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FINAL

PROPOSED REMEDIAL ACTION PLAN

OPERABLE UNIT NO. 13 (SITE 63)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0340

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Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

TABLE OF CONTENTS

Page

LIST OF ACRONYMS AND ABBREVIATIONS iii

INTRODUCTION 1
- Report Organization 1
- Background and Setting of MCB, Camp Lejeune 2
- Background and Setting of Operable Unit No. 13 2

PREVIOUS INVESTIGATIONS 3
- Initial Assessment Study, 1983 3
- Site Inspection, 1991 3
- Remedial Investigation, 1995 4

SUMMARY OF SITE-RELATED RISKS 8
- Human Health Risk Assessment 8
- Ecological Risk Assessment 9

PROPOSED REMEDIAL ACTION PLAN FOR OU No. 13 11
- No Further Remedial Action Decision Rationale 11

COMMUNITY PARTICIPATION 13
- Public Comment Period 13
- Information Repositories 14
- Public Inquiries 14
- Mailing List 15

LIST OF TABLES

1 Summary of Positive Detections in Soil, Site Inspection, 1991
2 Summary of Positive Detections in Groundwater, Site Inspection, 1991
3 Summary of Positive Detections in Surface Water, Site Inspection, 1991
4 Summary of Positive Detections in Sediment, Site Inspection, 1991
5 Summary of Site Contamination, Remedial Investigation, 1995
6 Summary of Current and Future Potential Site Risks, Remedial Investigation, 1995
7 Summary of Terrestrial Quotient Indices, Remedial Investigation, 1995

LIST OF FIGURES

1 Operable Unit No. 13 - Site 63, Marine Corps Base, Camp Lejeune
2 Site Location Map, Site 63 - Verona Loop Dump
3 Site Map and Surface Contours, Site 63 - Verona Loop Dump
4 Remedial Investigation Sampling Locations, Site 63 - Verona Loop Dump

LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPCs	contaminants of potential concern
DoN	Department of the Navy
ER-L	effects range - low
ER-M	effects range - median
FFA	Federal Facilities Agreement
HI	hazard index
IAS	Initial Assessment Study
ICR	incremental lifetime cancer risk
IR	Installation Restoration
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCLs	Maximum Contaminant Levels
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
NC DEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCWQSs	North Carolina Water Quality Standards
OU	Operable Unit
PCB	polychlorinated biphenyl
PRAP	Proposed Remedial Action Plan
QI	quotient index
RA	Risk Assessment
RI	Remedial Investigation
ROD	Record of Decision
SI	Site Inspection
SQC	sediment quality criteria
SSV	sediment screening value
SVOCs	semivolatile organic compounds
SSSVs	surface soil screening values
SWSV	surface water screening value
TAL	Total Analyte List
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

INTRODUCTION

This Proposed Remedial Action Plan (PRAP) presents the Department of the Navy's (DoN's) preferred remedial action plan for Operable Unit (OU) No. 13 at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The DoN and MCB, Camp Lejeune have issued this PRAP as part of the public participation responsibility under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, commonly referred to as Superfund), and the Federal Facilities Agreement (FFA) between MCB, Camp Lejeune, the DoN, the United States Environmental Protection Agency (USEPA) Region IV, and the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR). This PRAP has been prepared to identify the preferred remedial action alternative for OU No. 13 and provide justification for that preference; supply information concerning how the public can become involved with the remedial action selection process; and solicit public review and comments regarding the proposed remedy for OU No. 13.

This document summarizes information that may be found in greater detail within the Remedial Investigation (RI) Report prepared for OU No. 13. The RI Report for OU No. 13, contained within an administrative record file, provides information and findings in support of the selected remedial action presented within this document. The administrative record file for OU No. 13 is available for public review at the MCB, Camp Lejeune Installation Restoration Division Office (Building 67, Room 238) and at the Onslow County Library in Jacksonville, North Carolina. The DoN encourages the public to review the administrative record file in order to gain a more comprehensive understanding of OU No. 13. The public is also encouraged to comment on information contained within the administrative record file and this PRAP. Public comments will be accepted by the DoN, USEPA Region IV, and NC DEHNR representatives listed at the end of this document.

