PROPOSED REMEDIAL ACTION PLAN SITE 73 OPERABLE UNIT 21 (OU 21) MCB CAMP LEJEUNE NC

4/1/2009

CH2M HILL

Proposed Remedial Action Plan

Site 73: Operable Unit Number 21

Marine Corps Base, Camp Lejeune
Camp Lejeune, North Carolina

April 2009

1 Introduction

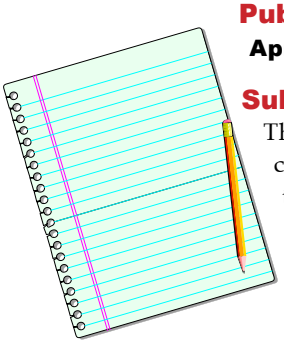
This **Proposed Remedial Action Plan (PRAP)** identifies the Preferred Alternative for addressing soil and **groundwater** impacts at **Site** 73 of **Operable Unit** Number 21 (OU No. 21) on the Marine Corps Base (MCB) Camp Lejeune in Onslow County, North Carolina. The Preferred Alternative is **Groundwater Treatment by Air Sparging (In-Situ Aeration), Downgradient Enhanced Reductive Dechlorination (ERD) Injections, the Monitoring of the Natural Degradation of Chemicals of Concern (COCs), and Land Use Controls (LUCs). LUCs** will be implemented as part of the remedy to prevent exposure to the impacted groundwater and petroleum hydrocarbon-impacted soils present at Site 73. LUCs will be maintained until site conditions allow unlimited use and unrestricted exposure.

The U.S. Department of the Navy (Navy), the **lead agency** for site activities at MCB Camp Lejeune, is issuing this PRAP in order to solicit public comments on the remedial alternatives, and in particular the preferred **remedial action** for Site 73. This PRAP fulfills public participation responsibilities as required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

This PRAP summarizes the remedial alternatives evaluated for Site 73. Detailed background information for Site 73 is contained in the **Remedial Investigations (RIs)** (Baker, 1997 and CH2M HILL, 2009), the **Feasibility Study (FS)** (CH2M HILL, 2009), and other documents contained in the **Administrative Record** file and **Information Repository** for Site 73. A glossary of key terms used in this PRAP is attached, and are identified in bold print the first time they appear.

The Navy, MCB Camp Lejeune, and the **U.S. Environmental Protection Agency (EPA)**, in consultation with the **North Carolina Department of Environment and Natural Resources (NCDENR)** will make the final decision on the remedial approach for Site 73 after reviewing and considering all information submitted during the 30-day **public comment period**. The Navy and MCB Camp Lejeune, along with EPA, may modify the Preferred Alternative based on new information or public comment. Therefore, public comment on the Preferred Alternative is invited and encouraged. Information on how to participate in this decision making process is presented in Section 10. The State of North Carolina will issue a letter of concurrence at the appropriate time once the final **Record of Decision (ROD)** has been submitted.

Mark Your Calendar for the Public Comment Period



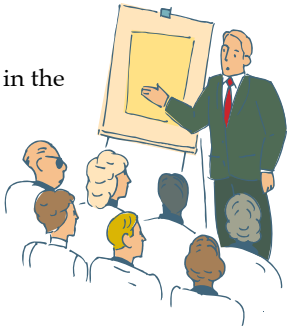
Public Comment Period
April 21 - May 20, 2009

Submit Written Comments
The Navy will accept written comments on the PRAP during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Attend the Public Meeting
April 21, 2009 at 6:00 p.m.

Coastal Carolina Community College in the Business Technology Bldg., Room 105
444 Western Blvd,
Jacksonville, NC 28546

The Navy will hold a public meeting to explain the PRAP. Verbal and written comments will be accepted at this meeting.



Location of Information Repository

Available for Review Online: http://public.lantops-ir.org/sites/public/lejeune/Site35_73Prap.aspx
Access to the website is available at:
Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

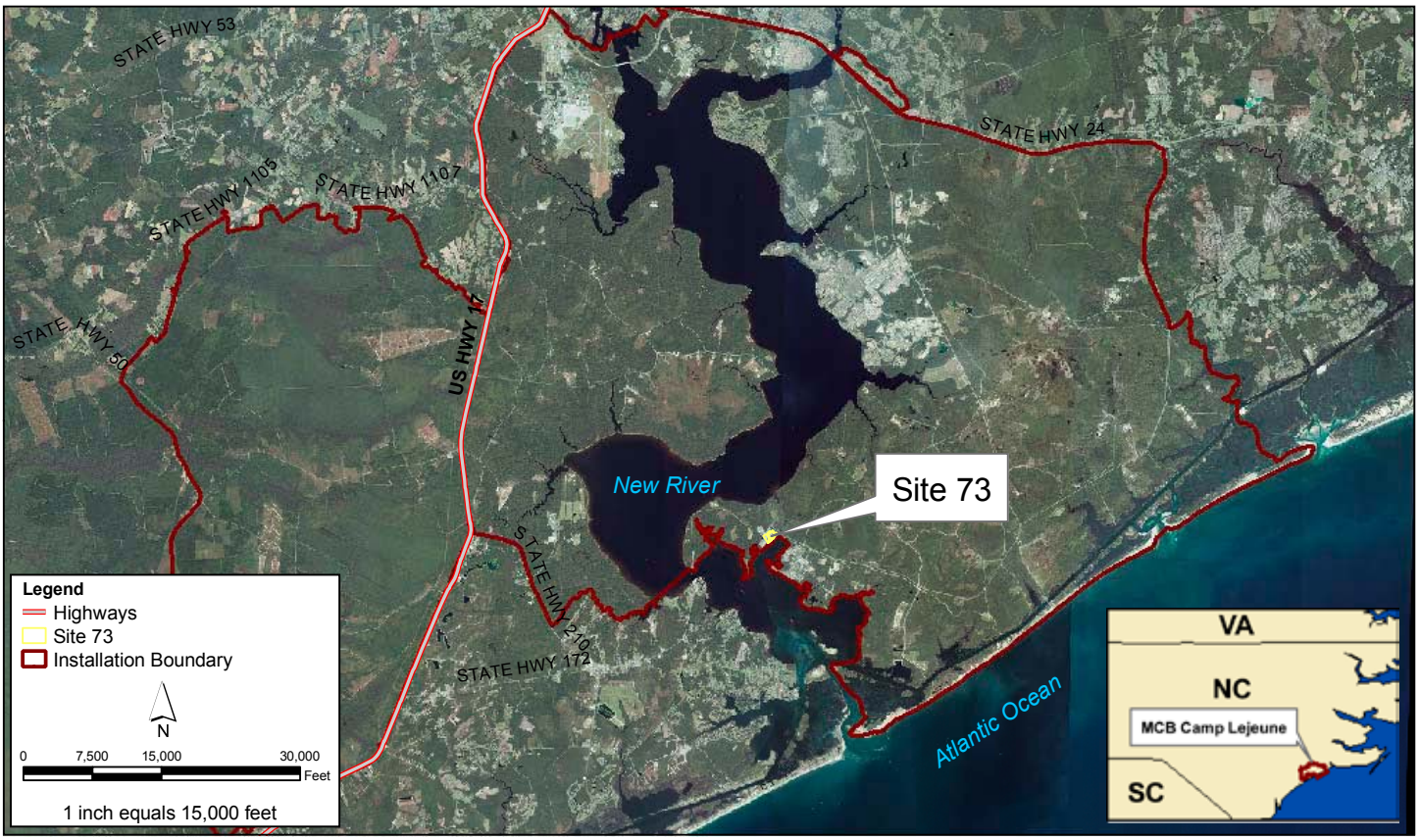


Figure 1 – Base and Site Location Map

2 Site Background

2.1 Site Description and History

MCB Camp Lejeune is a 156,000-acre facility located in Jacksonville, North Carolina within Onslow County **(Figure 1)**. The mission of MCB Camp Lejeune is to maintain combat-ready units for expeditionary deployment. The Base provides housing, training facilities, and logistical support for Fleet Marine Force Units and other assigned units.

