



## Marine Corps Base, Camp Lejeune Proposed Remedial Action Plan Operable Unit No. 14 (Sites 69)

May 1998

*This document is the Proposed Remedial Action Plan (PRAP) for Operable Unit (OU) No. 14 (Site 69) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. MCB, Camp Lejeune has been investigating sites through the Department of Defense (DoD) Installation Restoration (IR) Program. The goal of the IR Program is to identify, assess, characterize, and clean up or control contamination from past waste disposal operations. This PRAP presents an overview of the site history and studies conducted to date, and identifies the final proposed remedial action for consideration. The Final proposed remedial action at Site 69 is Institutional Controls and Monitored Natural Attenuation.*

### PURPOSE

This PRAP is issued to describe MCB, Camp Lejeune's preferred remedial action for Site 69. This PRAP has been prepared and solicited for comment as part of the DoD's public participation responsibility under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, and Section 300.430(f) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the Federal Facility Agreement (FFA) between MCB, Camp Lejeune, the United States Environmental Protection Agency, and the State of North Carolina.

This PRAP briefly summarizes information that can be found in greater detail in the Final Remedial Investigation (RI) Report for Operable Unit No. 14 as well as documents referenced in that report. The public is encouraged to review all documents in order to gain a more comprehensive understanding of the sites. The Administrative Record, which contains all relevant documents with respect to Site 69 and the IR Program, is available for public review at the Onslow County Library and at MCB, Camp Lejeune.

### COMMUNITY ROLE IN THE SELECTION PROCESS

MCB, Camp Lejeune relies on public input to ensure that the concerns of the community are considered in selecting a remedy for each site. All reports on the sites have been made available for the public comment period (June 19 - July 19, 1998). A public meeting will be held on June 30, 1998 to present the conclusions of the RI, and to propose the final remedial action for Site 69. Comments received at the public meeting, as well as written comments, will be addressed in the Responsiveness Summary section of the Record of Decision (ROD). The ROD formalizes the selection of the remedy.

### BACKGROUND INFORMATION

#### Site Location and Description

MCB, Camp Lejeune is a training base for the U.S. Marine Corps located in Onslow County, North Carolina. The facility covers approximately 236 square miles and includes 14 miles of shoreline. Operable Unit (OU) No. 14 (Site 69, Rifle Range Chemical Dump) is one of 18 OUs located within MCB, Camp Lejeune. During the period of approximately 1950 to 1976, Site 69 was reportedly used to dispose chemical wastes such as PCBs, solvents, pesticides, and drums of gas. Background information indicates that the drums may contain chemical warfare materiel (CWM). The CWM may be in the form of Chemical Agent Identification Sets (CAIS), which were used for training and contain small quantities of chemical agents like mustard gas. Site 69 is located in a remote area of the base approximately two hundred yards west of the New River and about three quarters of a mile southeast of the Rifle Range (see Figure 1). Everett Creek is located approximately one quarter mile south of the site. The site covers approximately 14 acres and is situated in a topographic high area of the base. Historical aerial photographs depict the boundary of the disposal area and evidence of trenches where wastes were reportedly disposed (see Figure 2). Today, the boundary of the former disposal area as well as the trenches are barely noticeable due to overgrown vegetation which covers the site. A fence was erected in the late 1980s to prevent access by trespassers and military personnel. Military training exercises are still carried out in the vicinity of the site.

## Previous Investigations

In 1983, an Initial Assessment Study was completed by the Department of the Navy (DoN) at MCB, Camp Lejeune. The Rifle Range Chemical Dump was identified as a site for further study based on the review of background information and interviews with military personnel. Following the identification of this site, the DoN conducted a Confirmation Study during the period 1984 to 1987. Eight monitoring wells were constructed at the site and two rounds of groundwater samples were collected to evaluate groundwater quality in the shallow aquifer. Two of the monitoring wells (69GW02 and 69GW03) exhibited high levels of volatile organic compounds (VOCs) above drinking water standards. These wells are located in the southern portion of the site. A third round of samples were collected in 1991. The VOCs, which are waste constituents of spent solvents, included tetrachloroethene (PCE), vinyl chloride (VC), 1,2-Dichloroethene (1,2-DCE), trichloroethene (TCE), and other breakdown or "daughter" compounds of the solvent wastes. Surface water samples collected from Everett Creek and the New River did not exhibit VOC contamination associated with Site 69. No soil samples were collected during the Confirmation Study.

## Remedial Investigation

The field portion of the RI was initiated in 1994 and completed in 1996. The field investigation was initiated by performing a geophysical survey to delineate the area where buried materials may have been placed. This survey revealed that buried metallic debris was prevalent under one quarter of the site area, but within the boundary of the site fence. The metallic debris was primarily found to be in the central and southern portions of the site. Approximately 29 shallow test borings were hand augered to a depth ranging from 2 to 4 feet and soil samples were collected for laboratory analysis (organics, metals, and chemical surety degradation compounds). In addition to the existing eight shallow monitoring wells, a total of seven shallow wells were installed during the RI at locations within the site boundary, and outside the fenced area in order to evaluate groundwater quality down gradient from the suspected source area. Six monitoring wells were installed near the suspected source area and at offsite locations to monitor groundwater quality in the upper portion of the Castle Hayne Aquifer directly beneath the shallow aquifer. Because the Castle Hayne aquifer is large and serves as the area's drinking water source (although there are no supply wells near the site), six deep monitoring wells were installed near the source area and offsite in order to determine whether VOCs have migrated vertically and horizontally away from the site. During the installation of selected onsite monitoring wells, additional soil samples were collected for laboratory analysis. All onsite intrusive activities such as drilling and sample collection were conducted in conjunction with the U.S. Army Technical Escort Unit in order to prevent exposure to CWM. The U.S. Army's responsibility was to monitor for chemical agents during all intrusive field activities and take emergency corrective action if required. However, no CWM degradation compounds were detected during the investigations. In addition to the extensive groundwater and soil investigations, additional surface water and sediment sampling was performed onsite (pooled water), and in Everett Creek, the New River, and an unnamed tributary to the New River. Fish and benthic sampling was also conducted in Everett Creek and the New River in order to evaluate potential ecological impacts from the site.

