>
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<td>Ethylbenzene</td>
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<td>3J</td>
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<td>Semivolatiles</td>
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<td>130J</td>
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<tr>
<td></td>
<td></td>
<td>2,4-Dinitrophenol</td>
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<tr>
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<td>Dibenzo furan</td>
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<td>58J</td>
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<tr>
<td></td>
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<td></td>
<td>Phenanthrene (PAH)</td>
<td>2.3 X 10^7</td>
<td>NA</td>
<td>59J</td>
<td>860</td>
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<td></td>
<td></td>
<td>Anthracene (PAH)</td>
<td>2.3 X 10^8</td>
<td>NA</td>
<td>190J</td>
<td>190J</td>
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<td></td>
<td></td>
<td>Carbazole</td>
<td>3.2 X 10^4</td>
<td>NA</td>
<td>180J</td>
<td>180J</td>
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<tr>
<td></td>
<td></td>
<td>di-n-Butyl-phthalate</td>
<td>7.8 X 10^3</td>
<td>NA</td>
<td>260J</td>
<td>390J</td>
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<td></td>
<td></td>
<td>Fluoranthene (PAH)</td>
<td>3.1 X 10^4</td>
<td>NA</td>
<td>130J</td>
<td>830</td>
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<tr>
<td></td>
<td></td>
<td>Benzo(a)anthracene (PAH)</td>
<td>870</td>
<td>NA</td>
<td>76J</td>
<td>510</td>
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<td></td>
<td></td>
<td>Chrysene (PAH)</td>
<td>8.7 X 10^3</td>
<td>NA</td>
<td>70J</td>
<td>470</td>
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<td></td>
<td>bis(2-Ethylhexyl)phthalate</td>
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<td>48J</td>
<td>87J</td>
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<td></td>
<td>Benzo(b)fluoranthene (PAH)</td>
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<td>89J</td>
<td>360J</td>
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<td></td>
<td></td>
<td>Benzo(k)fluoranthene (PAH)</td>
<td>8700</td>
<td>NA</td>
<td>120J</td>
<td>510</td>
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</tbody>
</table>

Notes:
- Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
- NA - Not applicable
- ND - Not detected
- PAH - Polynuclear aromatic hydrocarbon

(1) Organics and Metals in both surface and subsurface soils are compared to EPA Region III Risk Based Concentrations (RBCs) for a residential area (Criteria I) (EPA updated 5/8/2001), and two times base background concentrations for MCB, Camp Lejeune (Criteria II) (Metals only). Only priority pollutant metals (i.e., aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, thallium, vanadium, zinc) are presented on this table. For lead, the residential action level in soil is used (USEPA, 1994). Refer to the RI for completed metals detection data.
<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction</th>
<th>Detected Organics/Inorganics</th>
<th>Comparison Criteria</th>
<th>Site Contamination</th>
<th>Number of Detections Above Comparison Criteria I</th>
<th>Number of Detections Above Comparison Criteria II</th>
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<td></td>
<td></td>
<td></td>
<td>Criteria I</td>
<td>Criteria II</td>
<td>Min. Conc.</td>
<td>Max. Conc.</td>
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<td>Surface Soil</td>
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<td>(continued)</td>
<td>Indeno(1,2,3-cd)pyrene (PAH)</td>
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<td>NA</td>
<td>88J</td>
<td>310J</td>
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<td></td>
<td></td>
<td>Dibenz(a,h)anthracene (PAH)</td>
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<td>NA</td>
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<td>150J</td>
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<td>Benzo(g,h,i)perylene (PAH)</td>
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<td>Pesticides</td>
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<td>PCBs</td>
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<td></td>
<td>Manganese</td>
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<td>160</td>
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<td>Nickel</td>
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<td>Thallium</td>
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<td>Zinc</td>
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<td>3.7</td>
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Notes:
Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
NA - Not applicable
ND - Not detected
PAH - Polynuclear aromatic hydrocarbon
### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**

**SITE 65 - ENGINEER AREA DUMP**

**RECORD OF DECISION, CTO-0130**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction</th>
<th>Detected Organics/Inorganics</th>
<th>Comparison Criteria</th>
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<th>Number of Detections Above Comparison Criteria I</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Criteria I</td>
<td>Criteria II</td>
<td>Min. Conc.</td>
<td>Max. Conc.</td>
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<td>Volatiles</td>
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<td>Carbon Disulfide</td>
<td>7.8 X 10^5</td>
<td>NA</td>
<td>2J</td>
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<td>2-Butanone</td>
<td>4.7 X 10^6</td>
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<td>Trichloroethene</td>
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<td>2J</td>
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<td>Toluene</td>
<td>1.6 X 10^5</td>
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<td>3J</td>
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<td>NA</td>
<td>55J</td>
<td>55J</td>
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<td>2-Methylnaphthalene</td>
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<td>NA</td>
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<td>97J</td>
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<td>di-n-Butylphthalate</td>
<td>7.8 X 10^5</td>
<td>NA</td>
<td>160J</td>
<td>340J</td>
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<td></td>
<td>Fluoranthene (PAH)</td>
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<td>1400</td>
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<td>900</td>
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<td></td>
<td>Chrysene (PAH)</td>
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</table>

Notes:

Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).

NA - Not applicable

ND - Not detected

PAH - Polynuclear aromatic hydrocarbon

(1) Organics and Metals in both surface and subsurface soils are compared to EPA Region III Risk Based Concentrations (RBCs) for a residential area (Criteria I) (EPA, updated 5/8/2001), and two times background concentrations for MCB, Camp Lejeune (Criteria II) (Metals only). Only priority pollutant metals (i.e., aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, thallium, vanadium, zinc) are presented on this table. Refer to Table the RI for completed metals detection data.
### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**

**SITE 65 - ENGINEER AREA DUMP**

**RECORD OF DECISION, CTO-0130**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction</th>
<th>Detected Organics/Inorganics</th>
<th>Comparison Criteria</th>
<th>Site Contamination</th>
<th>Number of Detections Above Comparison Criteria I</th>
<th>Number of Detections Above Comparison Criteria II</th>
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<td>Criteria II</td>
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<td>Max. Conc.</td>
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<td></td>
</tr>
<tr>
<td>Subsurface Soil</td>
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<td>bis(2-ethylhexyl)phthalate</td>
<td>$4.6 \times 10^4$</td>
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<td>870</td>
<td>NA</td>
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<td>680</td>
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<td>Ideno(1,2,3-cd)pyrene (PAH)</td>
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<td>1900</td>
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<td>4.6</td>
<td>45J</td>
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<td>2700</td>
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<td>4.4J</td>
<td>340J</td>
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<td>1.504</td>
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<td>2300</td>
<td>7252</td>
<td>236J</td>
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</table>

**Notes:**

Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).