Site 73 encompasses the Amphibious Vehicle Maintenance Facility in the Courthouse Bay area of MCB Camp Lejeune, directly north of Courthouse Bay. OU No. 21 consists solely of Site 73. Site 73 is a currently used area that contains the main maintenance facility (Building A47), numerous support buildings, aboveground storage tanks, vehicle wash racks, and oil-water separators **(Figure 2)**.

The Amphibious Vehicle Maintenance Facility was constructed in 1946. Maintenance activities were historically conducted in the former maintenance building (Building A3), located southeast of the current Building A47 **(Figure 2)**. Used motor oil and battery acid resulting from maintenance activities were reportedly discharged directly to the ground surface northeast of Building A3. Between 1983 and 1989, Building A3 was demolished and Building A47 was constructed. Based on the nature of maintenance activities conducted and chlorinated volatile organic compounds **(CVOCs)** identified in groundwater, it is likely that other **hazardous substances** (e.g., chlorinated solvents) were also disposed of in this area. Significant development of the Courthouse Bay area surrounding Site 73 has occurred in the last 10 to 15 years and the current land use is industrial.

Ten underground storage tanks (USTs) containing various petroleum products (diesel fuel, gasoline, and /or waste oil) were formerly located at Site 73 to support the Amphibious Vehicle Maintenance Facility operations. All USTs except UST A47-1 have been removed (approximate location is within the footprint of the former maintenance building). The NCDENR issued No Further Action for five of the USTs (A47-2, A47-4, A47-5, A-2, and A-10/SA26). Investigations are currently being completed under the UST Program for four of the USTs (A47-3, UST-A47/SA21, A12-1, and A12-2).UST A47-1 was investigated as part of the CERCLA investigation due to its location within the area of CVOC-impacted groundwater.

2.2 Summary of Previous Investigations

Site 73 was characterized under numerous investigations and studies between 1983 and the present. The following is a chronological list of those studies **(Table 1)**.

As shown in **Figure 2**, the **conceptual site model (CSM)** depicts the site characteristics, nature and extent of impacts, and transport pathways. Groundwater impacts at Site 73 are present in both the surficial and Castle Hayne aquifers.

Previous Study / Investigation*	Date	Investigation Activities
Initial Assessment Study (WAR, 1983)	1983	A review of historical records, aerial photographs, and field inspections found that an estimated 400,000 gallons of waste oil was discharged directly onto the ground surface, primarily near Building A-47. Approximately 20,000 gallons of waste battery acid was also reportedly disposed in the area northeast of Building A-47. Therefore, Site 73 was recommended for additional study.
Confirmation Study (ESE, 1990)	1984 - 1990	Groundwater samples were collected in areas where washing had occurred, or locations of existing or suspected former USTs. Shallow groundwater was impacted by volatile organic compounds (VOCs) and metals.
RI (Baker, 1997)	1997	Surface soil, subsurface soil, groundwater, sediment, and surface water samples, and benthic and aquatic species were collected to evaluate the nature and extent of impacts and potential risks to human health and the environment. COCs identified were benzene, **trichloroethene (TCE)**, cis-1,2-dichloroethene (cis-1,2-DCE), and **vinyl chloride (VC)** in shallow and intermediate groundwater.
Supplemental Groundwater Investigation (Baker, 1998a)	1998	Shallow and intermediate groundwater samples were collected for further delineation. The results indicated that **natural attenuation** was occurring; the shallow benzene plume was stable and decreasing in concentration; and the shallow chlorinated VOC (CVOC; i.e., TCE, cis-1,2-DCE, VC, etc.) area of concern had not changed in shape or size but was not fully delineated in both the shallow and intermediate aquifer zones.
FS (Baker, 1998c)	1998	Remedial alternatives were developed for groundwater in both the shallow and intermediate aquifer zones to mitigate the potential for direct exposure and to treat impacted groundwater.
Groundwater Modeling Report (Baker, 1998b)	1998	Groundwater modeling was conducted to predict the fate and transport of CVOCs. The results indicated that natural degradation was occurring in the deep aquifer zone and that intermediate and deep groundwater was discharging to Courthouse Bay and the New River.
Long Term Monitoring (LTM) Optimization Report (CH2M HILL, 2005)	2000-2005	LTM of CVOCs and benzene in shallow, intermediate, and deep groundwater was conducted to verify the plumes were stable and not expanding. LTM was discontinued in 2005 when additional sampling as part of the RI began.
Natural Attenuation Evaluation Study (CH2M HILL/Baker/CDM, 2002)	2002	A study was conducted to evaluate the extent and rate of natural attenuation. Benzene was the only fuel-related compound detected in the shallow and intermediate aquifer zones; it was degrading by natural, in-situ processes and was not discharging to Courthouse Bay. Reduced levels of TCE, cis-1,2-DCE, and VC and their patterns of occurrence in the shallow aquifer zone, were indicative of natural attenuation, but the potential for VC to discharge into Courthouse Bay was identified. TCE, cis-1,2-DCE, and VC were identified in the intermediate aquifer zone but were considered not likely discharging to Courthouse Bay. Additional delineation was recommended to verify the extent of impacts.
Technology Evaluation (Baker, 2003)	2003	Potential remedial options were evaluated for treatment of intermediate groundwater with TCE concentrations above 1,000 micrograms per liter (µg/L) ("hot spot" area), near Building A47. Five treatment technologies (in-situ chemical oxidation using permanganate, abiotic reduction using colloidal iron injection, ERD promoted by hydrogen release compound (HRC™), bio-augmentation, sparging with hydrogen, cometabolic sparging with air and propane, or sparging with ozone using horizontal wells) were evaluated based on effectiveness, site constraints, depth of the COC mass, presence of underground utilities, land use, and cost. Hydrogen sparging delivered via a horizontal directionally drilled (HDD) well was recommended.
Pilot Study Report (MicroPact/Baker, 2006)	2006	A 900-foot-long HDD well with 400 feet of screened area was installed to a depth of 85 feet below ground surface (bgs) in the "hot spot" area. Approximately 40 hydrogen injections were completed in 2004 and 2005. The average TCE concentration decreased by approximately 35%, and the average total VOC concentration decreased by approximately 8%.
Final Phase 2 Pilot Study Report (AGVIQ/CH2M HILL, 2008)	2008	A pilot study was conducted to evaluate air and ozone sparging for removal of CVOCs present in the "hot spot" area using the existing HDD well. Results indicated that TCE and DCE concentrations in the intermediate aquifer zone decreased by 75%; average TCE concentrations in the shallow aquifer zone increased; and average VC concentrations were relatively constant.
Supplemental RI (SRI) (CH2M HILL, 2009b)	2005-2009	An SRI was completed to summarize the nature and extent of impacts and potential risks to human health and the environment. Primary COCs identified were VOCs (TCE, cis-1,2-DCE, VC, and benzene). The greatest VOC concentrations are located beneath the paved area associated with Building A47. COCs detected in the shallow aquifer (TCE, VC, and benzene) appear to originate in the vicinity of UST A47-3. The greatest concentrations of COCs detected within the intermediate aquifer were detected between Building A47 and the approximate footprint of the former maintenance building. Soil samples were collected in 2006 and 2008 to delineate the extent of petroleum-related impacts. No significant source of free-phase petroleum was identified; however, an area of petroleum hydrocarbon-impacted soil was delineated in the area corresponding with historic waste oil discharge. The source of impacts is likely from multiple surficial spills associated with maintenance activities that occurred before the concrete-paved parking area was constructed.
Feasibility Study (CH2M HILL, 2009a)	2009	Potential remedial alternatives were identified to address CVOCs in groundwater and petroleum hydrocarbon-impacted soil. Four remedial alternatives were selected for detailed comparative analysis: (1) no action, (2) monitored natural attenuation (MNA), (3) ERD using existing horizontal well and downgradient ERD injections, and (4) air sparging with downgradient ERD injections.

Notes: *The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Site 73.