## RI Results and Extent of Contamination

Groundwater contamination is most prevalent in the shallow aquifer near monitoring well 69GW15. The primary volatile contaminants in this well included: 1,2-dichloroethene (11,000 ug/L); vinyl chloride (260 ug/L); and, TCE (48 ug/L). The state groundwater standards for these contaminants are 70 ug/L (1,2-DCE), 0.015 ug/L (VC), and 2.8 ug/l (TCE), respectively. The source of the VOCs is determined to be very close to this well based on the results of the geophysical survey and analytical results (see Figure 3). However, due to the presence of CWM within the former landfill, this source could not be investigated via intrusive methods such as test pitting. VOC contamination in the shallow aquifer extends horizontally toward monitoring wells 69GW02, 69GW03; well 69GW15 exhibits concentrations of VOCs an order of magnitude higher than other wells located within the site. Offsite shallow wells did not detect VOCs above state groundwater standards.

VOCs have migrated vertically into the Castle Hayne aquifer. The upper most zone of the aquifer (directly under the shallow aquifer) exhibited elevated levels of VOCs above drinking water standards near the suspected source area. For example, monitoring well 69GW15UW, which monitors the upper zone of the Castle Hayne aquifer (27 to 37 feet below ground surface), exhibited high levels of 1,2-DCE (2,300 ug/L), vinyl chloride (1,600 ug/L), and TCE (320 ug/L). However, the upper zone of the Castle Hayne does not appear impacted away from the source area. Monitoring wells located down gradient

