Proposed Remedial Action Plan

Site 49; Operable Unit No. 23

Marine Corps Installations East - Marine Corps Base Camp Lejeune

North Carolina

February 2013

1 Introduction

This **Proposed Remedial Action Plan (PRAP)** identifies the Preferred Alternatives for addressing **groundwater** contamination at **Site 49: Operable Unit (OU)** No. 23, located at Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) in Onslow County, North Carolina.

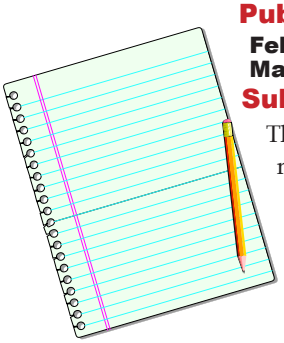
The Preferred Alternative for Site 49 includes **monitored natural attenuation (MNA)** and **land use controls (LUCs)**.

This PRAP is issued jointly by the U.S. Department of the Navy (Navy), the **lead agency** for site activities, MCIEAST-MCB CAMLEJ, and the **U.S. Environmental Protection Agency (EPA)**, in consultation with the **North Carolina Department of Environment and Natural Resources (NCDENR)** in order to solicit public comments on the remedial alternatives, and in particular the preferred **remedial action** for Site 49. This PRAP fulfills the public participation responsibilities 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 49. Detailed background information for Site 49 is contained in the Comprehensive **Remedial Investigation (RI) / Feasibility Study (FS)** (CH2M HILL, 2012), and other documents in the **Administrative Record** file and **Information Repository** for MCIEAST-MCB CAMLEJ. Key information from the RI/FS report, including all remedial options considered and the rationale for selection of MNA and LUCs as the preferred remedy for Site 49 is summarized in this PRAP. A glossary of key terms used in this PRAP is attached, and the terms are identified in bold print the first time they appear.

The Navy, MCIEAST-MCB CAMLEJ, and EPA, in concurrence with NCDENR, will make the final decision on the remedial approach for Site 49 after reviewing and considering all information submitted during the 30-day **public comment period**. The Navy and MCIEAST-MCB CAMLEJ, 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. A **Record of Decision (ROD)** will then be prepared to document the Selected Remedy for Site 49.

Mark Your Calendar for the Public Comment Period



Public Comment Period

February 17, 2013 through March 19, 2013

Submit Written Comments

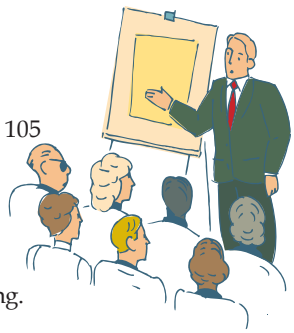
The Navy will accept written comments regarding the PRAP during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Attend the Public Meeting

February 21, 2013, from 6:00 P.M.

Coastal Carolina Community College
Business Technology Building, 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 Administrative Record Files

Available Online at: http://go.usa.gov/jZi

Internet access is available at the Onslow County Library:

58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

2 Site Background

MCIEAST-MCB CAMLEJ is a 156,000-acre facility located in Jacksonville, North Carolina, within Onslow County (**Figure 1**). The mission of MCIEAST-MCB CAMLEJ 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.

2.1 Site Description

Site 49 is located aboard MCAS New River, in the northwest portion of MCIEAST-MCIEAST-MCB CAMLEJ (**Figure 1**). The site covers less than 1 acre and is located on the south bank of the New River. The site is covered with a small maintained grassy area in the northern portion and a forested wetland bisected by a drainage feature in the southern portion. Building AS810, primarily used for storage, is located immediately northwest of the site.

A review of historical aerial imagery indicates that building AS810 has been in use since the early 1950s.

2.2 Summary of Previous Investigations and Actions

A brief summary of the previous investigations conducted at Site 49 is presented in **Table 1**.

3 Site Characteristics

Site 49 is relatively flat, with elevations ranging from 2 to 6 feet (ft) above mean sea level (msl). The ground surface slopes gently to the New River to the east northeast and a local drainage feature to the southeast. The northern portion of Site 49 is maintained grass area.

The southern portion of Site 49 consists of a forested wetland bisected by a drainage feature. A portion of surface water runoff from MCAS New River flows to the New River through a series of drainage channels that converge through the drainage feature that bisects the site. A jurisdictional wetland is present, surrounding the drainage feature as depicted on **Figure 3**.