NA - Not applicable

ND - Not detected

PAH - Polynuclear aromatic hydrocarbon
### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**

**SITE 65 - ENGINEER AREA DUMP**

**RECORD OF DECISION, CTO-0130**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
<thead>
<tr>
<th>Media</th>
<th>Fraction</th>
<th>Detected Organics/Inorganics</th>
<th>Comparison Criteria</th>
<th>Site Contamination</th>
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<td>Silver</td>
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<td>0.866</td>
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<td>di-n-Butylphthalate</td>
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<td>bis(2-ethylhexyl)phthalate</td>
<td>6</td>
<td>3</td>
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<td>Pesticides</td>
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<td>NA</td>
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<td>PCBs</td>
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<td></td>
<td></td>
<td>Barium</td>
<td>2000</td>
<td>2000</td>
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</table>

**Notes:**
- Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
- NA - Not applicable
- ND - Not detected
- PAH - Polynuclear aromatic hydrocarbon

(2) Comparison Criteria for groundwater are Federal Maximum Contaminant Levels (MCL) (Criteria I) and North Carolina Water Quality Standards (NCWQS) (Criteria II).

(3) Secondary MCL for aluminum, iron, and zinc; if MCL is a range, the lower concentration is used for comparison.
### TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**  
**SITE 65 - ENGINEER AREA DUMP**  
**RECORD OF DECISION, CTO-0130**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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<tr>
<th>Media</th>
<th>Fraction</th>
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<th>Comparison Criteria</th>
<th>Site Contamination</th>
<th>Number of Detections Above Comparison Criteria I</th>
<th>Number of Detections Above Comparison Criteria II</th>
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<tr>
<td></td>
<td></td>
<td>Iron</td>
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<td>300</td>
<td>41.9</td>
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<td>2100</td>
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<td>Surface Water^{(5)}</td>
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**Notes:**
- Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
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- ND - Not detected
- PAH - Polynuclear aromatic hydrocarbon

^{(3)} Secondary MCL for aluminum, iron, and zinc; if MCL is a range, the lower concentration is used for comparison.

^{(4)} Federal Action Level for lead.

^{(5)} Positive contaminant detections in surface water are compared to freshwater screening values for human health (water and organism consumption): EPA Region IV Water Quality Standards (EPA), 1995 or NCWQS (NC) (Criteria I), and upstream background concentrations from the White Oak River Basin Study (Criteria II).

^{(6)} EPA Water Quality Criteria, 1991, Human Health Published Criteria (water and organism consumption).

## TABLE 1 (Continued)

SUMMARY OF SITE CONTAMINATION
SITE 65 - ENGINEER AREA DUMP
RECORD OF DECISION, CTO-0130
MCB, CAMP LEJEUNE, NORTH CAROLINA

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<th>Site Contamination</th>
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<td>Criteria II</td>
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Notes:
Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
NA - Not applicable
ND - Not detected
PAH - Polynuclear aromatic hydrocarbon

(6) EPA Water Quality Criteria, 1991, Human Health Published Criteria (water and organism consumption).
(8) There are no established criteria for sediment, therefore Criteria I is NA. Criteria II is the average upstream background sediment concentration from the White Oak River Basin Study.
## TABLE 1 (Continued)

**SUMMARY OF SITE CONTAMINATION**  
**SITE 65 - ENGINEER AREA DUMP**  
**RECORD OF DECISION, CTO-0130**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
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<tr>
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<th>Comparison Criteria</th>
<th>Site Contamination</th>
<th>Notes:</th>
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Notes:
- Concentrations are presented in µg/Kg (ppb) for organics in fish tissue and in mg/Kg for metals in fish tissue (ppm).
- NA - Not applicable

\(^{(9)}\) Organics and Metals in fish tissue (fillet samples) are compared to EPA Region III RBCs for human ingestion of fish (Criteria I). There is no Criteria II.
## TABLE 2
SUMMARY OF SITE CONTAMINATION - POST RI SAMPLING
SITE 65 - ENGINEER AREA DUMP
RECORD OF DECISION, CTO-0130
MCB, CAMP LEJEUNE, NORTH CAROLINA

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# TABLE 2

**SUMMARY OF SITE CONTAMINATION - POST RI SAMPLING**  
**SITE 65 - ENGINEER AREA DUMP**  
**RECORD OF DECISION, CTO-0130**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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<th>Comparison Criteria</th>
<th>Site Contamination</th>
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### TABLE 2

**SUMMARY OF SITE CONTAMINATION - POST RI SAMPLING**

**SITE 65 - ENGINEER AREA DUMP**

**RECORD OF DECISION, CTO-0130**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
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<th>Media</th>
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<th>Site Contamination</th>
<th>Number of Detections Above Comparison Criteria I</th>
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<th>Number of Detections Above Comparison Criteria III</th>
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# TABLE 2

**SUMMARY OF SITE CONTAMINATION - POST RI SAMPLING**  
**SITE 65 - ENGINEER AREA DUMP**  
**RECORD OF DECISION, CTO-0130**  
**MCB, CAMP LEJEUNE, NORTH CAROLINA**

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## TABLE 2
SUMMARY OF SITE CONTAMINATION - POST RI SAMPLING
SITE 65 - ENGINEER AREA DUMP
RECORD OF DECISION, CTO-0130
MCB, CAMP LEJEUNE, NORTH CAROLINA

<table>
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<th>Site Contamination</th>
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Notes:

Concentrations are presented in µg/Kg for organics in soil and sediment and in µg/L for all water contaminants (ppb); metal concentrations for soil and sediment are presented in mg/Kg (ppm).
NA - Not applicable
NE - Not established

1. Organics and Metals in both surface and subsurface soils are compared to EPA Region III Risk Based Concentrations (RBCs) for a residential area (Criteria I) (EPA updated 5/8/2001), EPA Region IX Preliminary Remediation Goals (PRGs) for a residential area (Criteria II) (EPA 11/01/00), and two times base background concentrations for MCB, Camp Lejeune (Criteria III) (Metals only). For lead, the residential action level in soil is used (USEPA 1994).

2. Comparison Criteria for groundwater are Federal Maximum Contaminant Levels (MCL) (Criteria I) and North Carolina Water Quality Standards (NCWQS) (Criteria II).

3. Positive contaminant detections in surface water are compared to EPA Tier II freshwater screening values for human health (water and organism consumption) (Criteria I), North Carolina Water Quality Standards (NCWQS) for fresh surface water (Criteria II), and the average upstream background surface water concentrations from the White Oak River Basin Study (Criteria III). NCWQS were human health values. If human health values were not available, values for aquatic life were used (NCDENR, 1988).

* Human health value not available, value is for aquatic life
(AL) Value represents action level

** There are no established human health criteria for sediment. Comparison Criteria are EPA Region IV Ecological Screening Levels for freshwater (EPA 2000) (Criteria I), and the average upstream background sediment concentration from the White Oak River Basin Study (Criteria II).
### TABLE 3

**SUMMARY OF COPCs IN EACH MEDIA OF CONCERN**

**SITE 65 - ENGINEER AREA DUMP**

**RECORD OF DECISION, CTO-0130**

**MCB, CAMP LEJEUNE, NORTH CAROLINA**

<table>
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<th>Contaminant</th>
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<td>Carbon Tetrachloride</td>
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<tr>
<td>Xylenes (Total)</td>
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**Notes:**

! = Detected in media; compared to relevant criteria and standards.