The DoN, with assistance from the USEPA and the NC DEHNR, may modify the preferred alternative or select another remedy based upon new information or comments received from the public. The public comment period will begin on November 6, 1996 and end on December 6, 1996. MCB, Camp Lejeune and the DoN, with assistance from USEPA Region IV and the NC DEHNR, will select a final remedy for OU No. 13 only after the public comment period has ended and the information submitted during that time has been reviewed and considered. A Record of Decision (ROD) stating the selected remedial action plan for OU No. 13 will be prepared based upon the results of the RI, the PRAP, and the public comment period. The Final ROD may recommend a different remedial action than is presented in this PRAP depending upon public comments and any new information that may become available.

Report Organization

This PRAP document is divided into five main sections under the following headings: Introduction; Previous Investigations; Summary of Site-Related Risks; Proposed Remedial Action Plan for OU No. 13; and Community Participation. The first section presents background information pertaining to both MCB, Camp Lejeune and OU No. 13. The second section presents pertinent information and findings from previous site investigations. A summary of both human health and ecological site-related risks is presented within the third section. The fourth section presents the proposed remedial action plan for OU No. 13. Finally, the fifth section contains information for members of the community so that they may provide input during the selection of a remedy.

Background and Setting of MCB, Camp Lejeune

MCB, Camp Lejeune is located on the coastal plain of North Carolina in Onslow County. The facility encompasses approximately 234 square miles and is bisected by the New River. The New River flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the facility are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville borders MCB, Camp Lejeune to the north.

Construction of MCB, Camp Lejeune began in April 1941 at the Hadnot Point Industrial Area, where major functions of the base are located today. The facility was designed to be the "World's Most Complete Amphibious Training Base." The MCB, Camp Lejeune complex consists of five geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, and the Rifle Range Area.

Background and Setting of Operable Unit No. 13

There are currently 42 Installation Restoration (IR) sites at MCB, Camp Lejeune which have been grouped into 18 OUs. OUs are formed as an incremental step toward addressing individual site concerns. OUs may address geographical portions of a study area, site-specific problems or initial phases of an action, or may consist of any set of actions performed over time or any actions that may be concurrent but located in different parts of a site. OU No. 13 consists of only one IR site; Site 63 is also referred to as the Verona Loop Dump. As depicted on Figure 1, Site 63 is located within the western portion of the facility, to the south of Marine Corps Air Station (MCAS), New River. [Note: All tables and figures have been provided at the end of this document.]

The Verona Loop Dump (Site 63) is comprised of approximately five acres and is located nearly two miles south of the MCAS, New River operations area. Vehicle access to the site is via Verona Loop Road, east from U.S. Route 17. As depicted on Figure 2, the study area is located along Verona Loop Road approximately 1.25 miles from U.S. Route 17. Site 63 is bordered to the south by Verona Loop Road, to the east by an unnamed tributary to Mill Run, and to the west by a gravel access road.

Site 63 is relatively flat, however, the eastern portion slopes toward an intermittent tributary along the study area boundary; the unnamed tributary then discharges into Mill Run approximately 2,000 feet south of the study area. Mill Run discharges into the Southwest Creek which eventually flows into the New River. A drainage ditch along Verona Loop Road receives surface water runoff from the extreme southern portion of the site and the asphalt road surface. Figure 3 depicts the topography and general arrangement of Site 63.

Much of the site is heavily vegetated with dense understory and trees greater than three inches in diameter. A partially improved gravel road provides access to the main portion of the study area; other unimproved paths extend outward from this road. Training exercises, maneuvers, and recreational hunting are frequently conducted in the area. Several personnel entrenchments, used during training exercises, have been excavated throughout the study area. Earthen berms and small to medium size trees have been felled to construct protective works around many of the entrenchments.

Very little information is available regarding the history or occurrence of waste disposal practices at Site 63. The study area reportedly received wastes generated during training exercises. The type of materials generated during these exercises are described only as "bivouac" wastes. Additional information suggests that no hazardous wastes were disposed of at Site 63. The years during which disposal operations may have taken place are not known.

PREVIOUS INVESTIGATIONS

The following section describes previous investigation activities at Site 63. These investigations include an initial assessment study (IAS), a site inspection (SI), and an RI.

Initial Assessment Study, 1983

In 1983, an IAS was conducted at MCB, Camp Lejeune by Water and Air Research, Inc. The IAS evaluated potential hazards at various sites throughout MCB, Camp Lejeune, including Site 63. The IAS was based upon review of historical records, aerial photographs, a site visit, and personnel interviews. The IAS concluded that waste quantities at Site 63, regardless of their nature, were of a volume that did not require further investigation; therefore, additional investigations were not recommended for the study area at that time.