The remnants of a former structure are situated adjacent to the southwest corner of Building AS810, and consist of a raised concrete pad that contains a central floor drain and several circular holes located along the side of the pad closest to building AS810 (**Figure 3**).

A terra cotta pipe was observed ending in the New River near the southeast portion of the site, appearing to be in line with the former structure. A probe rod and posthole digger was used to track the location and orientation of the drain pipe from the bank of the New River inland toward Building AS810. The drain pipe appeared to terminate in the wooded area approximately

Figure 1 – Base and Site Location Map

Table 1 – Previous Investigations and Actions

Previous Investigation/Action*	Administrative Record Number	Dates	Activities and Findings
Initial Assessment Study (IAS) Water and Air Research, Inc [WAR], April 1983	001511	1983	Site 49 was identified as the MCAS Suspected Minor Dump. Site 49 was described as approximately 800 ft of shoreline along the New River where possible waste disposal that included paint, paint-related waste, and potentially hazardous substances may have occurred. The timeframe of the disposal activities was not specified in the report, and Site 49 was not recommended for further investigation because of the small quantity of waste reported.
Preliminary Assessment/ Site Inspection (PA/SI), CH2M HILL, March 2011	004681	2009-2011	A PA/SI was conducted at Site 49 to confirm the no further action (NFA) recommendation in the IAS. The PA/SI was conducted in two phases. In July 2009, eight subsurface soil and three groundwater samples were collected and analyzed for semivolatile organic compounds (SVOCs), VOCs, and metals. Based on the results, six additional groundwater samples were collected in February 2010 and analyzed for VOCs only. The PA/SI concluded that potential human health and ecological risks were present due to potential exposure to VOCs in groundwater. Based upon the potential risks identified by the PA/SI, completion of an RI was recommended.
Remedial Investigation/ Feasibility Study (RI/FS), CH2M HILL, August 2012	005498	2011-2012	Surface soil, subsurface soil, groundwater, pore water, surface water, and sediment samples were collected to further define the nature and extent of VOC contamination and assess potential risks to human health and the environment. The results indicated that VOCs in groundwater could pose potential human health risks. No significant risks to ecological receptors were identified from exposure to site media. Based on the unacceptable risks identified, an FS was conducted to identify the Remedial Action Objectives (RAOs) for groundwater and potential treatment technologies to satisfy these RAOs. The following remedial alternatives were assessed in the FS: (1) No action, (2) MNA and LUCs, (3) Air Sparging (AS) with MNA and LUCs, and (3) enhanced in situ bioremediation (EISB) with MNA and LUCs
Additional Groundwater Sampling and Results Technical Memorandum, CH2M HILL, February 2013	005539	2013	An additional round of groundwater analytical data from monitoring well IR49-MW01 was collected to further assess trends of groundwater data over time. Concentrations of VOCs continue to reduce over time and trend analysis indicates that the remedial time frame for MNA will be reduced from what was presented in the RI/FS.

*Documents listed are available in the Administrative Record and provide detailed information to support remedy selection at Site 49.

60 ft inland from the bank of the New River. MCIEAST-MCB CAMLEJ does not have historical documentation regarding the use of the concrete pad, drains, or terra cotta pipe.

Groundwater investigations completed at Site 49 have focused on the surficial aquifer and underlying Castle Hayne Aquifer. For the purposes of the PRAP, the aquifers have been designated as two zones corresponding to the following depths: surficial (screened to 15-20 feet below msl) and upper Castle Hayne Aquifer (screened to 40 feet below msl).

Potable water for MCIEAST-MCB CAMLEJ 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. There are no water supply wells within 1,500 ft of Site 49.

3.1 Nature and Extent of Contamination

Surface and Subsurface Soil

No concentrations of VOCs were detected in surface soil or subsurface soil that exceeded levels that allow for unlimited use and unrestricted exposure (UU/UE).

Groundwater

The highest concentrations of VOCs in groundwater were isolated in the vicinity of one monitoring well (IR49-MW01) located adjacent to the New River in the eastern portion of the site (Figure 2). The VOCs 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), benzene, 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, and 1,2,-trichloroethane (1,1,2-TCA) were detected in groundwater samples at concentrations exceeding the **North Carolina Groundwater Quality Standards (NCGWQS)**. **Table 2** provides the maximum concentrations detected for each COC in groundwater at Site 49. Figure 2 depicts the horizontal and vertical extents of the COCs. Concentrations of the COCs exceeding the NCGWQS were isolated to samples collected from the surficial aquifer. Groundwater samples collected from the upper Castle Hayne Aquifer did not contain detectable concentrations of the COCs.