Table 1 – Previous Studies and Investigations

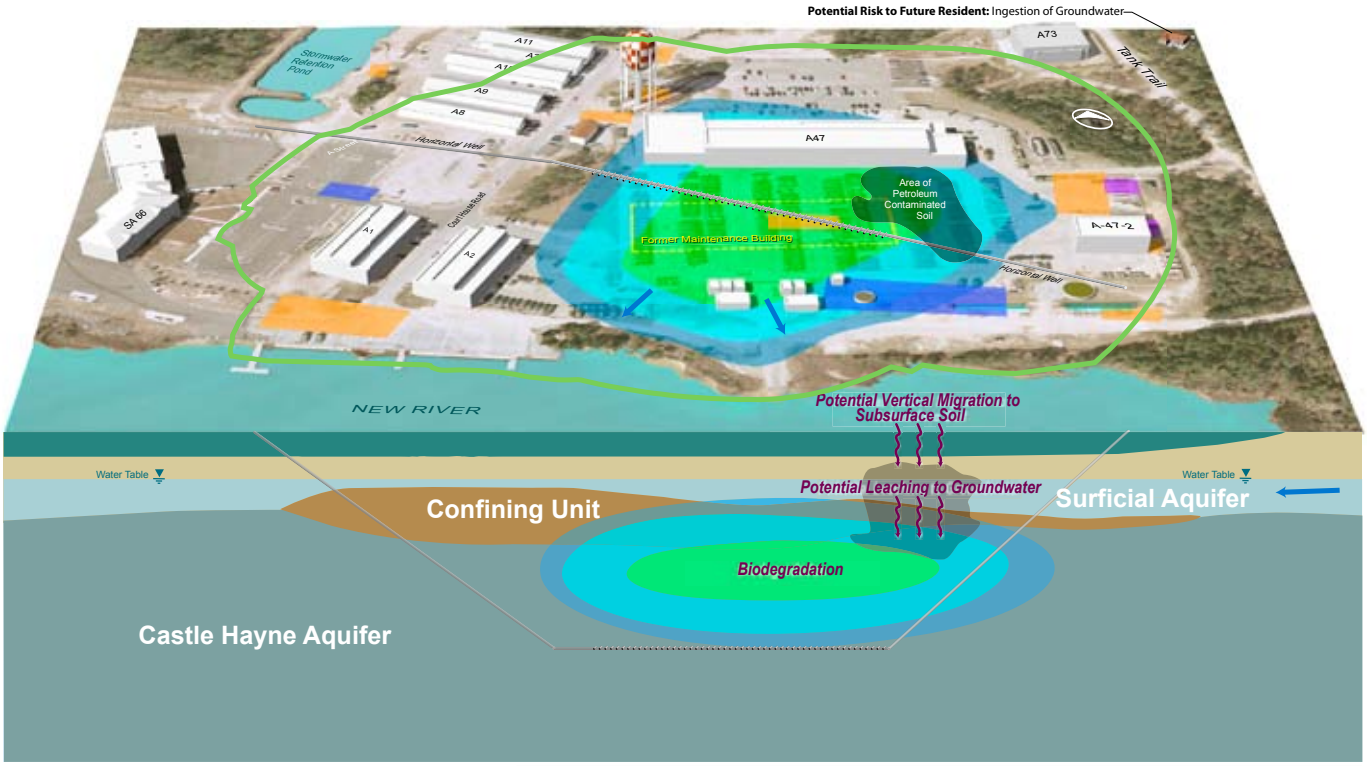


Figure 2 – Site 73 Conceptual Site Model

Legend

- Horizontal Well
- Groundwater Flow Direction
- Location of Existing/Former UST
- Hazmat Storage
- Vehicle Washdown Areas
- Operable Unit 21

TCE Concentrations

- 50 < x < 100 µg/L
- 5 < x < 50 µg/L
- 2.8 < x < 5 µg/L

3 Site Characteristics

Site 73 has been defined historically as the area around the former maintenance building, Building A3, and the current Building A47 in the Courthouse Bay area **(Figure 2)**. Site 73 is an industrial area, and most of the ground surface is covered with buildings and asphalt and/or concrete, with intermittent grass-covered areas. A stormwater retention pond and storage buildings are located to the west of Site 73.

The general topography of the Site 73 area is moderate, with a gentle slope towards Courthouse Bay. Consequently, stormwater runoff tends to drain directly south to Courthouse Bay, to two small unnamed tributaries to the east and west, or to the retention ponds to the west, and ultimately discharging to Courthouse Bay (New River). There is a broad marshy area associated with the western tributary. Directly north of the site is another large marsh and stream that discharges north into the New River. The marsh lying directly north is separated from the site by Sneads Ferry Road (State Route 172), which represents a local topographic high and surface water runoff divide.

Groundwater investigations completed at Site 73 have focused on the surficial and underlying Castle Hayne aquifers. For the purposes of the PRAP, the aquifers have been evaluated as three zones corresponding to the following depths: shallow (surficial aquifer - 0 to 25 feet bgs), intermediate (Castle Hayne aquifer - 45 to 90 feet bgs), and deep (Castle Hayne aquifer - 100 to 150 feet bgs). In general, the groundwater flow direction within the shallow, intermediate, and deep aquifer zones is to the southeast. Groundwater is generally encountered at depths ranging from 0.55 feet below mean sea level to 9.28 feet below mean sea level. The variation in the depth to groundwater is primarily attributed to topographical changes. Hydraulic gradients range from approximately 0.002 to 0.004 feet per feet and average linear seepage velocities for the surficial aquifer were estimated to range from 38 to 70 feet per year and from 5 to 10 feet per year in the Castle Hayne aquifer.

Potable water for MCB Camp Lejeune and the surrounding residential area is provided by public water supply wells that pump groundwater from the Castle Hayne aquifer. Regionally in southeastern North Carolina, the Castle Hayne aquifer may be used as a potable source of domestic water supply, watering lawns, or filling swimming pools. Three active water supply wells are within a 1-mile radius of Site 73, and two active wells are just beyond the 1-mile radius. All water supply wells are located across Courthouse Bay which acts as a natural barrier. The water supply wells are not impacted by Site 73 and groundwater modeling indicates that impacted groundwater at Site 73 will not impact the water supply wells in the future.

3.1 Nature and Extent of Contamination

During the July 2008 field activities, the COCs benzene, TCE, cis-1,2-DCE, and VC were detected in groundwater at concentrations exceeding the North Carolina Ground Water Quality Standards (NCGWQS) and/or federal

Maximum Contaminant Levels (MCLs) in one or more of the monitoring wells in the shallow, intermediate, and deep aquifer zones. **Table 2** provides the maximum concentration detected for each COC at Site 73. COCs detected in the shallow aquifer zone (benzene, VC, and cis-1,2-DCE) appear sporadically in the concrete pad area in the suspected vicinity of the former maintenance building. The highest concentration of COCs detected in the intermediate aquifer zone (TCE, cis-1,2-DCE, VC, and benzene) were generally located between Building A47 and the approximate footprint of the former maintenance building. Benzene and VC were detected as deep as 110 feet bgs in the groundwater in one monitoring well at concentrations exceeding the applicable NCQWGS. No COCs were detected in any of the other groundwater samples collected from the deep aquifer zone monitoring wells. Based on the chemical and physical data gathered during the various phases of investigation conducted at Site 73, the COCs detected in groundwater samples are likely the result of historical disposal activities in the vicinity of the former maintenance building.

Groundwater impacts appear to be limited to the shallow and intermediate aquifer zones in the vicinity of the concrete parking area, south of Building A47 **(Figure 2)**. The overall magnitude of impacts has decreased significantly since the completion of the RI sampling in 2006, as a result of the air sparging pilot test using the horizontal well. The operation of the air sparge system has also decreased the extent and magnitude of TCE impacts in the intermediate aquifer zone. Further reduction of TCE concentrations and increased concentrations of cis-1,2-DCE and VC observed after the completion of the air sparge pilot test suggest **anaerobic degradation of CVOCs by reductive dechlorination** is occurring naturally. Based on the current analytical data, VC-affected groundwater may be discharging to Courthouse Bay, or may in the near future.