Site Inspection, 1991

In 1991, Baker Environmental, Inc. conducted an SI at Site 63 to confirm findings of the IAS. The SI consisted of the following field activities: the installation and sampling of three monitoring wells; the collection of two soil samples from each monitoring well pilot test boring (one near the surface and one just above the water table); the collection of two soil samples from six additional soil test borings; and the collection of two surface water and two sediment samples from the adjacent tributary to Mill Run.

Upon visual inspection of the site, conclusive indications (e.g., distressed vegetation, denuded areas, etc.) of hazardous waste disposal were not apparent; however, reinforced concrete rubble, construction material, and various other inert debris was identified during the SI and subsequent site visits. The observed waste material was limited to a number of distinct piles or areas, rather than being strewn throughout the study area.

The following paragraphs briefly describe the results and conclusions of the SI at Site 63. Tables 1 through 4 present summaries of laboratory analytical results from analysis performed on the samples collected during the SI.

Soil Investigation

The volatile organic compounds (VOCs) toluene and xylene were detected at concentrations of 2 and 3 μg/kg in a soil sample obtained from the ground surface. No other volatile compounds were detected among any of the samples obtained from either surface or subsurface soils. As provided in Table 1, concentrations of semivolatile organic compounds (SVOCs) ranged from 43 μg/kg of di-n-butylphthalate to 280 μg/kg of benzoic acid. The six soil samples obtained during installation of the three monitoring wells provided the only SVOC detections. The pesticides 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT were detected at low concentrations in one surface sample obtained from the eastern portion of the study area; no other pesticides were detected among the other soil samples. Aroclor-1254 was detected at a concentration of 1,000 μg/kg in a surface sample obtained near the central portion of the study area. Several inorganic analytes were also detected among the soil samples obtained at Site 63. The concentrations of the detected inorganic analytes were, for the most part, consistent with base-specific background levels. Table 1 presents positive detections of both organic and inorganic soil analytical results from the SI at Site 63.

Groundwater Investigation

Carbon disulfide, benzoic acid, and bis(2-ethylhexyl)phthalate were the only organic compounds detected in groundwater. Carbon disulfide was not detected in any other environmental media at Site 63. Aluminum, barium, chromium, lead, iron, and manganese (all total metals) were detected at concentrations which exceeded either federal Maximum Contaminant Levels (MCLs) or North Carolina Water Quality Standards (NCWQSs). However, studies conducted at several sites throughout MCB, Camp Lejeune have also exhibited concentrations of total metals in excess of water quality standards. The results of these analyses tend to reflect the presence of suspended material in samples rather than depict true groundwater conditions. Table 2 presents a summary of the groundwater analytical results from the SI conducted at Site 63.

Surface Water and Sediment Investigation

No organic compounds were detected among the two surface water and two sediment samples obtained from the unnamed tributary that lies to the east of Site 63. A number of inorganic analytes were, however, detected in both the surface water and sediment samples. Iron was the only inorganic analyte detected among the surface water samples at a concentration which exceeded applicable state or federal screening values. Table 3 provides a summary of positive surface water detections.

Two sediment samples were also collected from the same surface water and sediment sampling locations along the unnamed tributary. Several inorganic analytes were detected including arsenic, chromium, copper, lead, nickel, and zinc. Only one detection each of copper and lead exceeded federal screening values. The sediment comparison values were based upon a potential to adversely impact aquatic life. The concentrations of copper and lead were within the "probable" adverse effects to biota range. Table 4 presents sediment analytical results generated during the SI at Site 63.

Remedial Investigation, 1995

The RI field investigation of Site 63 commenced on November 2, 1995 and continued through November 16, 1995. The RI field program at Site 63 consisted of a site survey; a soil investigation, which involved direct-push sample collection; a groundwater investigation, which included temporary monitoring well installation, sampling, and aquifer testing; a surface water and sediment investigation; and a habitat evaluation. The following provides an overview of the various investigation activities carried out during the RI:

- Surface Soil Samples Collected 46
- Subsurface Soil Samples Collected 50
- Temporary Wells Installed and Sampled 8
- Existing Shallow Wells Sampled 3
- Surface Water Samples Collected 5
- Sediment Samples Collected 5

The various investigations were performed at Site 63 to assess the nature and extent of contamination that may have resulted from previous waste management practices or site activities; assess the human health, ecological, and environmental risks associated with exposure to surface and subsurface soils; and characterize the geologic and hydrogeologic setting of the study area. The following provides a brief summary regarding the extent of contamination at Site 63. This summary focuses on the primary site concerns and is not intended to address all analytical results. A summary of site

contamination, by media, is provided in Table 5. Figure 4 depicts the various RI sampling locations at Site 63.