X = Selected as a COPC in the human health risk assessment.
TABLE 3 (Continued)

SUMMARY OF COPCs IN EACH MEDIA OF CONCERN
SITE 65 - ENGINEER AREA DUMP
RECORD OF DECISION, CTO-0130
MCB, CAMP LEJEUNE, NORTH CAROLINA

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Notes:

! = Detected in media; compared to relevant criteria and standards.
X = Selected as a COPC in the human health risk assessment.
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</table>
**TABLE 5**

GLOSSARY OF USEPA REMEDIAL ALTERNATIVE EVALUATION CRITERIA
MCB CAMP LEJEUNE, NORTH CAROLINA

- **Overall Protection of Human Health and the Environment** – addresses whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

- **Compliance with ARARs/TBCs** - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs), criteria to-be-considered (TBCs), and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.

- **Long-Term Effectiveness and Permanence** - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume Through Treatment** - refers to the anticipated performance of the treatment options that may be employed within an alternative.

- **Short-Term Effectiveness** - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.

- **Implementability** - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.

- **Cost** – includes capital and operation and maintenance costs. For comparative purposes, present worth values are provided.
**FIGURE 3**

CONCEPTUAL SITE MODEL
FOR CURRENT AND FUTURE HUMAN RECEPTORS
SITE 65 - ENGINEER AREA DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

- Future Residents
- Current Military Personnel (Trainees and Recreational Users)
- Future Construction Workers
- Current Fishermen
- Current Adult Fishermen

**Air**

- Ingestion
- Inhalation
- Atmospheric Deposition
- Erosion/Adveective Transport
- Particulate Emissions

**Soil**

- Ingestion
- Dermal Contact
- Infiltration/Percolation
- Erosion/Adveective Transport
- Volatilization

**Surface Water**

- Ingestion
- Dermal Contact
- Partitioning/Deposition

**Fish**

- Ingestion
- Uptake/Bioaccumulation

**Groundwater**

- Ingestion
- Dermal Contact

**Future Residents**

- Current Military Personnel (Trainees and Recreational Users)
- Future Construction Workers
- Current Adult Fishermen

- Future Residents
- Current Fishermen
FIGURE 7
SUPPLY WELL LOCATION MAP
SITE 65 – ENGINEER AREA DUMP
RECORD OF DECISION
CTO – 0130
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA


LEGEND
- SITE
BB-221 - ACTIVE SUPPLY WELL
BB-43 - DEACTIVATED SUPPLY WELL (1991)
APPENDIX A
STATE OF NORTH CAROLINA CONCURRENCE LETTER
Commander, Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Building N-26)
Norfolk, Virginia 23511-2699

Attention: Mr. Kirk Stevens
Navy Technical Representative

Commanding General
Marine Corps Base
PSC Box 20004
Camp Lejeune, NC 28542-0004

Attention: AC/S, EMD/IRD

RE: State Conditional Concurrence on the
Record of Decision (ROD)
Operable Unit No. 09 (OU09), Site 65
MCB Camp Lejeune, North Carolina

Dear Mr. Stevens:

The North Carolina Superfund Section has reviewed the Final ROD for OU09, Site 65 and concurs with the no action remedy subject to the following conditions:

1. Our concurrence on the ROD and of the selected remedy for the site is based solely on the information contained in the ROD. Should we receive additional information that significantly affects the conclusions or remedies contained in the ROD, we may modify or withdraw this concurrence with written notice to the Navy and MCB Camp Lejeune.

2. Our concurrence on the Interim ROD in no way binds the State to concur in future decisions nor commits the State to participate, financially or otherwise, in the cleanup of the Site. The State reserves the right to review, comment, and make independent assessments of all future work relating to this Site.

We appreciate the opportunity to review this ROD and look forward to continuing to work with MCB Camp Lejeune, the Navy, and EPA at Camp Lejeune.

Sincerely,

Grover Nicholson, Head
Federal Facilities Branch
Superfund Section

cc: Gena Townsend, US EPA Region IV
Neal Paul, MCB Camp Lejeune

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
401 Oberlin Road, Suite 150, Raleigh, NC 27605
Phone: 919-733-4996 Fax: 919-715-3605
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APPENDIX B
PUBLIC MEETING TRANSCRIPT
MARINE CORPS BASE (MCB)  
CAMP LEJEUNE, NORTH CAROLINA  

PUBLIC MEETING REGARDING  

THE  

PROPOSED REMEDIAL ACTION PLAN (PRAP)  

FOR OPERABLE UNITS (OUs) NO. 9 (SITE 65)  
AND NO. 17 (SITES 90, 91 AND 92)  

__________________________  

July 18, 2001  
Coastal Carolina Community College  
Jacksonville, North Carolina  

Reported by:  

Kathryn F. Kilpatrick  
Carolina Court Reporters, Inc.  
105 Oakmont Professional Plaza  
Greenville, North Carolina 27858  
252-355-4700  
800-849-8448  
Fax: 252-355-4707
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Meeting convened .................................................. 3

PRESENTATION ON OU 9, SITE 65 BY MR. RICH BONELLI
INCLUDING QUESTIONS BY ATTENDEES ......................... 4

PRESENTATION ON OU 17, SITES 90, 91, AND 92 BY
MS. ELLEN BJERKLIE HANNA INCLUDING QUESTIONS BY ATTENDEES .. 14

Adjournment of Meeting ............................................ 29
MR. RAINES: I want to thank you all for coming out. Once again, we don't get a whole lot of public participation; kind of, either the public doesn't have a good deal of trust in the work we're doing on base or they're just not interested, but I want to welcome you here tonight. We're here to talk about the proposed remedial action plan for four sites. These four sites are grouped under two different Operable Units. One Operable Unit is OU 9, Site 65. It is an old five-acre dump. It is physically located out at Courthouse Bay back in the woods. This dump was used mainly for construction debris, but it also had some liquids disposed there and some batteries and things like that. The other Operable Unit is 17, and it includes Sites 90, 91, and 92. These three sites were old underground storage tanks that, upon removal, it was discovered that there was some solvent ground water contamination. We spent a couple of years investigating these sites and, as part of the CERCLA process, once we have completed our investigation, we are required to present our findings and our proposed plan to the public for their comments. We are proposing a no-further-action record of decision for these sites, based on the fact that there is very little contamination associated with these sites, and the fact that there is no human health or environmental risk associated with these sites. Tonight, we have with us representatives of the EPA, the State Department of Environment and Natural Resources, and Baker Environmental, our engineering consultant, on-base contractor. They will be giving a presentation tonight, explaining what we have done, what we have found, what we are proposing. If
you have any questions, go ahead and just stop them. If you would, state your name for the court reporter, and then at the end we will go ahead and have a question-and-answer session so that we can make sure that we address all your questions. Rich Bonelli is with Baker, and he will start this off.