Table 2 – Maximum Concentration of COC's

COCs	Maximum Concentration (µg/L)
1,1,2,2-PCA	78.5
1,1,2-TCA	1.35
1,2-DCA	0.62J
Benzene	2.47
cis-1,2-DCE	155
PCE	1.33
TCE	276
trans-1,2-DCE	108
VC	22.1

µg/L – micrograms per liter

Note: The maximum concentrations were detected in the vicinity of monitoring well IR49-MW01 during the PA/SI.

3.2 Fate and Transport of Contamination

The primary contaminant migration pathway is through groundwater flow in the surficial aquifer. Vertical migration of COCs detected in the surficial aquifer to the upper Castle Hayne aquifer is not occurring based on the lack of detections in the upper Castle Hayne, low concentrations of COCs in the surficial aquifer, and upward vertical

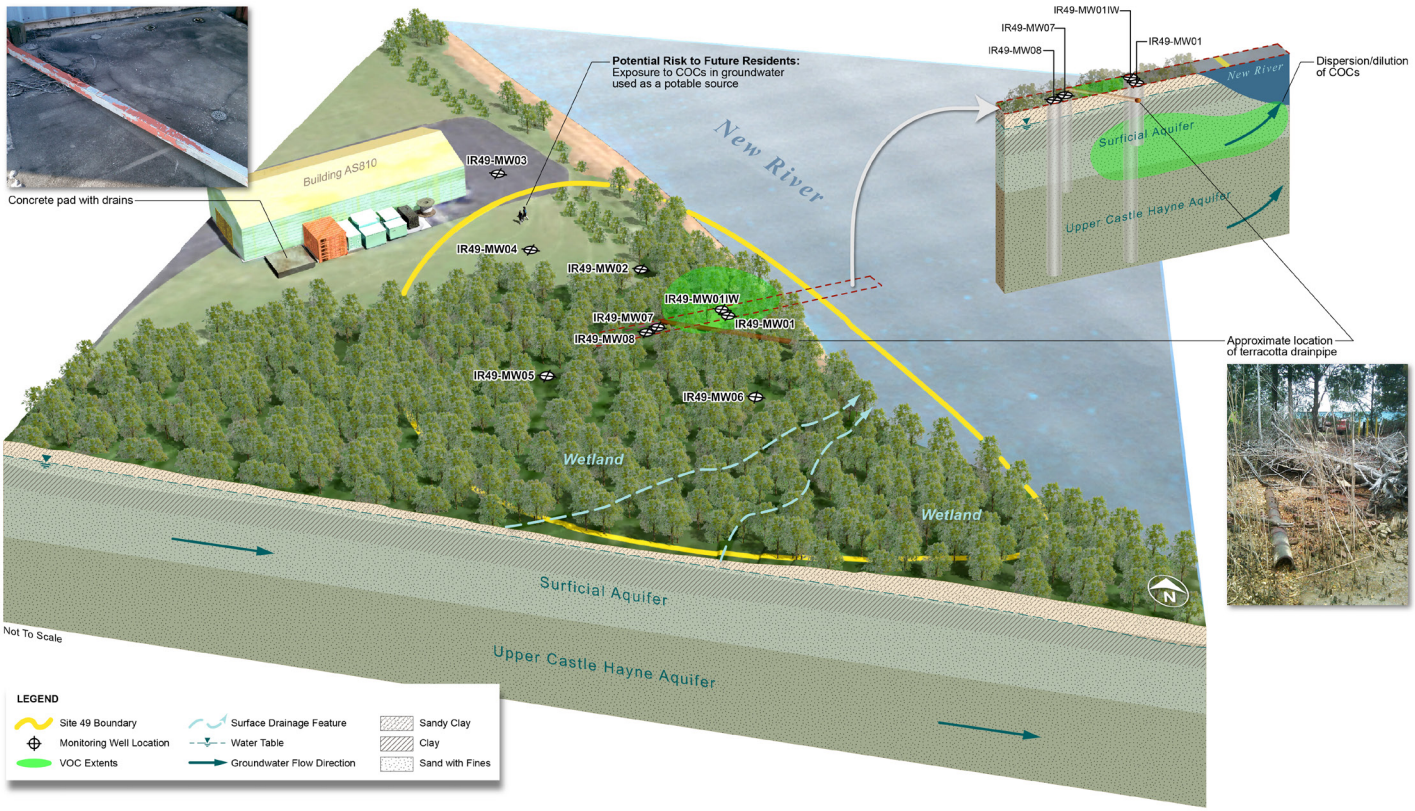


Figure 2 – Conceptual Site Model

gradients measured between the two aquifer zones. Thus, horizontal groundwater migration is the primary contaminant transportation pathway.