Soil Investigation

Styrene was detected in only one of the subsurface soil samples obtained at Site 63. Styrene was detected at a concentration of 41 µg/kg in a subsurface sample from location 63-SB15. No other VOCs were detected among the 96 soil samples retained for laboratory analyses. Given the limited extent of styrene and the lack corroborating evidence of volatile contamination, the presence of styrene is most likely the result of a single event rather than long-term disposal operations. Additionally, the single styrene detection did not exceed the applicable soil screening value of 2,000 µg/kg.

The presence of SVOCs in soil is most likely the result of former or ongoing activities at Site 63. The concentration and infrequent detection of semivolatile compounds among soil samples is consistent with the historical use of Site 63; indicative of incidental spillage, or may be the result of ongoing maneuvers and training exercises. Semivolatile compounds were identified in both surface and subsurface soil samples obtained from the suspected disposal portion of the study area. Concentrations of SVOCs were limited to two surface and three subsurface sampling locations throughout the entire site. The positive SVOC results correspond directly to the visual identification of graded soil or construction debris observed during the field investigation. None of the positive SVOC detections exceeded applicable soil screening values for the protection of groundwater, nor do they suggest long-term disposal operations.

Positive detections of pesticides were observed in both surface and subsurface soil samples at Site 63. Pesticide concentrations were low (i.e., less than 0.1 mg/kg) and primarily limited to within and adjacent to the suspected disposal portion of the study area. The majority of pesticide detections were observed in surface soil samples. The frequency and overall concentration of pesticides in soil, nonetheless, does not suggest pesticide disposal activities. Much of the study area appears to have been graded during previous site operations; the reworked surface soil may have contained residual pesticides. The presence of pesticide compounds among soil samples obtained at Site 63 is most likely the result of routine base-wide application and use of pesticides.

As provided in Table 5, a number of samples submitted for analyses had target analyte list (TAL) metal concentrations which exceeded applicable soil screening values or base-specific background levels. Arsenic, barium, and nickel were detected at concentrations which exceeded soil screening values protective of groundwater among one, five, and seven of the 96 soil samples submitted for analyses; however, the same three inorganic analytes were not detected above NCWQSs among any of the groundwater samples obtained at Site 63.

The distribution of detected inorganic analytes among both surface and subsurface samples followed no discernible pattern. In at least one case, however, findings from the analytical program were consistent with visual observations of buried debris and non-native surface material recorded during the field investigation. A total of 13 inorganics were detected above twice their average base-specific background levels; 9 of the 13 analytes were detected at maximum concentrations in a subsurface sample obtained from location 63-SB23. Boring 63-SB23 is located within the central portion of the suspected disposal area and identified as having both surface and subsurface debris (refer to Figure 4). With the exception of boring 63-SB23, inorganic analytes were observed at varying concentrations scattered throughout the study area.

Groundwater Investigation

Volatile, semivolatile, pesticide, and polychlorinated biphenyl (PCB) organic compounds were not detected in any of the groundwater samples submitted for analyses from Site 63. As a result of those analyses, the extent of organic compounds in groundwater were not addressed.

Inorganic analytes were detected in each of the 11 groundwater samples submitted for analyses from Site 63. Iron, manganese, and zinc were the only TAL total metals detected at levels in excess of either federal MCL or NCWQS. Positive detections that exceeded applicable screening standards for both iron and manganese were distributed throughout the suspected disposal portion of the study area. The sample obtained from temporary well 63-TW07 exhibited the only positive detection of zinc that exceeded the 2,100 µg/L screening standard, zinc was detected at a concentration of 17,100 µg/L. Subsurface soil samples collected from both the eastern and western portions of the study area had positive detections of zinc which exceeded background levels. Although the distribution of zinc among soil samples is not limited to the suspected disposal portion of the study area, temporary well 63-TW07 is located within one of the areas identified as having elevated concentrations of zinc in soil. The presence of zinc in soil does not completely account for its elevated concentration in groundwater, however. If zinc disposal operations had taken place at Site 63 elevated concentrations of zinc would also be evident in the adjacent monitoring well 63-GW02 and at much higher concentrations among soil samples obtained from the suspected disposal area. Temporary monitoring well 63-TW07 is hydraulically downgradient from the suspected disposal portion of the study area and permanent well 63-GW02. The limited dispersion of zinc in sampling media suggests that its presence is not indicative of former or ongoing disposal activities.