MR. BONELLI: Before I begin, I want to introduce some of the Baker team who came down with me this evening. With me is Ellen Bjerklie Hanna, who will be presenting on OU 17; Karen Wood, who is our lead human health risk assessment specialist; and Heather Governor, who is our lead ecological risk assessor. Please feel free to ask questions, and I will be speaking this evening on OU 9. The purpose and objective of our meeting this evening is to provide the community with the overall understanding of the investigation, findings and results, to inform the community of the process used for the selected remedy, and lastly we want to make sure that the concerns of the community are met in terms of addressing the selective remedies we will be speaking to tonight. As far as the topics that I want to cover, I’ll be talking a little bit about the site description and history. I’ll then get into an overview of the investigations and their findings and a summary of the site risks. I’ll then move into the scope and role of the proposed response actions. Lastly, again, questions and answers. But feel free to ask questions as I’m going along.

Site 65, OU 9, is located in the southern part of Camp Lejeune, near Courthouse Bay. Originally, Site 73 was also included within OU 9 but was removed because of additional studies
that will be going on there, so right now, Site OU9 only includes Site 65.

**Site description:** As Rick said, the site is very heavily wooded. Really, the only open space is located just east of the site where the Engineering School resides. There are two small ponds located just east of Site 65 we also looked at during our investigation.

**Site History:** This site operated -- operations occurred there from 1952 to 1972, of which, reportedly, there were two separate disposal areas, one related to battery acids, the second one related to POL wastes (or petroleum, oil and lubricants). In addition to those areas, through investigations of aerial photography, we also noted a burn area on the site as well as these large debris mounds, or piles, which were predominantly there from the operations of the school. They do a lot of training with bulldozers. As I show you some of the pictures, you'll see some of these mounded areas. Here's a site plan of the area. The investigation boundary, study area, was up in this area here. You'll notice the debris piles here, the burn area, which we discovered through review of the aerial photography. To the east, the heavy equipment training area, and further east we have the two ponds which I spoke of earlier. This is a panoramic shot we took during the RI. Again, it's a very heavily wooded site. You'll notice in the background these mounded areas, again created from the bulldozing operations from the school. This picture identifies
some of the pails, corroded cans, we found as part of the debris. None of the cans that we found, none of the discarded debris contained any waste or liquids in them. They’re very old and corroded. This is a shot of Courthouse Bay Pond. Again, notice the very heavily wooded area. The color of the pond water is very turbid, and that was created from water in the runoff. There is a lot of runoff through soils that ended up in the pond here.

Overview of the Investigation and the Findings: For the most part, there have been three studies conducted at the site, the first one being the Site Inspection by Baker back in 1991, the Remedial Investigation conducted by Baker in 1995, report coming out in 1997, and post-RI sampling, which was conducted just recently, April of this year. The Site Inspection study (the SI) -- and SI is one of the very early studies done in the CERCLA process. Predominantly, the SI is done to give us some initial understanding of the volume of waste that may be there, estimated areas of contamination, and things like that. It was a very small-scaled operation we were studying, but we looked at some of the focused areas. The investigation itself -- we looked at soil, we looked at ground water, installing some shallow ground water monitoring wells, and we collected surface water and sediment samples from the two ponds that I spoke of earlier.

The Results of the SI and the Recommendations: In the soil and ground water, surface water and sediment, we did find some low
levels of organic compounds, as well as some inorganics, being metals. Probably the most important, I guess, detection, if you will, from the study are some of the compounds we found in the soil. The recommendation of the SI recommended the site then move into what's called the RI process (or Remedial Investigation), which is the next step in the CERCLA process. The RI, again, was conducted back in 1995. The Remedial Investigation was a continuation of the SI, and was expanded to include not just the immediate area Site 65. We also included some areas to the east in the Engineering School area. Again, we also looked at the ponds. The purpose of the RI was to better define the levels of compounds that we detected, but also to perform a human health and ecological risk assessment based on the data. The field program itself -- again, we looked at a number of different media from the soil and the ground water. We installed some additional monitoring wells. We sampled the surface water and sediment from the ponds. We also did some exploratory test pits, in which we had a backhoe on site, and we did some digging around to see if we could find any buried materials or wastes. And lastly, biological sampling of the ponds, which included both the fish and benthic organisms. Here is a site map showing the locations during the Remedial Investigation. Again, most of our sampling activities were focused in this area here in the debris piles, in the burn areas, and we expanded the investigation to also look at some areas to the east. And lastly, again, we took some samples from the two ponds.
RI Results: I’m not going to go through each and every one of these in great detail. In general, we did find organic compounds and inorganics in all the various media. Predominantly, a lot of the organic compounds -- and when I say organic compounds, I’m referring to the volatiles and semivolatiles, PCBs and pesticides. There were a number of these compounds that were either laboratory contaminants or associated with plasticizers which show up in some of the sampling equipment. Some of the PAHs, which are a subset of the semivolatiles, did show up in the area of the burn operation, which we expect. Anytime you burn materials, you have a residue that is left behind. You’re going to find some PAHs. In terms of the fish data, as you see here, we did find some both organic and inorganic compounds and metals. As far as the first number you see that is kind of large, the problem was a compound called acetone, which is associated with a laboratory contaminant. By and large, the inorganics that we found to be in the metals were probably ubiquitous or naturally occurring in the environment if you find a lot of metals, such as iron and manganese that are very common, both in the ground water as well as the soil. Lastly, in April of this year, we conducted some post-RI sampling. Early -- I believe it was January of this year -- near Site 65, they found some containers not -- you’ll see the map next -- not necessarily at Site 65 but in the general area. It was felt at that time that sampling needed to be conducted just to confirm or deny whether the contaminants or anything had leaked from these containers. As far as where that area was, again, here is the main Site 65 area we
looked at during the RI. The area where we found the containers is down in this area here. It is some distance away from the investigative area.

Post-RI Investigation: We looked at the soil, ground water, surface water, and sediment in the immediate area of those containers. We took some soils. Ground water was collected from some hydropunches to get an idea of the ground water. And there was a creek that ran very close to the containers themselves, and we sampled surface water and sediment as well. The results showed that the area around those areas was not impacted from a leak or disposal of those containers, which was good. So we didn’t really identify anything that could have come from those containers.

Summary of the Risks: I may have mentioned earlier about the Remedial Investigation. As part of that process, we will conduct a human health risk assessment and ecological risk assessment. The human health risk assessment will look at current situations as well as future situations for the contaminants of potential concern. We also look at a number of potential receptors nearby, and those receptors could be military personnel, children, construction workers. The information from the sampling data itself, we take that information, combine it with the different scenarios, and we try to come up with a risk, or develop a risk assessment number through various calculations. I followed the EPA guidelines. Our risk assessment showed that the site was found to
be within the acceptable range of the USEPA guidelines. I mentioned earlier about some of the inorganics found in the fish. We did find a slight exceedance from the mercury for young children through the consumption of fish. It is interesting to note that the other media on the site -- we looked at the ground water, surface water, and so forth -- did not have mercury. So, we concluded that the fish were brought in from somewhere else and basically put in the pond as part of a stocking, I guess, if you will, of the ponds. So, we believe that the fish themselves did not come from the site. Thus, we would make the conclusion that the inorganics found in the fish did not come from activities at the site. Ecologically, we also conducted a risk assessment there to look at the endpoints for both aquatic organisms living in the pond as well as terrestrial organisms -- rabbits, things like that, that may live in the area. The only thing we found there was a potential risk -- ecological from the pond itself, predominantly from the suspended material we noted in the surface water. If you think of the picture I showed you earlier, it was very turbid. In the area at the site at the pond, you've seen a lot of runoff from the area; it was very turbid. So, we believe that the ecological risk there was created from the suspended material in the water itself. The conclusions that we reached from the risk assessments were that there were no releases of the substances on the site that generated an unacceptable risk both to human health and the environment; again, a very sophisticated process of going through a lot of numbers and a lot of calculations to reach those
conclusions. The proposed action at the site is no action at all, which means that the site will be left as is, current conditions. Again, this recommendation, these conclusions were reached through a number of sampling rounds we conducted in the SI, in the RI, and the post-RI, and through our evaluation of site risks. This will be concluded through a no-action ROD, which will be coming out sometime in September, but that’s going to be our proposed remedy for this site. That concludes my presentation. If there are any questions that I can answer or our Baker team here.