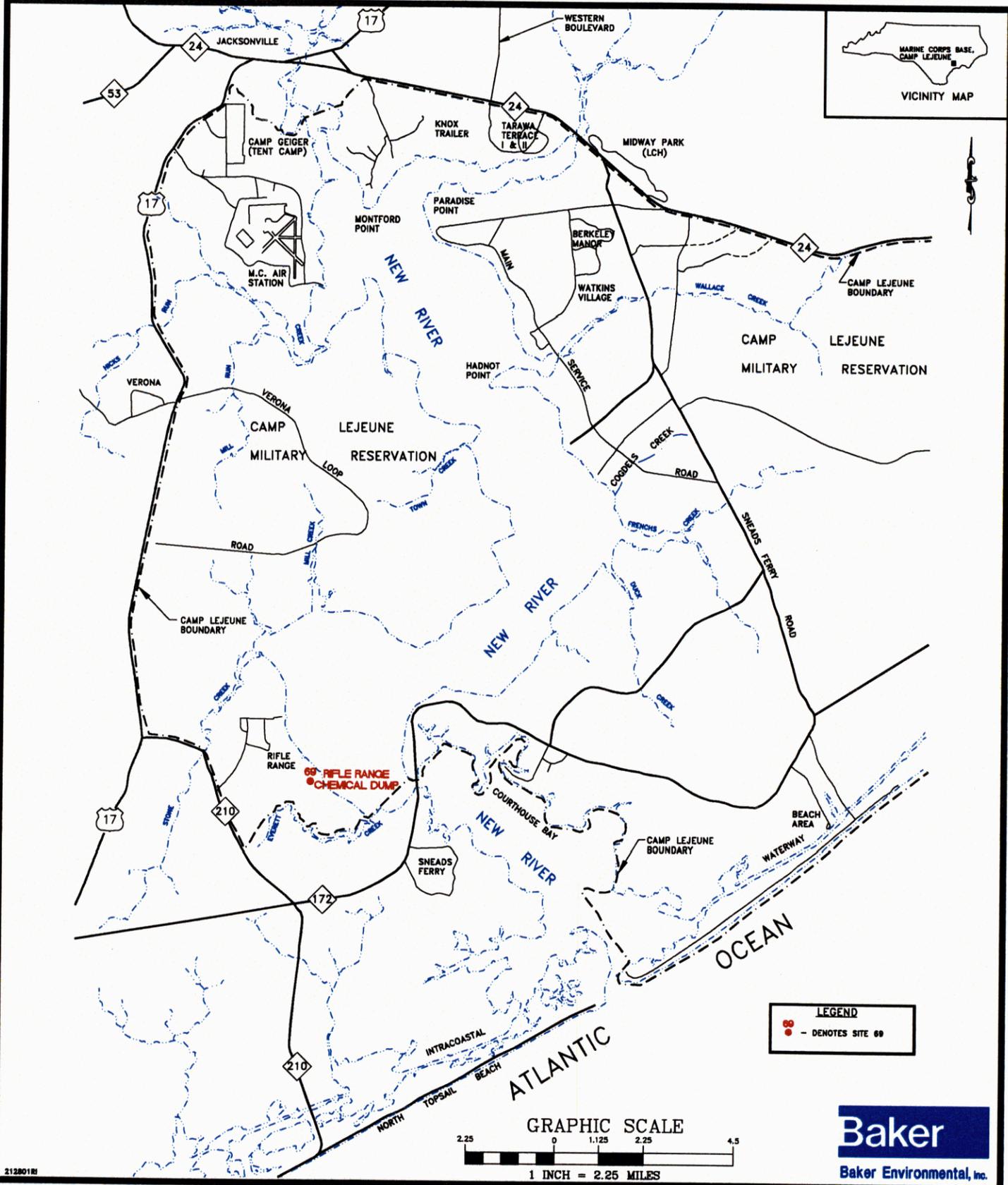


FIGURE 1  
 LOCATION MAP OPERABLE UNIT NO. 14  
 SITE 69

MARINE CORPS BASE, CAMP LEJEUNE  
 NORTH CAROLINA



from the source did not exhibit significant VOC contamination. However, some VOC contamination was detected below the upper zone of the Castle Hayne aquifer near the source area (this area is referred to in the RI Report as the "intermediate" zone). Monitoring well 69GW15IW, which monitors the intermediate zone of the Castle Hayne aquifer (45 to 60 feet below ground surface) near the probable source area, exhibited vinyl chloride at 180 ug/L, 1,2-DCE at 54 ug/L, and TCE at 3,000 ug/L. However, as with the other down gradient monitoring wells, limited contamination was detected in the intermediate zone of the Castle Hayne aquifer away from the source area.

With respect to soil, VOC contamination was limited to a few samples collected during the installation of monitoring well 69GW15. This is probably due to the wastes being buried in deeper trenches that could not be disturbed as part of the RI due to safety reasons and U.S. Army policy on suspected CWM (U.S. Army policy states that CWM should not be disturbed or removed unless there is a potential for impacts to public health and safety). The high water table at the site also prevented soil samples from being collected below 5 or 6 feet in depth.

Surface water samples collected from standing pools of water onsite exhibited low levels of VOCs. These pools are hydraulically connected to the shallow aquifer. Surface water and sediment samples collected from the New River, the unnamed tributary to the north of Site 69, and Everett Creek did not exhibit VOC contamination.