Groundwater within the coastal plain region of North Carolina is naturally rich in iron and manganese. Groundwater concentrations of both iron and manganese at MCB, Camp Lejeune often exceed the state standards of 300 and 50 µg/L. Elevated levels of iron and manganese, at concentrations above the NCWQS, were reported in samples collected from a number of base potable water supply wells which were installed at depths greater than 162 feet below ground surface. Certain total metal concentrations in groundwater are due more to geologic conditions (i.e., naturally occurring concentrations and unconsolidated soils) and sample acquisition methods, than to mobile metal concentrations in the surficial aquifer.

Iron and manganese concentrations from a number of wells at Site 63 exceeded the NCWQS but fell within the range of concentrations for samples collected elsewhere at MCB, Camp Lejeune. Additionally, positive detections of both iron and manganese among groundwater samples retained from the upper-most portion of the surficial aquifer had no discernible pattern of distribution. The presence and concentrations of both iron and manganese in groundwater samples obtained at Site 63 appear to be indicative of natural site conditions rather than disposal activities.

Surface Water Investigation

No organic compounds were detected among any of the five surface water samples submitted for analyses from Site 63. As a result of those analyses, the extent of organic compounds in surface water were not addressed within the RI report.

Aluminum was the only TAL total metal identified among each of the five surface water samples obtained from the unnamed tributary that exceeded state or federal chronic screening values. Each sampling station had a positive detection of aluminum above the 87 µg/L chronic screening value. Positive aluminum detections among the five surface water samples obtained from the unnamed tributary ranged from 602 to 688 µg/L. The headwaters of the unnamed tributary are less than one hundred yards upgradient of Site 63, amongst pine and hardwood trees. The combination of acidic soil and acidification due to decaying leaves and pine needles most probably has contributed to the slightly acidic nature of surface water at Site 63. Field chemistry results suggest that the pH of the unnamed tributary is less than 4.0. Several hundred or even several thousand milligrams per liter of aluminum is not unusual for natural waters having a pH below 4.0. The slight acidity of surface water at Site 63, coupled with the natural occurrence of aluminum in site soil and sediment has effectively contributed to the observed levels of aluminum among each of the surface water samples.

Sediment Investigation

None of the TAL metal sampling results from Site 63 exceeded chronic sediment screening values; therefore, the extent of inorganic analytes in sediment were not addressed within the RI report. A summary of site contamination is presented in Table 5. Volatile, semivolatile, and PCB compounds were not detected among any of the five sediment samples submitted for analyses from Site 63. As a result of those analyses, the extent of volatile, semivolatile, and PCB compounds in sediment were also not addressed.

The pesticides 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, and gamma-chlordane were detected in one of the five sediment samples retained for analysis from Site 63. The only other pesticide detection was that of 4,4'-DDD in a sample obtained from a separate sampling location. Each of the pesticides were detected at concentrations less than 15 µg/kg. The maximum pesticide concentration among the five sediment samples obtained for laboratory analysis was 11 µg/kg of 4,4'-DDD. Each of the pesticide detections exceeded applicable chronic sediment screening values. The observed concentrations of the detected pesticides were typical of levels observed in sediments throughout MCB, Camp Lejeune. Positive detections of these compounds at Site 63 are most likely the result of former base-wide application and use of pesticides. The frequency and overall concentration of pesticides at Site 63 is not indicative of pesticide disposal activities.

SUMMARY OF SITE-RELATED RISKS

As part of the RI, both a human health risk assessment (RA) and an ecological RA were conducted to determine potential risks associated with possible exposure to environmental media at Site 63. The following subsections briefly summarize the findings of the human health and ecological RAs.

Human Health Risk Assessment

During the human health RA, contaminants of potential concern (COPCs) were selected for surface soil, subsurface soil, groundwater, surface water, and sediment. The selection of COPCs was based upon criteria provided in the USEPA Risk Assessment Guidance for Superfund. For each COPC identified, incremental lifetime cancer risk (ICR) values and hazard index (HI) values were calculated to quantify potential carcinogenic and noncarcinogenic risks posed by possible exposure to site media. Table 6 presents ICR and HI values for each environmental media and both current and future potential receptors. Current and future potential receptors evaluated in the RI included current military personnel, current trespassers (i.e., adolescents and adults), future residents (i.e., children and adults), and future construction workers. Table 6 also presents total ICR and HI values, which represent combined risks posed by possible exposure to site media. The total site-related risk was estimated by logically summing the multiple exposure pathways likely to affect the receptor during a given activity.