MR. SWARTZENBERG: I want to ask you about the fish. You said there was a slight risk for children if they ate the fish?

MR. BONELLI: Yes. That’s based on a -- Heather, you could probably speak to this better than I can, or Karen, can you maybe address that? That is Karen Wood from Baker.

MS. WOOD: Can you state your question again?

MR. SWARTZENBERG: I was concerned about the fish. First of all, how can you be so certain that it came with the fish you say were stocked there? Did anybody check with fish wildlife to see if there were any stocking programs there?

MS. WOOD: I believe at the time we did, and then this data was also reviewed by a toxicologist from the State of North Carolina, so there were some indepth further studies that addressed that issue at the time. And it was concluded that the fish were stocked, and the toxicologist felt those concentrations really would not pose a human health risk. The equations we use to calculate risk to humans in that particular scenario are very
conservative. That's assuming a child would eat a meal of something -- I don't remember the exact numbers -- but it's several grams of fish tissue on a daily basis. We try to look at the most conservative exposure assumptions.

MR. RAINES: Even fish from that pond?

MS. WOOD: Yes.

MS. TOWNSEND: I would like to add -- I'm Gena Townsend with EPA. When we saw that data in '97, before we even conducted the risk assessment, we were a little concerned ourselves. We sent that data to the state toxicologist in the Department of Public Health division, and -- I'm not sure what division -- and let them look at the data. We also did, I guess, a little more detail in the different type of fish, and the tissue samples were versus a whole fish, versus the edible part of the fish. And the recommendation from the State was that it's okay. So, we did have that concern before we even completed our investigations. And that all was addressed back in '97 and '98, so we're pretty confident that we're pretty clear on that.

MR. SWARTZENBERG: So, there is no mercury in the water, is that what you're saying?

MS. TOWNSEND: Right.

MR. SWARTZENBERG: It's just in the fish.

MS. TOWNSEND: Right. The mercury that we detected we only detected it in the fish. We did not detect it at the site in the soils or the water at all.

MR. SWARTZENBERG: Okay. So if I wanted to go fishing
there, I could go fishing there tomorrow, right? It’s not off
limits or anything.

MR. RAINES: You’d just have to check with the game
warden on base, but I would imagine you probably could.

MR. SWARTZENBERG: Okay.

MR. HUMPHRIES: How do you determine where to get your
core or your soil and water samples? Let me paint you a scenario.
That’s a training area also, which means that over the years,
engineers, contracts, they’ve used it for training and what have
you. Anytime you’re out in the field, four or five, sometimes a
couple of weeks, the drivers and operators of these various pieces
of equipment, they do first- and, sometimes, second-echelon
maintenance. From ’52 to ’72, they had no rules. You dumped oil
right where it fell. You could top off with a tank or something,
you’d have spillage, it goes right into the soil then. That’s all
over the place. My question is how do you determine where you get
your soil samples?

MR. BONELLI: One thing we did, Mr. Humphries, was to go
back and look through historical aerial photographs, dating back to
all those years. One of the issues, obviously, is when we get out
there it is so heavily wooded, where do you go? We were able to
find historical photographs that showed us areas that were cleared,
like the burn area that I spoke of earlier. So, we tried to use
aerial photography to position our samples. Obviously, going to
the outside, we sampled an area where we thought that could be
impacted. So that sampling event, we kind of expanded outward
using, again, historical photographs. There may have been some interviews conducted with some people to find out operations, but they weren’t just put on a map. There was some thought process behind them as far as where to go.

MR. HUMPHRIES: It’s a lot of guesswork though.

MR. BONELLI: Well, it’s a very large area, and the aerial photographs were extremely helpful because they did show, again, some areas that were cleared that looked like they could have been potential disposal operations, and so that was sort of the basis of where we sampled.

MR. HUMPHRIES: How big is the area, do you know? How many acres?

MR. BONELLI: I think the dump area itself that I showed you is five acres in size. And, obviously, that’s just the dump area. We investigated a lot larger area than that. When it goes out to the Engineering School area and the pond, that’s well above and beyond the five acres. Anybody else that has some questions? Thank you very much. I just need a minute to change the slides over. Ellen will be speaking about OU 17.