Exceedances of benzene and VC in the groundwater from one deep zone monitoring well suggest a downward migration component of the contaminant flow. Based on the absence of impacts in the remaining deep monitoring wells, the deep impacts appear to be limited in extent.

Surface water and sediment sampling in Courthouse Bay and its surrounding tributaries were thoroughly investigated during the 1997 RI. The RI concluded that Courthouse Bay is not adversely affected by the COCs detected in groundwater at Site 73.

Petroleum hydrocarbon-impacted soils were identified beneath the concrete parking area adjacent to Building A47 and directly north of the former maintenance building **(Figure 2)**. The investigation concluded that impacts are likely the result of multiple surficial spills, rather than a single event, that occurred before the concrete-paved parking area was constructed. Risk-based analysis of soil samples identified only the petroleum aromatic hydrocarbon fraction class C9-C22 as a COC. Free product has been observed historically in only one shallow monitoring well (IR73-MW14) within the footprint of the former maintenance building and near the approximate location of UST A47-1, however free product was not observed during the most recent sampling in event in July 2008. Analytical results of the groundwater sample collected from monitoring well IR73-MW14 in July 2008 did not indicate any COCs were present above the applicable NCGWQS. Additionally, the petroleum hydrocarbon-impacted area is effectively capped by concrete paving, reducing the potential for leaching into groundwater.

Groundwater	
COC	Maximum Concentration (µg/L)
Benzene	11
TCE	340
cis-1,2-DCE	1,000
VC	430
Soil	
COC	Maximum Concentration (mg/kg)
Petroleum Aromatic Carbon Fraction Class C9-C22	10,220

Table 2 – Maximum Concentrations Detected for COCs

3.2 Fate and Transport of Contamination

The primary fate and contaminant migration pathway for COCs in groundwater at Site 73 is through groundwater flow in the shallow and intermediate aquifer zones. The mechanisms of transport include dissolution, advection, and dispersion. Currently, the COCs in groundwater at Site 73 are undergoing chemical and biological changes over time. Although no site-related COCs have been identified in Courthouse Bay, groundwater in the shallow and intermediate aquifer zones is likely discharging into Courthouse Bay.

The primary contamination migration pathways for petroleum hydrocarbon constituents in impacted soils is through the potential vertical migration through subsurface soil followed by the potential leaching of the COCs to groundwater. However, petroleum hydrocarbon-impacted soils are effectively capped by approximately 18 inches of concrete paving present in the parking area, significantly reducing the potential for leaching of petroleum hydrocarbon constituents into groundwater. Groundwater sampling conducted in July 2008 indicated that petroleum hydrocarbon constituents were not present in groundwater at levels exceeding the applicable NCGWQS in the affected soil area. Thus, it is unlikely that a pathway exists for petroleum hydrocarbon-impacted soils to affect groundwater.

3.3 Principal Threats

The "principal threat" concept is applied to the characterization of "source materials" at a site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material; however, **Non-Aqueous Phase Liq-**

uids (NAPLs) in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Although residual Light Non-Aqueous Phase Liquids (LNAPL) may exist at Site 73, concrete paving at the site prevents petroleum hydrocarbon constituents from leaching into groundwater, which is confirmed by groundwater monitoring in the area where LNAPL has been observed historically. Dissolved concentrations of CVOCs in groundwater at approximately 1 to 5 percent of a compound's solubility would suggest the presence of **Dense Non-Aqueous Phase Liquids (DNAPL)** in the subsurface. The maximum concentrations of TCE, cis-1,2-DCE, and VC observed in the July 2008 sampling event at Site 73 were present in concentrations of less than 1 percent of their respective solubilities. Therefore, NAPLs are not considered to be principal threat wastes at Site 73.

Because no significant source materials are present and there are no realistic exposures scenarios to COC-impacted soil and groundwater, it can be concluded that there is no principal threat waste at Site 73.

4 Scope and the Role of the Action

MCB Camp Lejeune was placed on EPA's National Priorities List (NPL) effective November 4, 1989 (54 *Federal Register* 41015, October 4, 1989) under the narrative "Camp Lejeune Military Reservation (USNAVY)" and EPA ID# NC6170022580. There are 22 discrete OUs under CERCLA investigation at MCB Camp Lejeune. OU No. 21 consists solely of Site 73. The response action for Site 73 does not include or affect any other sites at the facility. Information on the status of all the OUs and sites at MCB Camp Lejeune can be found in the current version of the Site Management Plan, in the Administrative Record. This is the final remedial action for Site 73 and it does not include or affect any other sites at the facility

5 Summary of Site Risks

As part of the RI and FS, a baseline **Human Health Risk Assessment (HHRA)** and an **Ecological Risk Assessment (ERA)** were conducted. Detailed results of the HHRA and ERA are presented in the 1997 RI, 2009 Supplemental RI, and 2009 FS. The following subsections and **Table 3** briefly summarize the findings of these risk assessment studies.

Media	Human Health Risk	Ecological Risk
Surface Soil	Acceptable	Not Applicable
Subsurface Soil	Unacceptable	Not Applicable
Groundwater	Unacceptable	Not Applicable
Deep Groundwater	Acceptable	Not Applicable
Sediment	Acceptable	Acceptable
Surface Water	Acceptable	Acceptable
Fish and Crab Tissue	Acceptable	Acceptable
Benthic Macroinvertebrates	Not Applicable	Acceptable

Table 3 – Site 73 Risk Summary

5.1 Human Health Risk Summary

An HHRA was conducted to evaluate the potential human health risks associated with current and hypothetical future receptors. The current and future receptors evaluated were current military personnel, current trespassers, current adult fisherman, current child receptors, future residents, and future construction workers. The exposure scenarios evaluated were exposure to surface soil, surface water, and sediment for current receptors; ingestion of fish and crab tissue for adult fisherman and child receptors; and surface soil, groundwater, surface water, and sediment exposure for future receptors. The potential for vapor intrusion issues was also evaluated to determine if any Site 73 buildings were located within 100 feet of groundwater impacts exceeding site-specific vapor intrusion screening levels. These evaluations were used to determine if any further actions were needed at Site 73 to sufficiently protect human health. Health risks are based on a conservative estimate of the potential **cancer risk** or the potential to cause other health effects not related to cancer (noncancer hazard, or **hazard index** (HI)). EPA identifies an acceptable cancer risk range of 1 in 10,000 (10^{-4}) to 1 in 1,000,000 (10^{-6}) and a non-cancer hazard as an HI of less than 1. The results of the HHRA concluded the following:

- There was no unacceptable risk to human health and/or the environment under current use scenarios.
- There were no unacceptable risks present in the soil vapor in the vicinity of Building A47.
- There was no unacceptable risk to future industrial or construction workers.
- The risk from ingestion of groundwater for future adult ($1.0 \times 10^{-3} - 4.8 \times 10^{-4}$) and child residential ($4.8 \times 10^{-4} - 4.8 \times 10^{-5}$) receptors exceeds the EPA's acceptable cancer risk range for CVOCs mainly due the VC.
- The risk from exposure to petroleum hydrocarbon-

impacted soils for future adult (HI = 0.26 – 4.1) and child residential (HI = 0.45 – 5.8) receptors exceeds the acceptable non-cancer risk range for petroleum aromatic hydrocarbon fraction class C9-C22.

North Carolina requires chemical concentrations in groundwater to meet promulgated cleanup standards, NCGWQS, for protection of groundwater potentially used for drinking. Benzene, TCE, cis-1,2-DCE, and VC were identified in groundwater at Site 73 above the NCGWQS. The CSM **(Figure 2)** depicts the potential risk identified at Site 73, including the exposure **media**, exposure routes, and potential human health **receptors**.

5.2 Ecological Risk Summary

An ERA was completed as part of the original 1997 RI, and an ERA Addendum was completed as part of the 2009 SRI to evaluate whether past site operations have adversely affected terrestrial and aquatic communities on or adjacent to Site 73. Soil, surface water, and sediment samples collected during RI activities were compared to published values for toxicity in various aquatic and terrestrial species. In addition, fish, crabs, and benthic macroinvertebrates were collected and analyzed against toxicological information for contaminants detected in these media, which was then used to evaluate the potential adverse ecological effects to those receptors. The point of exposure included species living in, or coming into contact with contaminated surface soil, or bioaccumulation from consumption of smaller organisms because bioaccumulation was considered likely to occur at Site 73.