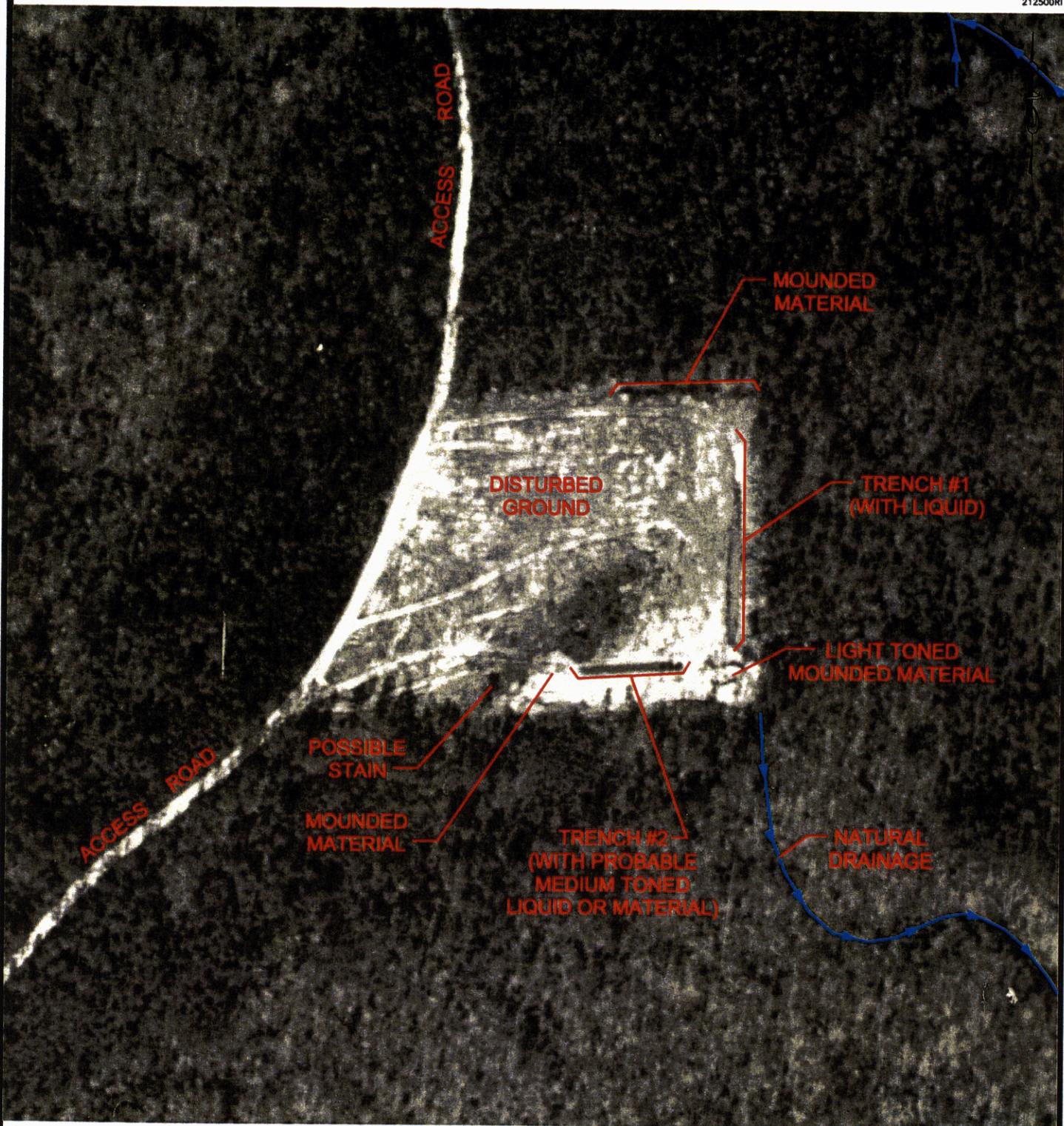
## HUMAN HEALTH RISK ASSESSMENT

A baseline human health risk assessment was performed to determine potential impacts to human health under current site conditions and future potential site conditions. Currently, access to the site is restricted by a fence and groundwater under the site is not utilized as a source of drinking water. The site is also located in a remote area away from base housing and industrial/commercial areas. Current exposure pathways include occasional trespassers who may climb the fence and come into contact with surface soil. Surface soil did not contain contaminants of potential concern and therefore, under current site conditions, there are no adverse health risks to the trespassers. Future potential use of the site considered impacts to construction workers and residents (assuming that the site was developed for residential use). The future potential exposure scenario always considers a residential scenario as a worst case condition even though there are no current plans to develop this site for residential use. In addition, under the future potential exposure scenario, it was assumed that shallow groundwater would be used as a potable water supply even though the base obtains water via deep supply wells. All of the base supply wells obtain water from the deeper Castle Hayne aquifer rather than the shallow aquifer due to better productivity yields. Under this exposure scenario, future potential health risks to adults and children exceeded Federal guidelines primarily due to ingestion of shallow groundwater, which is contaminated under the site. Impacts to construction workers via exposure to surface and subsurface soil were determined to be acceptable based on Federal guidelines. However, exposure to CWM during excavation activities could result in significant health risks.

## ECOLOGICAL RISK ASSESSMENT

Overall, metals and pesticides detected in onsite and offsite surface water and sediment have the potential to affect the integrity of aquatic ecosystems near Site 69. For the terrestrial ecosystems, metals appear to be the most significant concern. Metals and pesticides were detected onsite and offsite; their presence in sediment far up gradient from the site as well as other areas of the base suggest that these contaminants are widely dispersed and are not solely present in the environment due to former disposal operations at Site 69.

The potential risks associated with the metals and pesticides were evaluated by conducting biosurveys and analyzing fish tissue. Fish populations were sampled and were representative of estuarine and tidal systems. The fish community and benthic community appeared healthy and not impacted by contaminants detected in surface water and sediment. Low levels of benzene, toluene, pesticides, PCBs, and metals were detected in some fish tissue samples; however, the levels detected were low when compared to published background values. Their presence in fish tissue cannot be directly related to Site 69 but rather to cumulative contamination from base and other (i.e., non-military) operations surrounding the New River.



SOURCE: EPIC, 1992

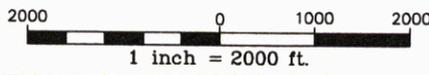


FIGURE 2  
 SITE 69  
 AERIAL PHOTOGRAPHY OF SITE 69  
 FEBRUARY 1, 1956  
 REMEDIAL INVESTIGATION CTO-0212  
 MARINE CORPS BASE, CAMP LEJEUNE  
 NORTH CAROLINA

**AREAS OF CONCERN  
AT SITE 69**

The results of the baseline human health and ecological risk assessment were evaluated to determine the areas of concern at Site 69 that may warrant remediation or institutional controls to protect the public's health and the environment.

Shallow and deep groundwater are media of concern at Site 69 because of the potential to cause future potential human health risks upon exposure. As mentioned previously, there is no current risk to human health; however, if the site was developed for residential purposes, risks to humans could exceed Federal guidelines due to ingestion of groundwater. Considering that the source of VOC contamination can not be removed due to buried CWM, the following remedial action objectives were identified for groundwater:

- Prevent future potential exposure to contaminated groundwater
- Protect uncontaminated groundwater for future potential beneficial use

The landfill material has been identified as the second area of concern at Site 69. The landfill material (including subsurface soil in contact with the wastes) does not currently result in unacceptable risks, but under a future potential exposure scenario for construction workers and residents living at the site, unacceptable risks could occur due to the fact that chemical warfare material may be present. Because the soil presents no risk to human health or the environment, and the contents in the landfill can not be removed, only one remedial action objective has been identified for soil at Site 69:

- Prevent future potential exposure to landfill materials that reportedly include CWM

**SUMMARY OF  
ALTERNATIVES**

A selected remedy should be protective of human health and the environment; be cost effective; comply with applicable statutory laws; and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. The remedy should also comply with the statute that prefers the use of treatment as a principle element for the reduction of toxicity, mobility, or volume of a hazardous substance.