MS. HANNA: As Rich said, my name is Ellen Bjerklie Hanna with Baker, and I’m presenting today on Operable Unit No. 17, which includes three sites, Sites 90, 91 and 92. It’s the same format as Rich went over. We need to present this information to the public so that we can get feedback from you on what our recommended response is. I’ll be giving you a brief history, talking about the studies that were done and a summary of the site risks. You can
feel free to ask questions as I’m going along, but also at the end. This is Operable Unit 17 here. It’s close to where OU 9 was that Rich spoke about. These three sites are right off of Courthouse Bay, and they were grouped together because all three of them were former UST sites (underground storage tanks). There were several programs done at these sites. As I said, they were underground storage tank sites. There were three well site checks done at each of these sites, and this is in the UST program. They installed three monitoring wells and took samples of soil and ground water, and based on the results of that, they may or may not have gone on to what’s called the Leaking Underground Storage Comprehensive Site Assessment. Then, depending on the results of that, you will see later, they ended up in the Installation Restoration Program, where we did a Remedial Investigation and then followed up with Post-RI Investigations. Site 90, the first site, had three 1,000 gallon tanks. There also happened to be at this site an above-ground storage tank (AST), and it’s basically used for industrial/commercial land use. There was a dry cleaning facility at this site. And here are some photographs. This is after the tank removal. Here’s one of our monitoring wells that was installed during the three well site check. That’s looking at the site from a different angle. As you can see, it’s open, grassy areas among some buildings. And here is a drawing of the site. The tank was located approximately between these two buildings. During the three well site check, which was conducted in 1993, as I said, three monitoring wells were installed. They sampled
subsurface soil and found several contaminants associated with underground storage tanks, and BTEX, which is benzene, toluene, ethylbenzene, and xylene in the ground water. Based on that, because they found those contaminants in the subsurface soil and ground water, they put that site into -- they did a study called the Leaking Underground Storage Tank Site Assessment, and they found two areas of ground water contamination, the northern area and the southern area, which -- the northern area was around up here. There was a small plume down here. And we found several contaminants in the ground water, relatively low levels. In the subsurface soil, we also found BTEX petroleum which you might find this at an underground storage tank site. They also found total chlorinated hydrocarbons and, because of those chlorinated contaminants, it was put into the Installation Restoration Program, and we did a Focused Remedial Investigation. They sampled for subsurface soil and ground water, and we took several samples. We detected these contaminants in the subsurface soil and several contaminants in the ground water, including PCE. These are the sampling locations for the RI. We installed more wells, in addition to the wells that were already there from that underground storage tank study. Those were subsurface soils and the samples and locations, and these were the ground water sample locations. They were basically the same locations, because as they installed the monitoring levels, they also took soil samples. Based on the analytical results that came back during the post-RI, we did a qualitative risk assessment, and for the qualitative risk
assessment, we took those results and screened them against various levels that were established by the EPA and North Carolina -- for both the soils and the groundwater, including those listed here. Risk Based Concentrations and the North Carolina Soil Screening Levels, we also looked -- compared the concentrations against QA/AC blanks and naturally occurring levels. At Site 90, no COPCs were identified in the subsurface soil. A COPC is a contaminant of potential concern. If one of the concentrations exceeded any of these screening levels, it was listed as a contaminant of potential concern. Nothing was identified from the subsurface soil. However, in the ground water there were a few identified -- some inorganics and PCE and chloroform. The inorganics were at levels that were considered naturally occurring. Inorganics occur in the site -- they are in the earth’s crust everywhere, and they were within these levels of what we consider common around the Camp Lejeune area. So, there was nothing out of the ordinary, and there was no reason to suspect why there would be any kind of metals contamination at this site. Chloroform, we believe, was related to laboratory contamination or our decontamination procedures. It’s a common contaminant that comes up. Therefore, only the PCE, which is tetrachloroethene, was considered to be site related. Because of the PCE detection, which was in one monitoring well at the site, we decided to do a supplemental ground water investigation, which was conducted in 1999 just to confirm the PCE concentration and, also, to make sure that those contaminants we believed were laboratory or decontamination related were such. Several
contaminants were found. Most of them, actually all of them, were believed to be not site related because we confirmed that they were laboratory or decontamination procedures. We did not detect tetrachloroethene, but we detected TCE (trichloroethene), and it did exceed the risk based concentration. That was out of the same well that PCE was detected in before, and that was the only well that it was detected in.

MR. SWARTZENBERG: Was that the well that was the closest to the above-ground storage tank?

MS. HANNA: It was near a concrete pad, actually, which was closer to the AST location. The AST contained, at one point, dry cleaning fluids, and that had been discontinued. Rich, do you know what year maybe that was discontinued?

MR. BONELLI: It's been a while.

MS. HANNA: Yeah, it was a long time ago. It used to be a dry cleaning operation, but was stopped, and then it became only a distribution center. Because of that, we did a Temporary Well Delineation Study -- because of the TCE. There were no wells immediately near that particular well, and we wanted to determine whether it was part of a larger problem, or if it was just in that one little area. So, three wells were installed. One upgradient and two downgradient of that well. No TCE was detected in any of these wells, so we concluded that it was a small area, it was not a larger problem. The temporary wells were located here, here, and here. MW04 is right there.

MR. RAINES: Where was the well site with -- or the
concrete pad with the AST?

MS. HANNA: The AST, I think, was located, around here.

MR. RAINES: Okay.

MR. SWARTZENBERG: So, it was probably related to the storage tank that had dry cleaning fluid in it.

MR. HUMPHRIES: Question. Did any of these contaminants get in the aquifer?

MS. HANNA: These were all in the shallow aquifer. All these wells were -- there were a couple of intermediate wells, but the only contaminant -- Oh, MW04, where that contaminant was found, is a shallow well, which is -- I’d have to look up the depth, but it was not in the drinking water aquifer. The Castle Hayne is -- Rich, could you answer how deep the Castle Hayne aquifer is?

MR. BONELLI: In this area of the base, it’s probably down around 60 to 70 feet down.

MS. HANNA: Yeah. This well is less than 30 feet for sure, and the contamination was not within the Castle Hayne aquifer.

MR. HUMPHRIES: My second question. You mentioned a large plume and a small plume. An acre, half-acre, or what?

MS. HANNA: That was in the original study. I don’t have an acreage. I don’t know.

MR. BONELLI: That was done during the UST study years ago. They just identified them, I think, as a north and south plume. I don’t think they actually got into the acreage, if I remember right.
MS. HANNA: They didn’t give acreage. Conclusions for this site -- we are recommending no action because the PCE was no longer detected, and TCE was in a very small area. The other contaminants that were identified as COPCs were not site related. A ROD will be prepared based on this no action that will be taking into account public comments and CERCLA process will be concluded for this site. I guess this site may go back into the UST Program, but I’m not sure. Rick, could you comment on that? Do you know if these sites are going back into the UST Program?

MR. RAINES: I see we’re going to determine that tomorrow, but they will be all relevant and applicable requirements -- regulations that the USTs are subject to. So, we meet all the requirements that the UST Program sets out to meet, too. Did that answer the question?

MS. HANNA: It did for me.

MR. SWARTZENBERG: What about the TCE that’s still in the ground water there? You’re just going to forget about it, right?

MR. RAINES: We’ve shown that it’s deteriorating, haven’t we?

MS. HANNA: Yes.

MR. RAINES: It’s naturally deteriorating. It’s going from PCE to TCE, and it’s in one well. We’re showing that it’s breaking down, and we have every reason to believe that it will continue to break down until it goes away.

MS. TOWSENDEL: I think, to add to that, it has taken us about four years to really close out the site. And because it was
only a minor problem for the IR Program, being that the TCE was just a little incidental hit as compared to the UST site, we’re thinking that this is one case where the UST contamination helped our natural attenuation process; what we’re trying to improve in other parts of the base, and that we’ve seen the degradation and plus, I don’t have the exact concentration, but the TCE that is remaining out there are very low levels. We’re talking -- what was it, 17?

MS. HANNA: It’s lower than that.

MR. RAINES: It’s 2.

MS. TOWNSEND: It’s 2? It started out 17, and now it’s 2, and it’s less than the standards for remediation. So this is one program where a contaminant may have helped another contaminant, and it’s remediated itself.

MR. SWARTZENBERG: Okay, I just didn’t pick that up.

MS. HANNA: The next site is Site 91, also UST sites. And this one had one 300-gallon tank. There also happened to be four ASTs removed that contained waste oil, antifreeze, and kerosene, and it’s basically an industrial land use setting. Here are some photographs. You can see a concrete cover, only tiny grass patch areas here amongst buildings. There is an open area there, but it’s used for -- is this the Engineering School area? Site 91?

MR. BONELLI: I believe so.