Conditions in the surficial aquifer are generally unfavorable for biological degradation for COCs based on suboptimal natural attenuation indicator parameters (NAIP). However, groundwater analytical data collected from the site over a 17 month period (April 2011 to October 2012) exhibited a decreasing trend in VOC concentrations. Specifically, concentrations of parent and degradation products in groundwater decreased by approximately 58 percent to 69 percent with no generation of additional degradation products. This suggests that physical degradation of VOCs is the primary mechanism for natural attenuation and includes dilution and adsorption.

3.3 Principal Threats

"Principal threat wastes" are 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 they be exposed. Contaminated groundwater generally is not considered to be a source material; however, **non–aqueous phase liquids (NAPLs)** in groundwater may be viewed as a source material. Dissolved concentrations of COCs in groundwater at approximately one to five percent of a compound's solubility could suggest the presence of DNAPL in the subsurface.VOC source material does not appear to be present at Site 49. There were no high concentrations of VOCs in the subsurface soil and groundwater concentrations were relatively low. The maximum historical concentration of TCE (276 micrograms per liter [µg/L]) detected in the surficial aquifer is less than 0.05 percent of the compounds' solubility (1,280 mg/L in water) and DNAPL was not observed during groundwater sampling activities. Therefore, it is reasonable to conclude that a continuing source of VOCs contamination is not present at Site 49.

4 Scope and Role of Response Action

MCIEAST-MCB CAMLEJ was placed on EPA's **National Priorities List (NPL)** effective November 4, 1949 (54 Federal Register 41015, October 4, 1989) under the narrative "Camp Lejeune Military Reservation (USNAVY)" and EPA ID# NC6170022580. There are 25 discrete OUs under CERCLA investigation in the **Installation Restoration Program (IRP)** at MCIEAST-MCB CAMLEJ. OU No. 23 consists of Site 49. This is the final remedial action for Site 49.

Information on the status of all the OUs and sites at MCIEAST-MCB CAMLEJ can be found in the current version of the Site Management Plan, in the Administrative Record.

5 Summary of Site Risks

During previous investigations (**Table 1**) an HHRA and ERA were conducted to evaluate risks to human health and the environment from the chemicals detected at Site 49. The following subsections and **Table 3** summarize the risk assessment results.

Table 3 – Site 49 Risk Summary

Media	Human Health Risk	Ecological Risk
Surface Soil	Acceptable	Acceptable
Subsurface Soil	Acceptable	Not Applicable*
Groundwater	Unacceptable	Not Applicable*
Sediment	Acceptable	Acceptable
Surface Water	Acceptable	Acceptable
Indoor Air	Unacceptable	Not Applicable

*Ecological receptors are not exposed to subsurface soil , groundwater, or indoor air

5.1 Human Health Risk Summary

The HHRA was completed during the 2012 RI to evaluate the potential impact of COCs on human health resulting from exposure to soil, sediment, surface water, groundwater, and **vapor intrusion** at Site 49.

The exposure scenarios evaluated included: exposure to surface and subsurface soil for current site workers and trespassers/visitors and future construction, industrial, and site workers, trespassers/visitors and residents; exposure to surface water and sediment for current recreational users, site workers and trespassers/visitors and for future construction workers; exposure to groundwater for future industrial and construction workers and residents; and exposure to air (vapor intrusion) for future industrial workers and residents.

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 (non-cancer 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 an acceptable non-cancer hazard as an HI of less than 1. The estimates of risk at Site 49 were used to determine if any further actions were required to sufficiently protect human health. The HHRA concluded:

- There is no unacceptable risk from exposure to surface soil, subsurface soil, sediment, or surface water.
- There is a potential risk to future residents from exposure to chlorinated VOCs (listed in **Table 2**) in groundwater, if used as potable drinking water.
- While VOCs were detected in groundwater at concentrations above vapor intrusion groundwater

screening levels (GWSLs) for an industrial building, there is no current building within 100 ft of the impacted groundwater. Therefore, the vapor intrusion pathway is currently incomplete, but would need to be re-evaluated if future land uses changes.