The risk characterization evaluates the potential for decrease in the aquatic and terrestrial populations from contaminants identified at the site. The Quotient Index (QI) approach was used to characterize the risk to aquatic receptors from exposure to surface water and sediments and to terrestrial receptors from exposure to surface soil, surface water, and biota. A QI greater than 1 indicates a significant potential risk. The QI equation is dependent on exposure concentration, chronic daily intake surface, water screening values, sediment screening values, and terrestrial reference values.

Overall, the ERA and ERA Addendum concluded that no site-related risks to terrestrial and aquatic receptors were present at Site 73.

It is the current judgment of the Navy, MCB Camp Lejeune, and EPA, in concurrence with NCDENR, that the Preferred Alternative identified in this PRAP, or one of the other active measures considered in the PRAP, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

6 Remedial Action Objectives

The role of the Preferred Alternative presented in this PRAP is to address the unacceptable risks posed by Site 73 and to eliminate current exposure pathways that may pose unacceptable human health risk. It is the current judgment of the Navy, MCB Camp Lejeune, and EPA, in consultation with NCDENR, that the Preferred Alternative identified in this PRAP, or one of the other active measures considered in the PRAP, is necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site that may present an imminent and substantial endangerment to public health or welfare. The **Remedial Action Objectives (RAOs)** for Site 73 are as follows:

- Restore groundwater quality at Site 73 to the NCGWQS and MCL standards based on the classification of the aquifer as a potential source of drinking water (Class GA or Class GSA) under 15A NCAC 02L.0201, and to prevent human ingestion of water containing COCs (benzene, TCE, cis-1,2-DCE, and VC) at concentrations above NCGWQS or MCL standards, whichever is more conservative, until the RAO has been obtained.
- Prevent future residential exposure to petroleum hydrocarbon-contaminated soils above the NC HWS SSL and minimize transport to groundwater.
- Minimize migration of COCs in groundwater to surface water.

Table 4 lists the remediation goals required to achieve RAOs for unlimited use and unrestricted exposure in groundwater and soil.

Groundwater	
Chemical (µg/L)	**NCGWQS***
Benzene	1
TCE	2.8
cis-1,2-DCE	70
VC	0.015
Soil	
Chemical (mg/kg)	**NC HWS SSL**
Petroleum Aromatic Carbon Fraction Class C9-C22	33.6

*NCGWQS are more conservative than the MCLs for the COCs

Table 4 – Remediation Goals

7 Summary of Remedial Alternatives

Remedial alternatives to address COCs in groundwater and petroleum hydrocarbon-impacted soil at Site 73 were developed and are detailed in the FS. With the exception of the No Action Alternative, all alternatives ultimately comply with **Applicable or Relevant, and Appropriate**

Alternative	Components	Details	Cost	
1—No Action	None	None	Capital Cost	$0
			Annual operation and maintenance (O&M)	$0
			Present-Worth	$0
			Timeframe	30 years
2 –MNA / LUCs	MNA	Groundwater monitoring and reporting to assess the progress of natural attenuation over time	Capital Cost	$13,500
			Annual O&M	$48,249
	LUCs	LUCs to prevent exposure to groundwater and petroleum hydrocarbon-impacted soil	**Present-Worth**	$763,736
			Timeframe	30 years
3 –ERD using existing Horizontal Well and Downgradient ERD Injections / LUCs	Enhanced Anaerobic Bioremediation through Horizontal Well	Injection of electron donors through existing horizontal well to stimulate anaerobic biodegradation of CVOC source by reductive dechlorination	Capital Cost	$854,751
			Annual O&M	$48,295
			Present-Worth	$1,946,816
	Enhanced Anaerobic Bioremediation via Downgradient Injections	Injection of electron donors in wells downgradient from horizontal well, upgradient of Courthouse Bay, to stimulate anaerobic biodegradation of CVOCs by reductive dechlorination and minimize migration of CVOCs to Courthouse Bay	Timeframe	20 years
	LUCs	LUCs to prevent exposure to groundwater and petroleum hydrocarbon-impacted soil		
	Groundwater Monitoring	Long-term groundwater monitoring and reporting to evaluate: -Effectiveness of the ERD injections -Potential impacts to surface water -Progress of natural attenuation over time -Potential migration to the deep aquifer		
4 – Air Sparging with Downgradient ERD Injections / LUCs	Air Sparging	Injection of air into saturated matrices through existing horizontal well to remove CVOC source through volatilization and/or bioremediation	Capital Cost	$585,988
			Annual O&M	$51,140
			Present-Worth	$1,778,608
	Enhanced Anaerobic Bioremediation via Downgradient Injections	Injection of electron donors in wells downgradient from horizontal well, upgradient of Courthouse Bay, to stimulate anaerobic biodegradation of CVOCs by reductive dechlorination and minimize migration of CVOCs to Courthouse Bay	Timeframe	20 years
	LUCs	LUCs to prevent exposure to groundwater and petroleum hydrocarbon-impacted soil		
	Groundwater Monitoring	Long-term groundwater monitoring and reporting to evaluate: -Effectiveness of the ERD injections -Potential impacts to surface water -Progress of natural attenuation over time -Potential migration to the deep aquifer		

Table 5 – Remedial Alternatives for Site 73

Requirements (ARARs), have the same RAOs, expected outcomes, and anticipated future land uses. The No Action Alternative does not protect human health and the environment, but is presented as a baseline for comparison purposes. A summary of the remedial alternatives is presented in **Table 5**.

8 Evaluation of Alternatives

The NCP outlines the approach for comparing remedial alternatives using the **nine evaluation criteria** listed below (see Glossary for a detailed description of each). Each remedial alternative for Site 73 was evaluated against the nine criteria listed below. Alternative 1 (no action) does not meet the RAOs and was not considered further.

8.1 Threshold Criteria

Overall Protection of Human Health and the Environment

Alternatives 2 (MNA), 3 (ERD) and 4 (Air Sparging and ERD) are all protective of human health and the environment. Alternative 2 is considered to be less protective than Alternatives 3 and 4 because it relies on natural degradation, which adds a higher degree of uncertainty for the rate of contaminant reduction and length of time to achieve RAOs. There would also be a potential for discharging of COCs to Courthouse Bay above surface water standards. Alternatives 3 and 4 are similar in protectiveness because they each employ an active treatment to reduce chemical concentrations. Monitoring will be conducted and LUCs will provide adequate protection of human health and the environment by controlling exposure to groundwater and petroleum hydrocarbon-impacted soil until the RAOs are achieved.

Compliance with ARARs

Alternatives 2, 3, and 4 are expected to comply with ARARs. Alternative 2 will have a longer timeframe associated with meeting the ARARs because it relies on natural degradation, whereas Alternatives 3 and 4, which are similar, employ active treatment and will therefore meet the ARARs in a shorter timeframe.

8.2 Primary Balancing Criteria

Long-term Effectiveness and Permanence

Once RAOs have been achieved, Alternatives 2, 3, and 4 are expected to have residual risks of approximately the same magnitude. Alternative 2 may not achieve RAOs for more than 30 years. Alternatives 3 and 4 are expected to achieve RAOs in the long term (estimated 20 years), although "**rebound**" is a potential issue with any injection or air sparging scenario.

Reduction in Toxicity, Mobility, or Volume through Treatment

Alternatives 3 and 4 will reduce the toxicity, mobility, and volume through treatment of groundwater, which is the statutory preference. Although Alternative 2 is not considered active treatment, the natural reduction of contaminant concentrations through a variety of physical, chemical, or biological activities is expected over time. Initial increases in cis-1,2-DCE concentrations and subsequent increases in VC concentrations may be observed as the reductive dechlorination process breaks down the TCE to cis-1-2-DCE and cis-1,2-DCE to VC.