MS. HANNA: But it’s pretty much industrial use. And here is a drawing of the site and the former ASTs were here. The
former UST basin was approximately here. As with Site 90, a three
well site check was done which found oil and grease in the soil,
and toluene in the ground water. Because there were contaminants
detected, they did a leaking underground storage tank assessment,
and again found two areas of contamination, which included the
chlorinated hydrocarbons again. So, that kicked it into the IR
Program. They also found chlorinated hydrocarbons in the
subsurface soil, so it went into the IR Program. And we did a
focused RI, did subsurface soil sampling and ground water sampling.
Again, we found common laboratory contaminants and inorganics in
the subsurface soil at -- the inorganics at levels similar to
naturally occurring levels. In the ground water, there were more
laboratory contaminant type things that we did not consider site
related. These are the subsurface soil sample locations during the
RI, and the groundwater sample locations. And a qualitative risk
assessment was done at this site, based on the post-RI results,
using the same screening criteria as for Site 90. For subsurface
soil, one inorganic was identified as a COPC.

MR. SWARTZENBERG: What is a COPC?

MS. HANNA: Contaminant of potential concern. Because it
exceeded the screening criteria that is established by EPA or the
State. In ground water, these contaminants were identified as
COPCs, and many of them weren’t considered site related at all. In
fact, none of these.

MR. SWARTZENBERG: Well, if they’re not site related,
what are they?
MS. HANNA: Well, the inorganics are naturally occurring. Chloroform here is considered a common laboratory contaminant. And when we looked at the concentrations -- the detections at the site, they were within -- there is a USEPA rule of thumb. When your concentration is less than 10 times your blank sample -- because we collect quality control samples -- if it's less than 10 times the concentration found in that sample, then you can't count it as being site related.

MR. SWARTZENBERG: Well, how could it be a contaminant of concern if it's not site related? It sounds like double talk.

MS. HANNA: The contaminant of potential concern -- what happened during the qualitative risk assessment was you take all the data and we screened it against the screening criteria which were not site specific; they are criteria that are established by EPA or the State, depending -- well, they both establish criteria. It may exceed one or the other. You often have different numbers. We took all the results, screened them, and then after that, we took a look at the QAQC -- some samples, and the naturally occurring levels of inorganics, and also looked at our concentration and compared it against those after the COPCs were identified. That was the second step. So, we took the entire list of contaminants, identified COPCs, and took only the COPCs that were identified, and then looked at those concentrations and compared it against the QAQC or naturally occurring levels. So, it was like a two-step process.

MR. RAINES: If I can add something to that. Jim,
remember when we went to -- we did the field trip and we did the sampling tests out at the well?

MR. SWARTZENBERG: Yes.

MR. RAINES: And they showed you how they brought out their own water and how in between sampling events they had to decontaminate the equipment and all that kind of stuff? They take a trip blank, use a sample of the water they take out to the site. They just return with that water, plus they -- but, during these processes, these contaminants can enter into -- say, they rinse off their probe and they don't get all the chloroform off. That's going to show up in the next sampling round. So, some of these things are introduced through --

MR. SWARTZENBERG: I guess it's just the way you're presenting it. You call it a contaminant of concern; what's the "p" for?

MS. HANNA: Potential.

MR. SWARTZENBERG: Then you say, well, it's not a big deal, because it's chlorinated. How can it be both?

MR. RAINES: Anything that pings high is a potential contaminant. And then we try and find out how they -- is it site related, or was it introduced during sampling?

MR. SWARTZENBERG: Okay.

MS. TOWNSEND: One thing that you keep in mind, the process is designed so you do not eliminate contamination before you evaluate it. Because that way, you can come up with a lot of false positives or false negatives. So what you do is you identify
whatever you found, then you start looking for the resulting action that caused that contaminant to be there. And in some of are cases, you could have chloroform that is an actual contaminant of the site. But you want to measure it against your blank in your equipment process before you do delete it from the list.

MR. SWARTZENBERG: Okay.

MS. HANNA: In order to verify just what you're talking about, whether things were site related or not, we did do a supplemental ground water investigation. They sampled 11 monitoring wells, and these contaminants came out. All three of these are considered common laboratory contaminants. We did the same process. We screened it against our blank samples and determined that they weren't site related. We did find some chloroform that were above the 10 times blanks. So, we have to classify that as site related. And, we also found two detections of Bis(2-ethylhexyl)phthalate, which is a common laboratory contaminant, but they were above the 10 times rule, so we classified them as site related. These contaminants were also detected. Because of that, we put it into our Post-RI Monitoring Program. We put it into our sampling program just to check on that. And they sampled eight wells. We did it quarterly, so we have four rounds of data for this site. Chloroform was detected in two individual wells, one in July of 2000 and one in October of 2000, but was not detected since then. So, there were two quarters where it wasn't detected at all anywhere on the site. Arsenic and iron were detected, but within these naturally occurring levels,
and pyrene was detected -- there was one well in October at low levels and it was never detected again. So, because of the follow-up studies and analysis, we believe that -- well, we recommend no action, because we don’t believe them to be site contaminants or site related. So, we’ve recommended no action. CERCLA process will be completed at the signing of the ROD, when we take into account public participation and comments, and the same thing for this site with the UST Program, as Site 91. Any questions on Site 91? Any other questions?

We’ll move on to Site 92. There was one 1000-gallon tank removed in 1994. During the removal, they found elevated levels of petroleum hydrocarbons and here is a photograph. There is a pier; boats are there. It’s somewhat of a recreational area; there is a picnic area. Here is the site. This is the Courthouse Bay here. Here is the pier, and there is the approximate location of the former UST. Because it was a UST, they did the three well site check. There was nothing found in the soil, but they found PCE in ground water and because of that it went into the IR Program, and they did a Focused Remedial Investigation on it. They studied subsurface soil and ground water and found inorganics, acetone, which is considered a common laboratory contaminant, and the same with the bis(2(ethylhexyl)phthalate and also, I believe, one detection of that pesticide in subsurface soil. Chloroform and inorganics were found in ground water. Here are the subsurface soil locations from the RI and ground water locations. The Qualitative Risk Assessment was done at this site as well. These
contaminants were found to be -- when screened were identified as contaminants of potential concern. Inorganics were within background. The acetone and chloroform, we believe, because they were below the 10 times rule, were considered laboratory or decontamination procedures. Because we found these lab contaminants, we wanted to verify that and also the inorganic levels, so we did some post-RI monitoring. No VOCs or SVOCs were ever detected during the course of sampling. There were four rounds of sampling at this site. We did them on a quarterly basis. The inorganics were found but, again, these we considered to be -- they were within naturally occurring levels and we don’t believe they were site related. So, based on these results, all these studies, over a course of time, we recommend no action. That would conclude the CERCLA process when the ROD is signed, and again, they may go back into the UST Program to address that -- close it out under that program.

MR. SWARTZENBERG: That tank was just gasoline.

MS. HANNA: Yes, it was just gasoline.

MR. SWARTZENBERG: Would any of that gasoline have MTBE in it?

MS. HANNA: None was detected.

MR. SWARTZENBERG: They did check for it.

MS. HANNA: Rich, do you know if they sampled for that?