The **conceptual site model (CSM)** (**Figure 2**) depicts the potential unacceptable risk identified at Site 49, including the exposure **media**, exposure routes, and potential human health receptors.

5.2 Ecological Risk Summary

The ERA was conducted as part of the 2012 RI to evaluate potential risks to ecological receptors. Risk was estimated by calculating **hazard quotients (HQ)** using the concentration of each contaminant in applicable media (soil, surface water, pore water, and sediment) and dividing by an ecological screening value (ESV). Contaminants were retained for further assessment if the HQ was greater than 1 (the concentration exceeded the ESV), the contaminant was detected but did not have an ESV, or the contaminant was not detected but the reporting limit was greater than the ESV. The list of COCs was further refined using a weight of evidence approach that considered spatial and temporal distribution of analytical results, the general ecological setting and health of the ecosystems, and food web modeling.

The results indicated that no constituents in site media were identified that are expected to a cause a significant risk to populations of ecological receptors at Site 49 or in the adjacent New River.

6 Remedial Action Objectives

It is the current judgment of the Navy, MCIEAST-MCB CAMLEJ, 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.

In order to be protective of human health and the environment and address potential future risks identified in the HHRA, the **Remedial Action Objectives (RAOs)** identified for Site 49 are as follows:

1. Restore groundwater quality to meet NCDENR and federal primary drinking water 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.
2. Prevent exposure to COCs in groundwater and vapor intrusion from COCs in groundwater until such time as groundwater concentrations or vapor intrusion mitigation measures allow for unlimited use/unrestricted exposure.

Cleanup levels were developed for COCs contributing to unacceptable risks and hazards from exposure to groundwater at Site 49 and are based on the more-conservative value of the NCGWQS or Federal Maximum Contaminant Level (MCL); see **Table 4**.

Table 4 – Groundwater Cleanup Levels

COCs	NCGWQS/MCL* (µg/L)
1,1,2,2-PCA	0.2
1,1,2-TCA	5
1,2-DCA	0.4
Benzene	1
cis-1,2-DCE	70
PCE	0.7
TCE	3
trans-1,2-DCE	100
VC	0.03

µg/L – micrograms per liter

*NCGWQS or MCL, whichever is more conservative

7 Summary of Remedial Alternatives

The remedial alternatives that were developed and evaluated to address COCs in groundwater at Site 49 are detailed in the FS and costs were updated in a Technical Memorandum. A summary of remedial alternatives is presented in **Table 5**. Treatment approaches for groundwater were designed to actively treat the source area (**Figure 2**) and provide passive treatment and/or monitoring.

With the exception of the no-action alternative for groundwater, all alternatives comply with Applicable or Relevant, and Appropriate 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.

8 Evaluation of Alternatives

The NCP outlines the approach for comparing remedial alternatives using the **nine evaluation criteria** listed below (see the Glossary for a detailed description of each). Each remedial alternative for Site 49 was evaluated against these criteria. A summary of the comparative analysis of the alternatives is presented below and in **Table 6**.

8.1 Threshold Criteria

Overall Protection of Human Health and the Environment

All of the alternatives screened, with the exception of the No Action Alternative, are protective of human health

Table 5 - Remedial Alternatives

Alternative	Details	Cost	
1 - No Action	None	Total Cost: Timeframe:	$0 Indefinite
2 – MNA and LUCs	Reliance on natural attenuation processes to reduce concentrations of VOCs in groundwater[1]. Biennial groundwater sampling to monitor the degradation of VOCs LUCs to prohibit aquifer use and the potential for future vapor intrusion.	Capital cost Semi-annual monitoring (yr 1-5) **Total present value** **Timeframe**	$13,000 $66,000 **$79,000** **5 years**
3 – EISB with LUCs and Long Term Monitoring (LTM)	Injection of bioremediation substrate and bioaugmentation culture to reductively dechlorinate VOCs. Quarterly groundwater monitoring for the first year to evaluate effectiveness of injections followed by biennial monitoring. LUCs to prohibit aquifer use and the potential for future vapor intrusion.	Capital cost Annual monitoring (yr 1-2) Reinjection after yr 1 **Total present value** **Timeframe**	$183,000 $20,000 $100,000 **$303,000** **2 years**
4 – Air Sparging (AS) with LUCs and LTM	Injection of air to induce mass transfer (stripping) of VOCs from groundwater and/or aerobic biodegradation. Semi-annual groundwater monitoring for first two years to evaluate effectiveness. LUCs to prohibit aquifer use and the potential for future vapor intrusion.	Capital cost Annual O&M (yrs 1-2) **Total present value** **Timeframe**	$169,000 $138,000 **$307,000** **2 years**

[1]For more information on MNA, see EPA's Guidance "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites" (EPA, 1999)

and the environment by reducing or controlling risks through remedial strategies and/or LUCs.