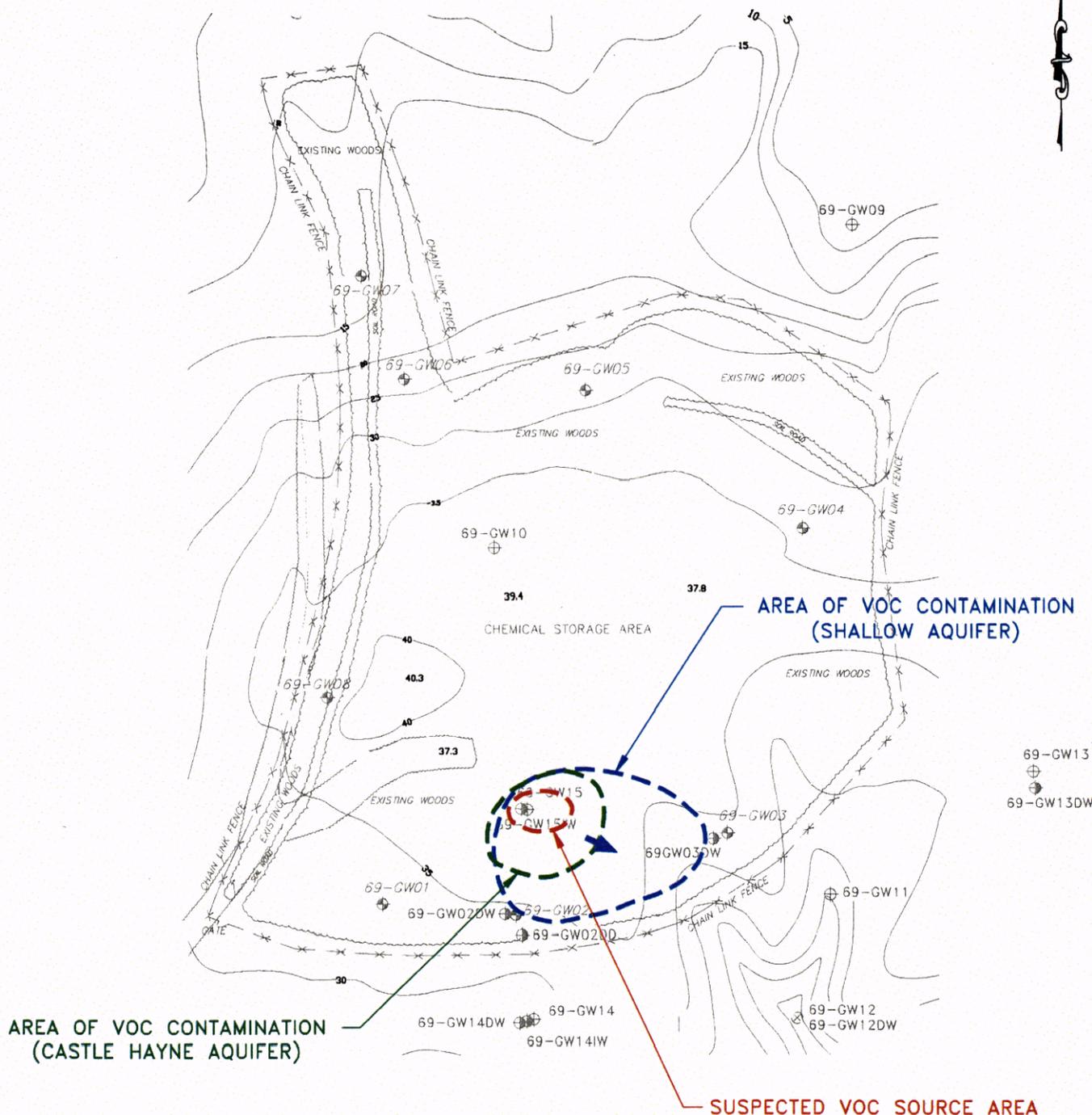
**Soil Alternatives**

Because of the reported presence of chemical warfare agents buried at Site 69, soil alternatives involving excavation, land clearing and grading, or other intrusive activities have been eliminated due to safety reasons and U.S. Army policy on dealing with CWM. With respect to in-situ treatment, one soil alternative was identified and presented in conjunction with groundwater alternative 69GW4 above. In addition to this alternative, two additional alternatives have been developed to meet the remedial action objectives for soil. A short description of these alternatives and a summary of their associated costs are presented below.

Alternative 69SO1: No Action

Capital Costs:	\$0
Annual O&M Costs:	\$0
Net Present Worth Cost:	\$0
Time to Implement:	None

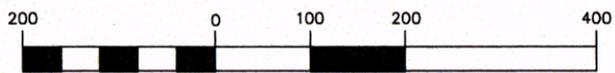
Description: The no action alternative is required by the NCP to provide a baseline for comparison to other remedial action alternatives. Under this alternative, no action would be taken to prevent future potential exposure to soil or landfill materials, or to reduce the toxicity, mobility, or volume of VOCs in the subsurface soil and buried wastes. Since these contaminants will remain, the NCP requires the lead agency (i.e., Department of the Navy) to review the effects of this alternative no less often than once every five years.



AREA OF VOC CONTAMINATION  
(CASTLE HAYNE AQUIFER)

AREA OF VOC CONTAMINATION  
(SHALLOW AQUIFER)

SUSPECTED VOC SOURCE AREA



1 inch = 200 ft.