Table 6 presents the HI values that exceed the USEPA acceptable limit of 1.0. As depicted in Table 6, unacceptable risk values include the HI for future child residents exposed to groundwater (10.0) and the HI for future adult residents exposed to groundwater (4.5). The subsections which follow present both current and future risk scenarios.

Current Scenario

In the current case, the following receptors were assessed: military personnel and trespassers. Receptor exposure to surface soil, surface water, and sediment was assessed for the trespassers. Receptor exposure to surface soil, subsurface soil, surface water, and sediment was assessed for military personnel. The potential risks associated with the current receptors were within or below the acceptable risk range as defined by USEPA.

Future Scenario

In the future case, child and adult residents were assessed for potential exposure to groundwater, surface soil, surface water, and sediment. A construction worker was evaluated for surface soil and subsurface soil exposure. There were no unacceptable risks associated with the construction worker. However, there were potential noncarcinogenic risks calculated for the child resident from groundwater (10.0) exposure. Similarly, there was a noncarcinogenic risk (4.5) calculated for the adult resident from groundwater exposure. These risk values exceeded the hazard index of 1.0 for noncarcinogenic effects. The maximum level of iron and zinc in groundwater were the primary contributors to these noncarcinogenic risks.

As stated previously, groundwater is not currently used potably at the site, and future residential development of the site is unlikely. Based on this information, the future groundwater exposure scenario evaluated in this risk assessment, although highly protective of human health, is unlikely to occur.

It should be noted that iron is an essential nutrient. The toxicity values associated with exposure to this metal are based on provisional studies which have not been verified by USEPA. In fact, if iron were removed from the evaluation of risk from groundwater ingestion, the noncarcinogenic risk for the child would decrease from 10.0 to 4.8 and, for the adult, from 4.5 to 2.3. As a result, the potential human health risk from exposure to iron in groundwater is conservative.

The other analyte contributing to the unacceptable HI value in groundwater for the future residential child and adult is zinc. Zinc had a HI of 3.6 for the future child resident and 1.6 for the future adult resident. While zinc was detected at a frequency of six out of eleven samples, only one detection exceeded the comparison criteria. This concentration of zinc (17,000 µg/L) is one order of magnitude greater than those detected in Site 63 soils. In addition, zinc was not detected in surface water. Consequently, the potential human health risk from exposure to zinc in groundwater is a conservative estimate.

Although the HI values for future residents exceed USEPA acceptable limits, the risks they represent appear to be insignificant. As a result, conditions at OU No. 13 may be considered protective of human health and the environment.

Ecological Risk Assessment

During the ecological RA, COPCs were selected for surface water, sediment, and surface soil, as provided in Table 7. Then, potential ecological risks associated with each COPC were evaluated. The following paragraphs summarize the conclusions made for aquatic and terrestrial receptors at OU No. 13 (Site 63).

The following subsections provide an overview of potential risks to both aquatic and terrestrial environs identified at Site 63 during this assessment. Potential risks to the aquatic environment at Site 63 are demonstrated by the cumulative quotient index (QI) ratios greater than 1.0 calculated for both surface water and sediment. In addition, potential risks to the terrestrial environment are demonstrated by exceedances of soil toxicity values and risk exhibited in terrestrial chronic daily intake (CDI) models. However, the significance of the potential risks is considered to be low based on this ecological risk assessment.

Aquatic Ecosystem

Surface water concentrations of aluminum, barium, and lead may be adversely impacting the aquatic environment in the freshwater stream at Site 63. Cumulative quotient index (QI) ratios were calculated for the surface water at 1.31 for acute and 16.28 for chronic. These inorganic COPCs were detected at relatively the same concentrations at each sampling location. However, due to the conservative barium criteria and lead in the blank sample, aluminum appears to be the only COPC potentially impacting the aquatic environment. It should be noted that aluminum and barium were detected at higher concentrations during the 1991 SI. In addition, aluminum dissolves readily into surface water under acidic conditions; pH concentrations detected at Site 63 surface water stations were below four. Therefore, the low pH levels may have elevated the concentrations of aluminum detected in the surface water.

The potential risk to the aquatic community posed by the sediment is demonstrated by cumulative QI value of 11.33 for the effects range-low (ER-L). It is noted that risk is not demonstrated by the cumulative QI values calculated for the effects range-median (ER-M) (0.98) and sediment quality criteria (SQC) (0.66) values. The risk to the aquatic environment from the sediment is primarily due

to concentrations of chlordane, 4,4'-DDD, and 4,4'-DDE. However, these pesticides are not site-related contaminants, but rather a result of former base-wide pesticide control programs.