Alternatives 3 (EISB) and 4 (AS) provide active treatment/mass transfer to reduce the concentrations of COCs in groundwater, potentially expediting the NA process. Monitoring and LUCs will provide protection until RAOs are achieved for Alternatives 2, 3, and 4.

Compliance with ARARs

Section 121(d) of CERCLA, as amended, specifies in part, that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site unless such ARAR(s) are waived under CERCLA Section 121(d) (4). See also 40 C.F.R. § 300.430(f)(1)(ii)(B).

All alternatives, except the No Action Alternative, are expected to comply with ARARs, including the groundwater cleanup levels, NCGWQS and MCLs, that are chemical-specific ARARs and North Carolina regulations for monitoring well construction and abandonment that are action-specific ARARs. Alternatives 2, 3, and 4 would all require measures to be taken to comply with performance monitoring and LUCs. Additionally, Alternatives 3 and 4 would also comply with ARARs related to underground injections.

8.2 Primary Balancing Criteria

Long-term Effectiveness and Permanence

With the exception of Alternative 1, all alternatives are expected to be effective in the long-term. Alternative 2 would take the longest to achieve RAOs because it relies on NA, whereas Alternative 3 provides enhanced conditions for biodegradation if contact with the contaminated media is made, which may be difficult in the clayey layers of the surficial aquifer.

Alternative 4 typically removes contaminants more quickly than the other alternatives under consideration; however, thorough distribution of air through the clay matrix would be difficult at this site.

Rebounding is also a potential issue from any injection or sparging scenario and could affect the long-term effectiveness of Alternatives 3 and 4. As a result, multiple injections or system restart may be required; however, it is less labor intensive to restart the compressor than to re-inject substrate.

8.3 Modifying Criteria

State Acceptance

Alternatives 3 and 4 provide active treatment to reduce COC concentrations. Although Alternative 2 does not provide treatment, natural attenuation should reduce the toxicity, mobility, and volume over time.

Short-term Effectiveness

Alternative 2 has the best short-term effectiveness in terms of affects to the community and environment because it

has minimal actions but the time required to meet RAOs is the longest (approximately 5 years) of the three active alternatives. Alternatives 3 and 4 are expected to meet RAOs in 2 years.

Alternatives 3 and 4 both require the installation of injection wells, spanning roughly a month, which requires operation of drill rigs and other heavy equipment to support injections or air sparge system installation. Alternative 4 has the highest impacts to the community and environment due to the necessity of electricity to run the AS system for months or years. Alternative 3 has a high water-use footprint associated with the injected substrate.

All three Alternatives have similar risks to human safety incurred by the transportation of personnel to the site for frequent sampling events.

Implementability

Alternative 1 is the easiest to implement because there is no action involved. Alternative 2 is the next easiest to implement because it involves minimal actions. Alternatives 3 and 4 will be more difficult than Alternatives 1 and 2, because subsurface injections or sparging within the surficial aquifer matrix will be difficult to distribute resulting in the potential for day lighting or incomplete treatment.

Cost

An order of magnitude cost for each alternative has been estimated based on a variety of key assumptions. The timeframes required to achieve the RAOs vary among alternatives. Significant uncertainty is associated with the timeframes.

Other than Alternative 1, the least expensive alternative was Alternative 2, with an estimated total present value of $79,000 followed by Alternative 3 with an estimated total present value of $302,000. Alternative 4 was the most expensive alternative with a total present cost of $306,000. Alternative 2 also has the lowest total capital cost, estimated at $13,000. Alternatives 3 and 4 have estimated capital costs of $120,000 and $138,000, respectively.

8.4 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

Community acceptance will be evaluated after the public comment period for this PRAP.

9 Preferred Alternative

Alternative 2, MNA and LUCs, was selected to comprise the Preferred Alternative for remediation of groundwater at Site 49. The preferred alternative is shown on **Figure 3** and consists of:

- Biennial (every other year) groundwater monitoring from four existing monitoring wells for 5 years.
- LUCs to prevent aquifer use and to mitigate potential future exposure of COCs in indoor air from vapor intrusion pathways.