**LEGEND**

- 69-GW02
- ⊕ EXISTING SHALLOW WELLS
- ⊕ PROPOSED DEEP WELL
- ⊕ PROPOSED SHALLOW WELL
- ⊕ PROPOSED PAIR OF SHALLOW AND DEEP WELLS
- ➔ GROUNDWATER FLOW DIRECTION
- TOPOGRAPHIC ELEVATION LINES (FEET, MSL)
- FENCE
- VEGETATION

**FIGURE 3**  
**AREAS OF VOC**  
**GROUNDWATER CONTAMINATION**  
**SITE 69 - RIFLE RANGE CHEMICAL DUMP**  
**MARINE CORPS BASE, CAMP LEJEUNE**  
**NORTH CAROLINA**

SOURCE: REVISED FROM LANTDIV, OCT. 1991

### Alternative 69SO2: Institutional Controls

Capital Costs:	\$0
Annual O&M Costs:	\$900
Net Present Worth Cost:	\$13,800
Time to Implement:	1 month

Description: Under this alternative, institutional controls would be implemented to limit site access and control future use of the site. These controls would include maintenance of the existing site fence, posting warning signs along the fence surrounding the site, and restricting land use. Land use restrictions would prohibit intrusive activities such as excavation. In addition, no residential, commercial, or industrial use of the property would be permitted.

## **Groundwater Alternatives**

Five alternatives have been developed to meet the remedial action objectives for groundwater. A short description of these alternatives and a summary of their associated costs are presented below.

### Alternative 69GW1: No Action

Capital Costs:	\$0
Annual O&M Costs:	\$0
Net Present Worth Cost:	\$0
Time to Implement:	None

Description: The No Action alternative is required by the NCP to provide a baseline for comparison to other remedial action alternatives. Under this alternative, no action would be taken to prevent exposure to groundwater or to reduce the toxicity, mobility, or volume of VOCs in the shallow or Castle Hayne aquifers. However, some reduction in contaminant levels may occur as there is evidence that natural attenuation is occurring in the groundwater. Under the no action alternative, there would be no other actions (e.g., groundwater monitoring) that would be implemented to evaluate the effectiveness of natural attenuation. Since these contaminants will remain, the NCP requires the lead agency (i.e., Department of the Navy) to review the effects of this alternative no less often than once every five years.

### Alternative 69GW2: Institutional Controls and Monitored Natural Attenuation

Capital Costs:	\$0
Annual O&M Costs:	\$63,000 (years 1-5); \$24,000 (years 6 - 30)
Net Present Worth Cost:	\$535,000
Time to Implement:	6 months

Description: Natural attenuation is an in-situ remedial action that results in the biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of VOCs in groundwater. Based on existing groundwater data dating back to 1984, there is evidence that natural attenuation is occurring in groundwater. In order to monitor the effectiveness of this alternative and for purposes of protecting human health, which could be potentially impacted if the VOCs migrate far enough from the site, a groundwater monitoring program will be implemented in the shallow and Castle Hayne aquifers. In an effort to provide additional evidence that natural attenuation is occurring, this alternative will include the performance of annual groundwater fate and transport model. Institutional controls to prevent the construction of supply wells in the area also will be included.

### Alternative 69GW3: Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

Capital Costs:	\$1,047,000
Annual O&M Costs:	\$67,000
Net Present Worth Cost:	\$2,088,000
Time to Implement:	1 year

Description: Under this alternative, a groundwater extraction, treatment, and discharge system would be constructed for the shallow and Castle Hayne aquifers and operated onsite. The groundwater

extraction system would be used to extract and contain groundwater contaminated above the cleanup goals (i.e., North Carolina and Federal drinking water/groundwater standards). Groundwater would be pumped using a series of down gradient well pairs located near the down gradient edge of the plume and a well pair located near the suspected source area. Each well pair would consist of a shallow well (approximately 25 feet deep) and a well in the upper zone of the Castle Hayne aquifer (approximately 60 feet deep). The estimated pumping rate is 100 gallons per minute (gpm). Pretreatment of the influent flow may be necessary due to high levels of iron and manganese that could foul the system. A low-profile air stripper would be used to strip the VOCs from the groundwater. Treated water would be discharged into the New River, which is located approximately 1,200 feet from the site. Under this alternative, a groundwater monitoring program would be implemented, and aquifer use restrictions would be in effect so that no supply wells would be constructed within a specified distance from the site. Groundwater treatment would continue until groundwater cleanup goals are achieved. Achieving these goals may be difficult since the source will remain, and it has been demonstrated at other sites with similar problems that groundwater contaminant levels typically reach asymptotic levels. Performance curves would be generated annually to determine if and when asymptotic levels are realized. If asymptotic levels are reached, the cleanup goals would be re-evaluated and possibly revised if the plume is determined to not impact down gradient groundwater supply wells (there are no supply wells within a one-mile radius).