CERCLA Criteria	No Action (1)	MNA (2)	ERD (3)	Air Sparging/ERD (4)
Threshold Criteria				
Protection of Human Health and the Environment	❍	◘	●	●
Compliance with ARARs	❍	◘	●	●
Primary Balancing Criteria				
Long-term Effectiveness and Permanence	❍	◘	●	●
Reduction in Toxicity, Mobility, or Volume	❍	◘	●	●
Short-Term Effectiveness	❍	◘	◘	◘
Implementability	●	●	◘	●
Present-Worth Cost	$0	$0.76M	$1.95M	$1.78M

Relative Ranking: ● High ◘ Moderate ❍ Low

Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria

Table 6 – Relative Ranking of Alternatives

Short-term Effectiveness

The short-term effectiveness associated with Alternatives 3 and 4 are similar with regard to how they would affect the community because both treatments rely on direct injection technology for implementation; however, Alternative 2 has a lesser impact on the community because it does not rely on an active treatment. Alternative 4 presents a slightly higher risk to construction workers during implementation than Alternative 3, based on the potential for vapor intrusion during the operation of the air sparge system. However, air monitoring during previous operation of the air sparge system indicated there were no risks. Alternatives 3 and 4 are most likely to achieve RAOs, whereas Alternative 2 would not since it relies on natural degradation rather than active treatment. Thus there would be a potential for COCs to be discharged to Courthouse Bay at concentrations above surface water standards with Alternative 2. None of the alternatives would affect the community for the petroleum-impacted soils as the soils are effectively capped with concrete.

Implementability

Alternatives 2, 3, and 4 can be implemented using standard and widely available technologies. However, the chemical injections for Alternatives 3 and 4 rely heavily on the ability to effectively distribute material in the subsurface. The air sparging component of Alternative 4 has been successfully implemented in the past and would be easier to implement than Alternative 3 because it may be challenging to distribute ERD substrate from the horizontal well.

Cost

Alternative 2 has includes minimal capital costs for implementation of the LUCs. Based on O&M costs lasting 30 years, the estimated **present-worth cost** for Alternative 2 is $760,000. The estimated capital cost for implementing Alternative 3 ($855,000) is higher than Alternative 4 ($586,000). The estimated present-worth cost, factoring in a 20-year O&M period, is $1.95 million for Alternative 3 and $1.78 million for Alternative 4. Alternative 3 has a higher capital cost associated with the cost of the additional ERD substrate required versus air that is injected into the horizontal well for Alternative 4.

8.3 Modifying Criteria

State Acceptance

State involvement has been solicited throughout the CERCLA and remedy selection process. NCDENR supports the Preferred Alternative, and its final concurrence will be solicited following the review of all comments received during the public comment period.

Community Acceptance

These modifying criteria will be evaluated after the public comment period for the PRAP.

A summary comparison of the alternatives is presented in **Table 6**. The Site 73 FS provides a more detailed comparative analysis of alternatives.

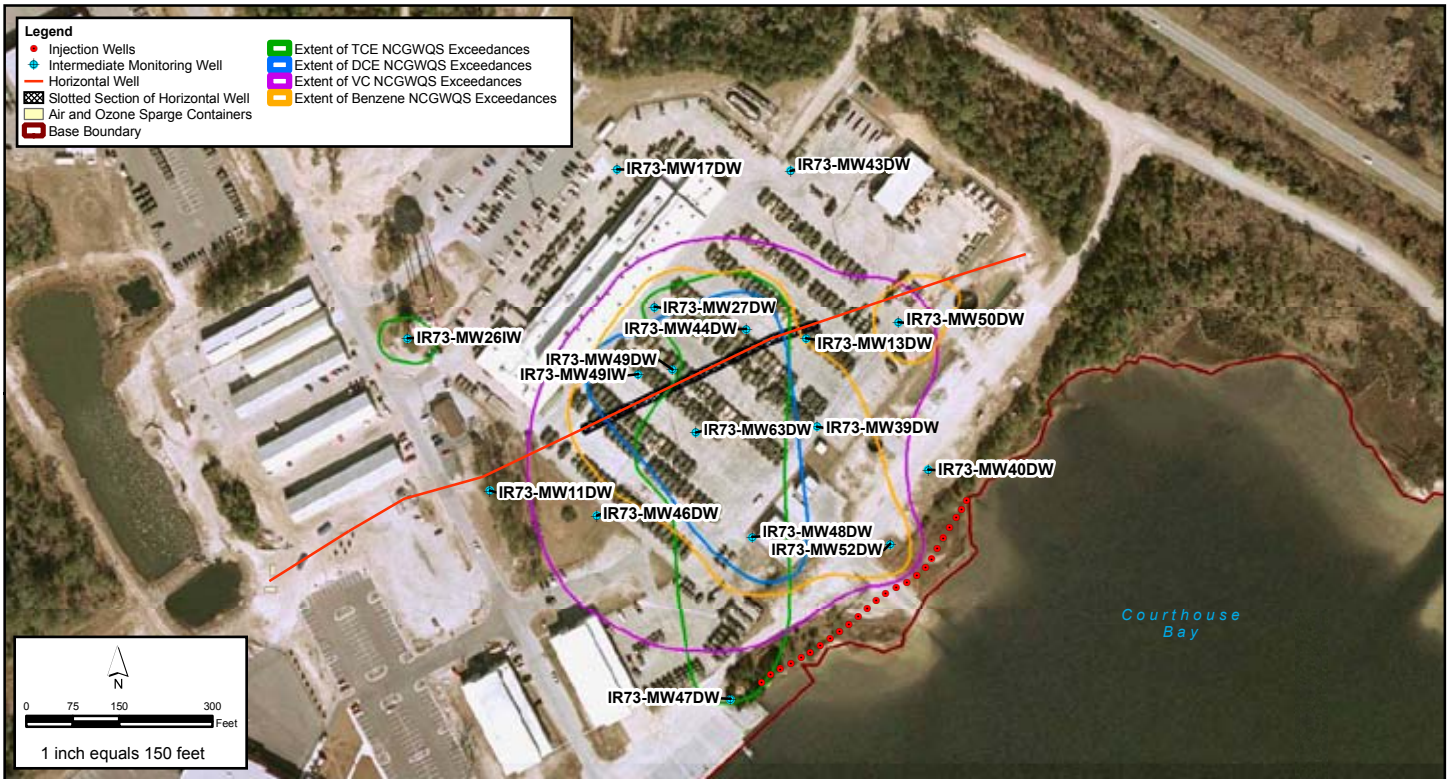


Figure 3 – Site 73 Extent of Groundwater Contamination in the Intermediate Aquifer Zone

9 Preferred Alternative

Alternative 4, air sparging with ERD injections, monitoring, and LUCs, is the Preferred Alternative to address soil and groundwater impacts at Site 73. This alternative employs the existing horizontal well and air sparging system to volatilize COCs from the groundwater and ERD injections to reduce the toxicity of the COCs in groundwater and minimize migration to surface water **(Figure 3)**. Monitoring will be conducted while the air sparging system is operating to ensure that there is no vapor intrusion pathway. Alternative 4 was chosen over Alternative 3 based on the ease of implementation and lower associated cost. The horizontal well is currently operational for air sparging and it may be challenging to retrofit the system to distribute ERD substrate from the well effectively. In addition, the ERD substrate is more expensive than air, so overall; the cost of implementing Alternative 3 would be higher.

Long-term groundwater monitoring will be conducted to monitor the effectiveness of air sparging and downgradient ERD injections (i.e., changes in COC concentrations and the extent of contamination over time). Although the effectiveness of mitigation of COCs in soil and groundwater will be measured by comparison to the remediation goals **(Table 4)**, the remedial technology is not guaranteed to reduce COC concentrations to levels at or below remediation goals across Site 73. However, natural attenuation processes will continue to reduce COC concentrations over time.