It should be noted that the intermittent, shallow nature of the stream may also introduce stress to the aquatic environment. The shallowness of the stream subjects the surface water to low dissolved oxygen concentrations and high temperatures both of which may adversely impact many aquatic organisms.

Terrestrial Ecosystem

Overall, some potential impacts to soil flora and fauna may occur as a result of concentrations of aluminum, chromium, copper, iron, lead, manganese, mercury, and zinc detected in the surface soil at Site 63. It should be noted that there is much uncertainty in the use of the flora and fauna surface soil screening values (SSSVs). In addition, the inorganics with the most exceedances of the SSSVs (aluminum, chromium, and iron) also exceed SSSVs for the background concentrations, indicating that regional conditions contribute to the potential risk to the terrestrial flora and fauna.

The terrestrial intake models only demonstrated a significant risk greater than one for the raccoon model. This risk was driven by concentrations of aluminum in the surface water via bioconcentration in fish tissue; however, it should be noted that background surface water concentrations of aluminum also may generate a risk in the raccoon model. Therefore, regional conditions are contributing to the terrestrial risk to the vertebrate population at Site 63.

The conclusions of the ecological RA, for both aquatic and terrestrial receptors, indicate that although a number of organic compounds and inorganic analytes exceeded applicable screening values, ecological risks at Site 63 appear to be insignificant. As a result, conditions at OU No. 13 may be considered protective of the environment.

PROPOSED REMEDIAL ACTION PLAN FOR OU No. 13

The No Further Remedial Action Alternative is the preferred remedy for OU No. 13 (Site 63). As its name suggests, this alternative involves taking no further remedial action at OU No. 13. This includes conducting no further environmental investigations or sampling. The site and all environmental media located within the site will remain in their current state. In addition, land use restrictions will be implemented via the Base Master Plan to preclude residential development and prohibit the installation of water supply wells within 1,000 feet of Site 63.

No Further Remedial Action Decision Rationale

This section provides detailed justification in support of the preferred remedial alternative for OU No. 13. The subsections which follow address individual site concerns and remedial limitations which have lead to the selection of the No Further Remedial Action Alternative.

Carcinogenic Risks

There are no unacceptable site-related carcinogenic risks associated with exposure to environmental media at Site 63. Multiple exposure pathways were evaluated for current and future potential human receptors; resultant estimates indicate that carcinogenic site risks are within or below the acceptable risk range as defined by USEPA.

Noncarcinogenic Risks

An assessment of potential noncarcinogenic risks posed by exposure to environmental media at Site 63 was also completed for possible current and future human receptors. This conservative evaluation of site risk suggests that future residents, given a number of exposure assumptions, could experience some adverse health effects. The evaluation was based upon the potential exposure of future child and future adult residents. Over 90 percent of noncarcinogenic risk generated by the future residential scenario is the result of presumed shallow groundwater ingestion. Ingestion of iron and zinc at the maximum concentrations detected among all groundwater samples obtained from Site 63 were used in the estimation of risk. It is important to note that this risk assessment is highly protective of human health and that future residential development of the site is unlikely.

Surficial Aquifer as Drinking Water Source

The majority of site-related noncarcinogenic risk to future residents was generated by possible ingestion of inorganic analytes in groundwater. Hydraulic conductivity results from Site 63 suggest that potable wells supplying groundwater for human consumption from the uppermost portion of the surficial aquifer would not be practical. Groundwater flow rates would not be sufficient to support a potable source of drinking water. In addition, suspended material resulting from loose surficial soils would further inhibit groundwater flow capacities through siltation. Given these circumstances, it is unlikely that the surficial aquifer could be used as a drinking water source. If a potable well were required in the future at Site 63 it would most likely supply groundwater from the deeper, Castle Hayne aquifer.

Ecological Risks

An ecological risk assessment of potential site-related impacts to both aquatic and terrestrial ecosystems was performed. Environmental media were assessed to determine the theoretical risks posed to various on-site ecological communities. Results of the ecological risk assessment indicate that the aquatic environment may potentially be impacted by pesticides detected in the sediment and that risks posed to the terrestrial environment are a result of naturally occurring inorganic analytes detected in the surface water and surface soil. Similar aquatic and terrestrial risks have been demonstrated by reference samples collected throughout MCB, Camp Lejeune from areas not known or suspected of having been impacted by facility operations. Based upon this assessment, the significance of potential risks to ecological receptors at Site 63 is considered negligible.