Alternative 69GW4: Dual Phase Vapor Extraction with Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

Capital Costs:	\$1,238,000
Annual O&M Costs:	\$98,200
Net Present Worth Cost:	\$2,337,000
Time to Implement:	1 year

Description: Under this alternative, an area of approximately 100 feet by 300 feet of contaminated soil and shallow groundwater would be remediated using a dual-phase vacuum extraction (DPVE) system to collect contaminated soil gas and shallow groundwater for treatment. DPVE is a method to remediate soil and groundwater using only a single extraction system and is well suited for shallow aquifers with low hydraulic conductivities and for sites with high water tables such as Site 69. The DPVE system would include approximately three extraction wells (approximately 15 to 20 feet deep) and underground interconnecting piping. A radius of influence of 50 feet was assumed for each well. Each well would extract groundwater at a rate of approximately 9 gpm. A DPVE pilot test would be required in order to determine the optimum radii of influence and pumping rate. In addition, the U.S. Army Technical Escort Unit would be required to assist in the installation since this alternative would require intrusive activities. A groundwater extraction, treatment, and discharge system would be constructed for the upper Castle Hayne aquifer and operated onsite, similar to Alternative 69GW3. Three wells would be constructed into the Castle Hayne aquifer in addition to the three DPVE wells. This system would require pre-treatment for metals removal prior to stripping the VOCs via a low-profile air stripper. The treatment system would be designed to treat approximately 100 gpm of contaminated groundwater prior to discharging the treated effluent into the New River. A groundwater monitoring program would be conducted to assess the effectiveness of the treatment alternative as well as monitoring offsite groundwater quality for purposes of preventing offsite exposure to groundwater. Aquifer use restrictions would be implemented restricting the construction of supply wells near the site.

Alternative 69GW5: In Situ Air Stripping with Institutional Controls and Monitoring

Capital Costs:	\$246,000
Annual O&M Costs:	\$39,000
Net Present Worth Cost:	\$853,000
Time to Implement:	6 months

Description: In situ air stripping (also referred to as "in well aeration") is an innovative technology that consists of a specially adapted vacuum vaporizer well that contains a vacuum retractor, an aboveground blower, and an off-gas treatment system. The off-gas treatment system typically consists of activated carbon units. The technology consists of a double-screened well which creates

a circulation cell that transports the dissolved and residual mobile-phased organic contaminants to a central well casing for treatment. The treatment mechanism is primarily air stripping and secondarily, bioremediation of semivolatile organics. Under this alternative, three UVB treatment units would be installed in the upper Castle Hayne aquifer in an attempt to mobilize contaminants from the source area to the UVB treatment units. (A two-phased treatability study has been conducted.) The UVB systems would be located in the suspected source area of the site where the highest levels of VOCs have been detected in both the shallow aquifer and the upper zone of the Castle Hayne aquifer. The units would be permitted to operate on an average of three months and evaluated with respect to influent levels. Once the influent levels either reached asymptotic levels, the units would be temporarily shut down for a limited period (e.g., one week) and restarted to create a "flushing" effect which may help to mobilize the contaminants from the source area. Under this alternative, a groundwater monitoring program would be implemented, and aquifer restrictions would be in effect so that no supply wells would be constructed within a specified distance from the site. Groundwater treatment would continue until groundwater cleanup goals are achieved. Achieving these goals may be difficult since the source will remain, and it has been demonstrated at other sites with similar problems that groundwater contaminant levels typically reach asymptotic levels. Performance curves would be generated annually to determine if and when asymptotic levels are realized. If asymptotic levels are reached, the cleanup goals would be re-evaluated and possibly revised if the plume is determined to not impact down gradient groundwater supply wells.

## EVALUATION OF ALTERNATIVES

During the FS process, each of the alternatives were assessed against nine evaluation criteria that are identified in the NCP. A summary of the comparative analysis conducted on the groundwater and soil alternatives follows for each of the nine criterion.

### Comparative Analysis of Groundwater and Soil Alternatives

#### Overall Protection of Human Health and the Environment

With respect to groundwater, Alternative 69GW1 (No Action) would not contain or actively remediate groundwater, nor would this alternative prevent future potential exposure to groundwater. Natural attenuation of the contaminants would likely continue under no action since existing site data have provided evidence of this phenomenon. The remaining four groundwater alternatives all involve groundwater remediation in different forms, and groundwater monitoring and institutional controls to prevent exposure to groundwater. Alternative 69GW4 would involve the most aggressive form of remediation since some reduction in soil contamination would also be expected to occur. None of the alternatives are believed to represent a permanent solution to restoring groundwater for future consumption or use since the source of the groundwater contamination can not be removed due to the reported presence of chemical warfare materials under the site.

With respect to soil, Alternative 69SO1 would not be protective of human health since the site could be used for other purposes in the future. However, under Alternative 69SO2, site restrictions can be imposed to limit the use of the area in order to prevent exposure to site contaminants.

#### Compliance With Applicable, Relevant, or Appropriate Requirements (ARARs)

With respect to groundwater, onsite groundwater quality exceeds State and Federal standards for drinking water or the protection of groundwater. Offsite groundwater quality has been shown to be below drinking water standards in both the shallow aquifer and the Castle Hayne aquifer. With long-term groundwater treatment, either through natural attenuation (Alternative 69GW2) or active processes (Alternatives 69GW3 through 69GW5), groundwater contaminant levels on site may achieve these standards over time. However, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of State and Federal ARARs would be possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective since the source of groundwater contamination can not be remediated due to the presence of CWM.

With respect to soil, there are no chemical-, location-, or action-specific ARARs since no remedial actions would be taken under either alternative.

Long-Term Effectiveness and Permanence

Regarding groundwater, Alternatives 69GW2 through 69GW5 would all be effective in preventing exposure to groundwater through the use of aquifer use restrictions and groundwater monitoring. Under Alternative 69GW1 (No Action), there would be no controls to prohibit future use of the aquifer and possible exposure to site contaminants. Alternatives 69GW2 through 69GW5 would only be effective as long as the plume could be contained while operating.