LUCs including, but not limited to, land use restrictions in the Base Master Plan, NOTICE OF CONTAMINATED SITE, Deed and/or Lease Restrictions, and administrative procedures to prohibit unauthorized intrusive activities (e.g., excavation, well installation, or construction) will be implemented as a part of the remedy to prevent exposure to the residual contamination on the site that exceeds the remediation goals. The LUCs will be implemented and maintained by the Navy and MCB Camp Lejeune until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and unlimited exposure (**Table 4**). The LUC performance objectives include:

- To prohibit human consumption of groundwater from the surficial and Castle Hayne Aquifers underlying Site 73 (unless prior written approval is obtained from the Navy, MCB Camp Lejeune, EPA and NCDENR);
- To prohibit unauthorized intrusive activities in areas with contaminated soil; and
- To maintain the integrity of any existing or future monitoring or remediation system at the site.

The estimated LUC boundary is provided in **Figure 4**, the actual LUC boundaries will be finalized in the Remedial Design (RD) document. The LUC implementation actions, including monitoring and enforcement requirements, will be provided in an LUC Implementation Plan (LUCIP) that will be prepared by the Navy after the ROD has been finalized. The Navy will submit the LUCIP to

Figure 4 – Estimated Land Use Control Boundary

EPA and NCDENR for review and approval pursuant to the Primary Document review procedures stipulated in the Federal Facility Agreement. The Navy will maintain, monitor (including conducting periodic inspections), and enforce the LUCs according to the requirements contained in the LUCIP and the ROD. The need for LUCs to prevent exposure and ensure protection will be periodically reassessed as COC concentrations are reduced over time.

Based on information currently available, the Navy, MCB Camp Lejeune, EPA, and NCDENR believe the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Navy expects the Preferred Alternative to satisfy the following requirements of CERCLA: 1) protective of human health and the environment, 2) comply with ARARs, 3) cost-effective, 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and 5) satisfy the preference for treatment as a principal element. The Preferred Alternative will be re-evaluated as appropriate in response to public comment or new information.

Because COCs will remain at the site above levels that allow for unlimited exposure and unrestricted, the Navy will review the final remedial action no less than every 5 years after initiation of the remedial action in accordance with CERCLA Section 121(c) and the NCP at 40 CFR300.4309f)(4)(ii). If results of the 5-year reviews reveal that remedy integrity is compromised and protection of human health is insufficient, the additional remedial actions would be evaluated by the parties and implemented by the Navy.

10 Community Participation

The Navy, MCB Camp Lejeune, Navy, and EPA provide information regarding environmental cleanups at Site 73 to the public through the Restoration Advisory Board, public meetings, the Administrative Record file for the site, the Information Repository, and announcements published in the Jacksonville Daily News, The Globe, and RotoVue newspapers. The public is encouraged to gain a more comprehensive understanding of Site 73 and the IRP. The public comment period for this PRAP is from April 21, 2009 – May 20, 2009 and a public meeting will be held on April 21, 2009 at 6:00 pm (see Page 1 of this report for details). Minutes of the public meeting will be included in the Administrative Record file. The Navy will summarize and respond to comments in a Responsiveness Summary, which will become part of the official ROD and will also be included in the Administrative Record file.

The Community Relations Plan for MCB Camp Lejeune, IRP fact sheets, and final technical reports concerning Site 73 are available to the public at the following internet address:

http://public.lantops-ir.org/sites/public/lejeune/Site35_73Prap.aspx

The internet can be accessed at the following location:

Onslow County Public Library
58 Doris Avenue East
Jacksonville, North Carolina 28540
(910) 455-7350

During the comment period, interested parties may submit written comments to the following address:

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Glossary of Terms

Administrative Record: Site information is compiled in an Administrative Record and placed in the general IRP information repository for public review.

Air Sparging: injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of VOCs from a dissolved state to a vapor phase.

Anaerobic degradation of CVOCs by reductive dechlorination: The natural degradation of chlorinated solvents by microorganisms. During reductive dechlorination, also known as dehalorespiration, a carbon atom in the chlorinated solvent accepts an electron from an electron donor (reduction), causing the release of a chlorine atom (dechlorination). The more chlorine atoms a compound has, the more oxidized its carbon is, and therefore, the more susceptible it is to reductive dechlorination. This process results in sequential dechlorination of a contaminant. The general, reductive dechlorination process results in the formation of degradation ("daughter") products, in the following order: **TCE → cis-1,2-DCE → VC → ethene.**

Applicable or Relevant and Appropriate Requirements (ARARs): 'Applicable' requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

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

Chemical of concern (COC): A subset of the chemicals of potential concern that are identified in the RI/FS as needing to be addressed by the proposed response action.

Chlorinated volatile organic compound (CVOC): Manufactured chemical that evaporates easily and is typically used in manufacturing as industrial chlorinated solvents, such as degreasers. See also "volatile organic compound."

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): is the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.

Conceptual Site Model: A description of a site and its environment that is based on existing knowledge and that assists in planning, interpreting data, and communicating. It describes sources of contamination (e.g., spills) and receptors (e.g., humans) and the interactions that link the two.

Contaminant Migration Pathway: The route that site contaminants may take to get from the source of contamination to a human being, animal, or plant.

Ecological Risk Assessment (ERA): The ecological risk assessment is the process which identifies potential risk to aquatic and terrestrial plants and animals from contaminants in soil, surface water, and sediments.

U.S. Environmental Protection Agency (EPA): The federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and with final approval authority for the selected ROD.

Enhanced Reductive Dechlorination (ERD): An anaerobic (without oxygen) process in which an electron donor source is injected into the subsurface to allow chlorine atoms on a parent CVOC molecule to be sequentially replaced with hydrogen and break down COCs.

Feasibility Study (FS): a study undertaken by the lead agency to develop and evaluate options for remedial action. The FS emphasizes data analysis and is generally performed concurrently and in an interactive fashion with the remedial investigation (RI), using data gathered during the RI. The RI data are used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives. The term also refers to a report that describes the results of the study.

Groundwater: As defined by section 101(12) of CERCLA, means water in a saturated zone or stratum beneath the surface of land or water.

Hazard Index (HI): A number indicative of noncancer health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than 1.0 indicates that the human popu¬lation is not likely to experience an adverse effect.

Hazardous Substance: As defined by section 101(14) of CERCLA, means: Any substance designated pursuant to section 311(b)(2)(A) of the CWA; any element, compound, mixture, solution, or substance designated pursuant to section 102 of CERCLA; any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act (42 U.S.C. 6901 et seq.) has been suspended by Act of Congress); any toxic pollutant listed under section 307(a) of the CWA; any hazardous air pollutant listed under section 112 of the Clean Air Act (42 U.S.C. 7521 et seq.); and any imminently hazardous chemical substance or mixture with respect to which the EPA Administrator has taken action pursuant to section 7 of the Toxic Substances Control Act (15 U.S.C. 2601 et seq.). The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance in the first sentence of this paragraph, and the term does not include natural gas, natural gas liquids, liquified natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

Human Health Risk Assessment (HHRA): A process to characterize the current and potential threats to human health from contaminant exposures if remedial activities are not implemented.

Information Repository: A file containing information, technical reports, and reference documents regarding an NPL site. This file is usually maintained at a location with easy public access, such as a public library or on the internet.

Lead Agency: means the agency that provides the OSC/RPM to plan and implement response actions under the NCP. EPA, the USCG, another federal agency, or a state (or political subdivision of a state) operating pursuant to a contract or cooperative agreement executed pursuant to section 104(d)(1) of CERCLA, or designated pursuant to a Superfund Memorandum of Agreement (SMOA) entered into pursuant to subpart F of the NCP or other agreements may be the lead agency for a response action. In the case of a release of a hazardous substance, pollutant, or contaminant, where the release is on, or any facility or vessel under the jurisdiction, custody, or control of Department of Defense (DOD) or Department of Energy (DOE), then DOD or DOE will be the lead agency. Where the release is on, or the sole source of the release is from, any facility or vessel under the jurisdiction, custody, or control of a federal agency other than EPA, the USCG, DOD, or DOE, then that agency will be the lead agency for remedial actions and removal actions other than emergencies. The federal agency maintains its lead agency responsibilities whether the remedy is selected by the federal agency for non-NPL sites or by EPA and the federal agency or by EPA alone under CERCLA section 120. The lead agency will consult with the support agency, if one exists, throughout the response process.