MNA and LUCs is preferred because trends over time indicate it will be effective based on the isolated contamination, will degrade COCs in a reasonable timeframe, is less expensive than Alternatives 3 and 4, and complies with ARARs.

Although the effectiveness of mitigation of COCs in groundwater will be measured by comparison to the cleanup levels (**Table 5**), MNA processes will continue to reduce VOC concentrations over time.

LUCs including, but not limited to, land use restrictions in the Base Master Plan, Notice of Inactive Hazardous Substance or Waste Disposal, file a Notice of Contaminated Site with the Onslow County Register of Deeds, and administrative procedures to prohibit unauthorized intrusive activities (for example, excavation, well installation, or construction) will be implemented as part of the remedy to prevent exposure to the contamination on the site that exceeds the clean up levels.

Consideration of vapor intrusion is recommended prior to any new construction or changes to existing building use or structure within the LUC boundary. The LUCs will be implemented and maintained by the Navy and MCIEAST-MCB CAMLEJ until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure. The LUC performance objectives include:

- To prohibit human consumption of or interaction with groundwater from the surficial aquifer underlying Site 49.
- To mitigate exposure of COCs in indoor air from vapor intrusion pathways
- To maintain the integrity of any existing or future monitoring well network at the site

Table 6 – Comparative Analysis of Alternatives

CERCLA Criteria	No Action	MNA and LUCs	EISB, LTM, and LUCs	AS, LTM, and LUCs
	(1)	(2)	(3)	(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 through treatment	❍	❍	●	●
Short-term effectiveness	❍	◘	◘	◘
Implementability	●	●	❍	❍
Present worth cost	$0	$79k	$303k	$307k

Ranking: ● High ◘ Moderate ❍ Low

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

Figure 3 – Preferred Alternative

The estimated LUC boundary is provided in **Figure 3**, although 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 a Land Use Control Implementation Plan (LUCIP) that will be prepared as part of the RD.

The Navy will submit the LUCIP to 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, MCIEAST-MCB CAMLEJ, 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) protects human health and the environment, 2) complies with ARARs, 3) is cost-effective, and 4) uses permanent solutions and alternative treatment technologies to the maximum extent practicable. Although the Preferred Alternative does not satisfy the statutory preference for treatment as a principal element, no source materials constituting principal threats are present, trends over time indicate that natural attenuation of groundwater will be effective and degrade VOCs in a reasonable timeframe, and the groundwater is not used for drinking water and LUCs will prevent exposure until concentrations allow for unlimited use and unrestricted exposure.

The Preferred Alternative can change in response to public comment or new information.

Because COCs will remain at the site above levels that allow for unlimited use and unrestricted exposure, 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, additional remedial actions would be evaluated by the parties and implemented by the Navy.

10 Community Participation

The Navy and EPA provide information regarding environmental cleanups at Site 49 to the public through the Restoration Advisory Board, public meetings, the Administrative Record file for the site, the Information Repository, and announcements published in *Jacksonville Daily News*, *The Globe* and *RotoVue*. The public is encouraged to gain a more-comprehensive understanding of Site 49 and the IRP. The public comment period for this PRAP is from February 17– March 19, 2013, and a public meeting will be held on February 21, 2013 at 6:00 pm (see page 1 of this report for details). 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.

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

Mr. Dave Cleland
NAVFAC Mid-Atlantic
Code: OPQE
USMC NC IPT, EV Business Line
6506 Hampton Blvd
Norfolk, VA 23508
Phone (757) 322-4851
Fax (757) 322-8280
david.t.cleland@navy.mil

Ms. Charity Rychak
MCIEAST - MCB CAMLEJ
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Location of Administrative Record and Information Repository

Available Online at: http://go.usa.gov/jZi

Internet access is available at the
Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7350

Glossary of Terms

This glossary defines in non-technical language the more commonly used environmental terms appearing in this PRAP. The definitions do not constitute the Navy's, EPA's, or NCDENR's official use of terms and phrases for regulatory purposes, and nothing in this glossary should be construed to alter or supplant any other federal or state document. Official terminology may be found in the laws and related regulations as published in such sources as the Congressional Record, Federal Register, and elsewhere.

Administrative Record: A compilation of site-related information for public review.

Air Sparge (AS): Injection of contaminant-free air into the subsurface saturated zone, enabling a phase transfer of hydrocarbons from a dissolved state to a vapor phase.

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.