Regarding soil, Alternative 69SO2 would provide a long-term permanent solution by implementing institutional controls to restrict future use of the land in order to prevent exposure to site contaminants.

Reduction of Toxicity, Mobility, or Volume

Alternatives 69GW1 and 69GW2 would provide some reduction of toxicity due to remediation via natural attenuation. Historical site data have shown that natural attenuation is occurring. Alternatives 69GW3 through 69GW5 would provide the most aggressive reduction in toxicity, mobility, or volume since these alternatives involve operating systems.

With respect to soil, neither Alternative 69SO1 or 69SO2 would meet this criterion since neither alternative involves remediation of the soil contaminants. Alternative 69GW4 would provide some reduction in toxicity, mobility, or volume of soil contamination via the DPVE treatment system.

Short-Term Effectiveness

With respect to groundwater, the No Action alternative would be the only alternative where no short-term risks would be expected since no activities would be implemented. Under the remaining alternatives, there would be potential risks to workers during the installation of the treatment systems, or during groundwater monitoring. Tasks involving intrusive activities such as installing extraction wells or units would require the assistance of the U.S. Army Technical Escort Unit for purposes of monitoring the site for the presence of chemical warfare agents. No impacts to base personnel are expected with any of the alternatives due to the remote location of the site.

With respect to soil, neither alternative would involve any remedial actions that would pose a risk to human health or the environment during implementation.

Implementability

With respect to groundwater, Alternatives 69GW1 and 69GW2 can be easily implemented. Alternatives 69GW3 through 69GW5 would require coordination with the U.S. Army during intrusive activities. The drilling and construction activities associated with alternatives 69GW3 through 69GW5 would all involve similar levels of difficulty. In addition, the remote location of the site and the ability to check and monitor the systems would result in greater implementability concerns for alternatives 69GW3 through 69GW5 than with Alternative 69GW2.

With respect to soil, there would be no implementability concerns with either alternative.

Cost

The net present worth costs of the five groundwater alternatives are provided below in order from least expensive to most expensive:

Alternative 69GW1	\$0
Alternative 69GW2	\$535,000
Alternative 69GW5	\$853,000
Alternative 69GW3	\$2,088,000
Alternative 69GW4	\$2,748,000

The net present worth costs for the soil alternatives are: \$0 for Alternative 69SO1 and \$13,800 for Alternative 69SO2.

Community Acceptance

This criterion has not yet been evaluated until receipt of comments generated during the public comment period.

State Acceptance

This criterion has not yet been fully evaluated until receipt of comments generated during the public comment period.

**SUMMARY OF  
PREFERRED  
ALTERNATIVES**

The proposed alternatives best suited to meet the remedial action objectives for groundwater and soil, based on the overall evaluation of the NCP criteria are:

- Alternative 69GW2 (Institutional Controls and Natural Attenuation)
- Alternative 69SO2 (Institutional Controls)

**PUBLIC PARTICIPATION**

The Department of the Navy encourages public participation in their environmental program. In the past, public meetings have been held to provide the community with information about the continuing environmental studies. In addition, these public meetings are held in order to solicit public comments and input with respect to the remedial action process. This PRAP and other background documents for OU No. 14 are available for public review at the following locations:

Onslow County Library  
58 Doris Avenue East  
Jacksonville, North Carolina  
(919) 455-7350  
Mon.-Thurs. 9:00 am to 9:00 pm  
Fri.-Sat. 9:00 am to 6:00 pm

MCB, Camp Lejeune  
Environmental Management Division  
Building 58, Room 234  
Marine Corps Base  
Camp Lejeune, North Carolina  
(910) 451-5068  
Mon.-Fri. 7:00 am to 3:00 pm

The Department of the Navy in conjunction with MCB, Camp Lejeune will hold a public information meeting on June 30, 1998 at 7:00 pm at the Onslow County Library. The 30-day public comment period will begin on June 19, 1998 and will end on July 19, 1998. The comments received will aid in the selection of a final remedial alternative for Site 69.

**POINTS OF CONTACT**

To provide written comments to this PRAP, please contact either:

Ms. Katherine Landman, Code 18232      or  
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**LIST OF ACRONYMS AND ABBREVIATIONS**

ARAR	Applicable or Relevant and Appropriate Requirements	MCB	Marine Corps Base
CAIS	Chemical Agent Identification Sets	NCP	National Contingency Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	O&M	Operation and Maintenance
CWM	Chemical Warfare Material	OU	Operable Unit
1,2-DCE	1,2-Dichloroethene	PCB	Polychlorinated Biphenyl
DENR	North Carolina Department of Environment and Natural Resources	PCE	Tetrachloroethene
DoD	Department of Defense	ppm	parts per million
DoN	Department of the Navy	PRAP	Proposed Remedial Action Plan
DPVE	Dual Phase Vacuum Extraction	RI	Remedial Investigation
FFA	Federal Facilities Agreement	ROD	Record of Decision
FS	Feasibility Study	TCE	Trichloroethene
gpm	gallons per minute	UVB	German acronym for "vacuum vaporizer well"
IAS	Initial Assessment Study	USEPA	United States Environmental Protection Agency
IRP	Installation Restoration Program	VC	Vinyl Chloride
KGB	German acronym for "coaxial groundwater ventilation"	VOCs	Volatile Organic Compounds