Land Use Controls (LUCs): Legal and administrative measures to protect human health and the environment when residual contamination is contained on site. LUCs limit human exposure by restricting activity, use, and access to properties with residual contamination.

Maximum Contaminant Levels (MCLs): Enforceable standards that apply to public water systems, developed by EPA. The highest level of a contaminant that is allowed in drinking water.

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

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

National Priorities List (NPL): A list compiled by EPA pursuant to CERCLA section 105, of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response.

Natural attenuation (NA): Reduction in mass or concentration of a constituent over time or distance from the source due to naturally occurring physical, chemical, and biological processes.

Naval Facilities Engineering Command (NAVFAC): Global organization which provides planning, design and construction of shore facilities for U.S. Navy activities around the world.

Nine Evaluation Criteria: The NCP outlines the approach for comparing remedial alternatives using these evaluation criteria:

- Overall Protection of Human Health and the Environment – Addresses whether a remedy provides adequate protection and how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
- Compliance with ARARs - A statutory requirement for remedy selection that an alternative will either meet all of the ARARs or that there is a good rationale for waiving an ARAR.
- Long-Term Effectiveness and Permanence - Addresses the expected residual risk that will remain at the site after completion of the remedial action and the ability of a remedy to maintain reliable protection of human health and the environment in the future as well as in the short term.
- Reduction of Toxicity, Mobility, and Volume Through Treatment - The anticipated performance of the treatment technologies a remedy may employ in their ability to reduce toxicity, mobility or volume of contamination.
- Short-Term Effectiveness - Considers the short-term impacts of the alternatives on the neighboring community, the plant workers, remedial construction workers, and the surrounding environment, including potential threats to human health and the environment associated with the collection, handling, treatment and transport of hazardous substances.
- Implementability - The technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.
- Cost - Encompasses all construction, operation and maintenance costs incurred over the life of the project, expressed as the net present value of these costs.
- State Acceptance - Considers substantial and meaningful state involvement on the Proposed Remedial Action Plan.
- Community Acceptance - The public's general response to the alternatives described in the PRAP and the RI and FS reports. The specific responses to the public comments are addressed in the Responsiveness Summary section of the ROD.

Non-Aqueous Phase Liquids (NAPLs): Either singular free-product organic compounds or mixtures of organic compounds that are resistant to mixing with water. NAPL zones are the delineated portions of the subsurface (including one or more aquifers) where such liquids (free-phase or residual NAPL) are present. There are two types of NAPLs: Light Non-Aqueous Phase Liquids (LNAPLs) and Dense Non-Aqueous Phase Liquids (DNAPLs):

- LNAPLs are less dense than water and tend to float on the water table (e.g., gasoline).
- DNAPLs have a density greater than water. This property allows them to sink through the water table and penetrate the deeper portions of an aquifer, making them difficult to locate and remediate. Examples of DNAPLs include some chlorinated solvents (e.g., TCE), coal tar wastes, creosote-based wood-treating oils, and some pesticides.

Noncancer Risk: Noncancer hazards (or risk) are expressed as a quotient that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sen-

sitive population to experience adverse health effects. EPA's threshold level for noncarcinogenic risk at Superfund sites is 1, meaning that if the exposure exceeds the threshold, there may be a concern for potential noncancer effects.

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

Operable Unit: A discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. 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, or may consist of any set of actions performed over time or any actions that are concurrent but located in different parts of a site.

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

Proposed Remedial Action Plan (PRAP): Identifies the preferred alternative and discusses the reasons for this preference. The PRAP includes a summary of background information relating to the site; describes the rationale for the selection of a preferred alternative; solicits public review and comment on all of the alternatives described in the proposed plan, and provides information on how the public can be involved in the remedy selection process.

Public Comment Period: The time period during which the public is encouraged to review and comment on each of the clean up options evaluated in a PRAP and other documents in the Administrative Record file.

Rebound: An increase in contaminant concentrations after a treatment system has been turned off. It occurs because not all contamination has been removed and, as the subsurface returns to equilibrium, additional dissolution of residual contamination occurs.

Receptors: Humans, animals, or plants that may be exposed to risks from contaminants related to a given site.

Record of Decision (ROD): A legal decision document that describes the remedial actions selected for a Superfund site, why certain remedial actions were chosen as opposed to others, how much they will cost, how the public responded to the Proposed Plan, and how the public's comments about the Proposed Plan were incorporated into the final decision.

Remedial Action: Those actions consistent with permanent remedy taken instead of, or in addition to, removal action in the event of a release or threatened release of a hazardous substance into the environment, to prevent or minimize the release of hazardous substances so that they do not migrate to cause substantial danger to present or future public health or welfare or the environment. The term includes, but is not limited to, such actions at the location of the release as storage, confinement, perimeter protection using dikes, trenches, or ditches, clay cover, neutralization, cleanup of released hazardous substances and associated contaminated materials, recycling or reuse, diversion, destruction, segregation of reactive wastes, dredging or excavations, repair or replacement of leaking containers, collection of leachate and runoff, on-site treatment or incineration, provision of alternative water supplies, any monitoring reasonably required to assure that such actions protect the public health and welfare and the environment and, where appropriate, post-removal site control activities. The term includes the costs of permanent relocation of residents and businesses and community facilities (including the cost of providing "alternative land of equivalent value" to an Indian tribe pursuant to CERCLA section 126(b)) where EPA determines that, alone or in combination with other measures, such relocation is more cost-effective than, and environmentally preferable to, the transportation, storage, treatment, destruction, or secure disposition off-site of such hazardous substances, or may otherwise be necessary to protect the public health or welfare; the term includes off-site transport and off-site storage, treatment, destruction, or secure disposition of hazardous substances and associated contaminated materials. For the purpose of the NCP, the term also includes enforcement activities related thereto.

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

Remedial Investigation (RI): A process undertaken by the lead agency to determine the nature and extent of the problem presented by the release. The RI emphasizes data collection and site characterization, and is generally performed concurrently and in an interactive fashion with the feasibility study. The RI includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for remedial action and to support the evaluation of remedial alternatives.

Site: The area of the facility where a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, placed; has migrated; or otherwise come to be located.

Trichloroethene (TCE): VOC typically used as a solvent in industrial applications.

U.S. Environmental Protection Agency (EPA): The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and with final approval authority for the Selected Remedy.

Vinyl chloride (VC): VOC that results from the breakdown of TCE and tetrachloroethene (PCE) in groundwater.

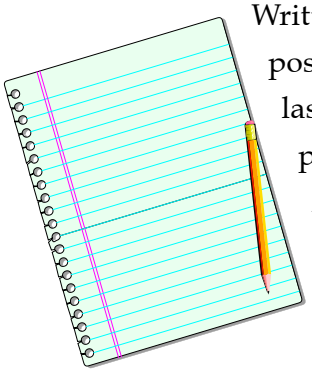
Volatile organic compound (VOC): A compound that easily vaporizes and has low water solubility. Many VOCs are manufactured chemicals such as those associated with paint, solvents, and petroleum. VOCs are common groundwater contaminants.

Please print or type your comments for Site 73 here

Mark Your Calendar for the Public Comment Period

Public Comment Period
April 21-May 20, 2009

Submit Written Comments



Written comments must be postmarked no later than the last day of the public comment period, which is May 20, 2009. Based on the public comments or on any new information obtained, the Navy may modify the Preferred Alternative. The insert page of this Proposed Plan may be used to provide comments, although the use of the form is not required. If the form is used to submit comments, please fold page, seal, add postage where indicated, and mail to addressee as provided.

Attend the Public Meeting
April 21, 2009 at 6:00pm

Coastal Carolina Community College
Business Technology Building, Room 105
4444 Western Blvd.
Jacksonville, NC 28546

The public comment period will include a public meeting during which the Navy, EPA, and MCB Camp Lejeune will provide an overview of the site, previous investigation findings, remedial alternatives evaluated and the Preferred Alternative; answer questions; and accept public comments on the Proposed Plan.

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Place stamp here

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Virginia Beach, Virginia 23462