MR. BONELLI: It’s typically a requirement to look for that, but I don’t know if their methods covered that. Sometimes they do, sometimes they don’t.
MR. SWARTZENBERG: Do you know whether this tank was leaking?

MR. BURTON: I don’t think the UST investigation found significant petroleum contamination. There wasn’t any in the soils, the manganese, with respect to the ground water.

MR. RAINES: There were very little POLs. It was the chlorinateds that drove it to further investigation. It wasn’t the POLs. Did not appear to be a release.

MR. SWARTZENBERG: I’d just be curious to know if they even bothered checking for MTBE. It wasn’t a big deal until about a year ago.

MR. RAINES: Well, this is fairly old, too. This might have been before they even started adding MTBE.

MR. SWARTZENBERG: Well, that’s my comment. You can do what you want with it.

MS. HANNA: I guess that’s it. Any other questions on these three sites?

MR. BONELLI: I’d like to thank everybody for coming this evening for our presentations. If you have any questions, feel free to contact me, and we’ll turn things back over to Rick and have him close our presentation for this evening.

MR. RAINES: Once again, we do have copies of the PRAPs up here. Be sure that everybody gets a copy of these. For your comments, I guess we will handle them informally. Mr. Swartzenberg, we’ll get back to you with an answer on the MTBE. Want to make sure you signed in, so we’ll have your name, and if
there are no more questions -- does anyone have any more questions?

MR. HUMPHRIES: I have one. How is the money situation for the cleanup?

MR. RAINES: That's a pretty broad question, but Kirk here is from LANTDIV, and they handle basically the money that funds the CERCLA program down here.

MR. HUMPHRIES: We're getting our share, right?

MR. RAINES: Yeah.

MR. KIRK: We are. It doesn't really deal with the (inaudible) action, but Camp Lejeune, in the Atlantic division that we handle, is the largest customer that we service, and their program this year was around six and a half million dollars, which would be again next fiscal year the same amount. We can talk in more detail right after the meeting to answer specific questions.

MR. HUMPHRIES: Always worried about money.

MR. RAINES: We do get our share and we -- as one of the larger installations, I don't know if we get first cut off the top, but basically they're continuing funding our program. Anything else? We want to thank y'all for coming out. Hopefully, you learned something, and --

MR. BONELLI: Don't hesitate to call us with your questions.

The meeting was concluded at 8:05 p.m.
STATE OF NORTH CAROLINA       )
                                   ) C-E-R-T-I-F-I-C-A-T-I-O-N
COUNTY OF LINCOLN             )

I, KATHRYN F. KILPATRICK, A COURT REPORTER AND NOTARY
PUBLIC IN AND FOR THE AFORESAID COUNTY AND STATE, DO HEREBY CERTIFY
THAT THE FOREGOING PAGES ARE AN ACCURATE TRANSCRIPT OF THE PUBLIC
MEETING REGARDING THE PROPOSED REMEDIAL ACTION PLAN (PRAP) FOR
OPERABLE UNITS (OUS) NO. 9 (SITE 65) AND NO. 17 (SITES 90, 91 AND
92), HELD ON JULY 18, 2001, IN JACKSONVILLE, NORTH CAROLINA,
TRANSCRIBED BY ME PERSONALLY.

I FURTHER CERTIFY THAT I AM NOT FINANCIALLY INTERESTED IN
THE OUTCOME OF THIS ACTION, A RELATIVE, EMPLOYEE, ATTORNEY OR
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MY COMMISSION EXPIRES MAY 2, 2006.

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APPENDIX C
LETTER FROM TOXICOLOGIST, NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES
Mr. Aaron Bernhardt, Environmental Scientist
Baker Environmental, Inc.
Airport Office Park, Building 3
420 Rouser Road
Coraopolis, Pennsylvania 15108

Dear Mr. Bernhardt:

I am writing in response to your request for a health risk evaluation of the analytical results of the fish and crab samples that were collected from Courthouse Pond and Powerline Pond at Site 65 and Courthouse Bay at Site 73. Based upon my review of these results, I offer the following health risk evaluation:

1. Methylene chloride, acetone, toluene, di-n-butyl phthalate, 2-butanone, and toluene were found in the fish and crab sampled from these two sites. Although elevated concentrations of methylene chloride and acetone were reported, all of these volatile organic chemicals are considered to be common laboratory contaminants (USEPA December 1989 Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A). Volatile organic chemicals typically do not bioconcentrate in fish and crab tissues because of their relatively low bioconcentration factors. Since all of these chemicals are common laboratory contaminants and volatile organic chemicals do not typically bioconcentrate in fish and crab tissues, these chemicals were most likely introduced into the samples in the laboratory. Based upon my review of the literature and the sampling data submitted, the concentrations measured for the above-mentioned chemicals are not likely to be representative of exposure concentrations.

2. The arsenic concentrations reported for fish and crab from these two sites were below the average levels typically reported for fish and seafood of 4 to 5 mg/kg (April 1993 Toxicological Profile for Arsenic, Agency for Toxic Substances and Disease Registry).

3. For Site 65, elevated DDD and DDE were reported in the whole body analysis of one bluegill. However, DDD and DDE were reported as nondetect or at very low concentrations for three composites of bluegill (two fillet, 1 whole), two composites of
largemouth bass (one fillet, one whole), and three composites of redear sunfish (one fillet, two whole). Compared to fillet samples, higher DDD and DDE concentrations were found in the whole body samples. Since the whole body analysis includes analysis of both muscle and fatty tissues (where DDD and DDE can concentrate), higher levels would be expected to be reported in the whole body analysis. The DDD and DDE concentrations reported for all fish were below the average concentrations reported for the United States in 1984 of 60 µg/kg for DDD and 190 µg/kg for DDE (May 1994 Toxicological Profile for 4,4'-DDT, 4,4'-DDE, 4,4'-DDD, Agency for Toxic Substances and Disease Registry). The DDD and DDE concentrations reported in this one composite of bluegill do not appear to be representative of the average concentrations present in the edible portion of fish at this site.

4. For Site 65, elevated antimony and beryllium concentrations were found in the whole body samples for some fish, but were not detected in the fillet samples. Typically, low levels of antimony and beryllium are found in fish. According to the September 1992 Toxicological Profile for Antimony (Agency for Toxic Substances and Disease Registry), "Antimony does not appear to accumulate in fish and other aquatic animals". The antimony and beryllium detected in the whole fish analyses most likely came from the dirt or sediment that was present on the surface of the fish during analysis or from nonmuscular portions of the fish. The antimony and beryllium concentrations reported do not appear to be representative of the average concentrations present in the edible portion of fish at this site.

5. The remaining analyte concentrations were well within normal and acceptable concentrations.

In summary, the concentrations reported for these two sites may not be representative of the concentrations present in the edible portion of fish and crab found at this site. Based upon the information submitted by Baker Environmental, Inc., consumption of the fish and crab should not pose a significant health risk. Please do not hesitate to call me if you have any questions at 919-715-6429.

Sincerely,

Luanne K. Williams, Pharm.D., Toxicologist
Medical Evaluation and Risk Assessment Branch
Occupational and Environmental Epidemiology Section

LKW/rlm