Aquifer: Underground bed of soil or rock from which groundwater can be usefully extracted.

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 million (1 × 10 6) that a person will develop cancer if exposed to a site that is not remediated.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): A federal law, commonly referred to as the Superfund Program, passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act codified at 42 U.S.C. §§ 9601 et seq., and amended again in 2000. CERCLA created a trust fund known as the Superfund, which is available to EPA to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Conceptual site model (CSM): 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 (for example, spills) and receptors (for example, humans) and the interactions that link the two.

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.

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

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

Feasibility Study (FS): An investigation of the nature and extent of contamination at a given site, for the purpose of developing and evaluating remedial alternatives, as appropriate.

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

Hazard Index (HI): A number indicative of non-cancer 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 indicates that the human population is not likely to experience adverse effects.

Human health risk assessment (HHRA): An evaluation of the risk posed to human health should remedial activities not be implemented at a site.

Hazard Quotient (HQ): the ratio of the exposure estimate to an effects concentration considered to represent a "safe" environmental concentration or dose.

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.

Installation Restoration Program (IRP): The Navy, as the lead agency, acts in partnership with EPA and NCDENR to address environmental investigations at the facility through the IRP. The current IRP is consistent with CERCLA and applicable state environmental laws.

Land use controls (LUCs): Physical, legal, or administrative methods that restrict the use of or limits access to property to reduce risks to human health and the environment.

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.

Long-term monitoring (LTM): Monitoring of groundwater or surface water to track changes in COC concentrations for a predetermined amount of time.

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

Monitored Natural Attenuation (MNA): Periodic monitoring of groundwater or surface water to track changes in COC concentrations and NA parameters.

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.
- 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.

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 developed by EPA of uncontrolled hazardous substance release sites in the United States that are considered 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 through naturally occurring physical, chemical, and biological processes.

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 that 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, Base 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 in the PRAP.
- 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.

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

North Carolina Groundwater Quality Standards (NCGWQS): Enforceable standards developed by NCDENR. They are the maximum allowable contaminant concentrations resulting from any discharge of contaminants to the land or waters of the state, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage.

North Carolina Surface Water Quality Standards (NCSWQS): Enforceable standards developed by NCDENR. They are the maximum allowable contaminant concentrations in surface waters in the state, which may be tolerated without creating a threat to human health or which would otherwise render the groundwater unsuitable for its intended best usage.

Operable Unit (OU): 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 OUs, depending on the complexity of the problems associated with the site. OUs can address geographical portions of a site, specific site problems, or different phases of remediation at a site.

Plume: A space in air, water, or soil containing pollutants released from a point source.

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

Public comment period: The time allowed for the members of an affected community to express views and concerns regarding an action proposed to be taken by the Navy and EPA, such as a rulemaking, permitting, or Superfund remedy selection.

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 public document that explains which cleanup alternative(s) will be used at NPL sites.

Remedial Action Objectives (RAOs): Objectives of remedial actions that are 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 action: A cleanup method proposed or selected to address contaminants at a site.

Remedial Investigation (RI): A study to determine the nature and extent of contaminants present at a site and the problems caused by their release.

Remedy-in-Place (RIP): Signifies that the remedy has already been implemented and has been demonstrated to be functioning as designed.

Site: The area of a 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.

Surface Water: Water collecting on the ground or in a stream, river, lake, wetland, or ocean.

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.

Vapor intrusion: The migration of volatile chemicals from the subsurface into overlying buildings.

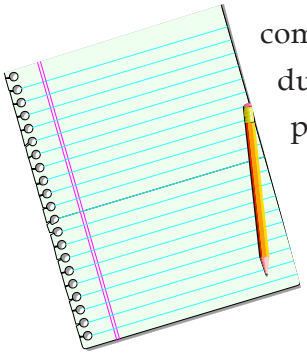
Volatile organic compound (VOC): A compound that easily vaporizes and has low water solubility. Many VOCs are manufactured chemicals, such as those associated with paint, solvents, and petroleum. VOCs are common groundwater contaminants.

Please print or type your comments for Site 49 here

Mark Your Calendar for the Public Comment Period

Public Comment Period
February 17, 2013 through March 19, 2013

Submit Written Comments



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

Attend the Public Meeting
February 21, 2013, from 6:00 P.M.

Coastal Carolina Community College
Business Technology Building, 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.

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USMC NC IPT, EV Business Line
Attn: Mr. Dave Cleland
6506 Hampton Blvd
Norfolk, VA 23508