Prevalence of Inorganic Analytes in Site Media

Inorganic analytes were detected in each soil, groundwater, surface water, and sediment sample obtained during the field investigation at Site 63. Analytes such as aluminum, arsenic, iron, lead, manganese, and zinc were principal contributors to both human health and ecological site risks. These and other inorganic analytes naturally occur, often abundantly, in site media. No discernible pattern of analyte distribution was evident among the various media sampled. Former site operations do not appear to have contributed to the presence or frequency of these analytes.

COMMUNITY PARTICIPATION

A critical part of the remedial alternative selection process is community involvement. The following information has been provided to solicit input from the community during the selection of a remedy for OU No.13.

Public Comment Period

The 30-day public comment period for the proposed remedial action plan at OU No. 13 will begin on November 6, 1996 and end on December 6, 1996. Written comments may be sent to the following points of contact:

Commander
Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Bldg. N-26)
Norfolk, Virginia 23511-2699
Attn: Ms. Katherine Landman, Code 18232

or Commanding General
AC/S Environmental Management Department - IRD
Marine Corps Base
PSC Box 20004
Camp Lejeune, North Carolina 28542-0004

A public meeting will be held at the Onslow County Library in Jacksonville, North Carolina on November 6, 1996. Representatives of the Navy, and their consultant, will be available at the meeting to answer questions and accept public comments regarding the proposed remedial plan for OU No. 13 (Site 63). In addition, an overview of the site characterization will be presented.

Meeting minutes will be made available to the public through the information repositories listed within this document. A responsiveness summary will be prepared at the conclusion of the comment period to summarize significant comments, criticisms, and new relevant information submitted to MCB, Camp Lejeune and the DoN during the comment period. The summary will include the responses to each issue and question raised at the public meeting. After the ROD is signed, MCB, Camp Lejeune and the DoN will publish a notice of availability of the ROD (including the responsiveness summary) in the Jacksonville and MCB, Camp Lejeune newspapers. A copy of the ROD will also be placed at both information repositories listed within this PRAP.

Information Repositories

A collection of general information pertaining to all MCB, Camp Lejeune OUs and IR sites, including all administrative records, is available to the community for review at the following locations:

MCB, Camp Lejeune
Building 67, Room 238
Marine Corps Base
Camp Lejeune, NC 28542
(910) 451-5068

Hours:
M-F: 7:00 a.m.- 4:00p.m.
Closed Saturday and Sunday

Onslow County Library
58 Doris Avenue East
Jacksonville, NC 28540
(910) 455-7358

Hours:
M-Thu: 9:00 a.m.- 9:00 p.m.
F-Sat: 9:00 a.m.- 6:00 p.m.
Closed Sunday

Public Inquiries

Inquires concerning the proposed remedy for OU No. 13 or other related issues may be directed to any of the following points of contact:

Commanding General
AC/S Environmental Management Department - IRD
Marine Corps Base
PSC Box 20004
Camp Lejeune, North Carolina 28542-0004
Attention: Mr. Neal Paul
(910) 451-5068

Commander
Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Bldg. N-26)
Norfolk, Virginia 23511-2699
Attention: Ms. Katherine Landman, Code 18232
(804) 322-4818

Remedial Project Manager
U.S. Environmental Protection Agency, Region IV
Atlanta Federal Center
100 Alabama Street, SW
Atlanta, Georgia 30303-3104
Attention: Ms. Gena Townsend
(404) 347-3016

N.C. Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687
Raleigh, North Carolina 27611-7687
Attention: David J. Lown, L.G., P.E.
(919) 733-4811

Community Information Line
Public Affairs Office
Marine Corps Base, PSC Box 2004
Camp Lejeune, North Carolina 28542-0004
Attention: Major Stephen Little
(910) 451-5782

Mailing List

If you are not on the current mailing list and would like to receive future publications pertaining to OU No. 13, as they become available, please contact by telephone or complete and mail a copy of the following form:

Commanding General
AC/S Environmental Management Department - IRD
Marine Corps Base
P.S.C. Box 20004
Camp Lejeune, North Carolina 28542-0004
Attn: Mr. Neal Paul
(910) 451-5068

Name _____

Address _____

Affiliation _____

Phone (____) _____

TABLES

TABLE 1

SUMMARY OF POSITIVE DETECTIONS IN SOIL
SITE INSPECTION, 1991
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Organic Compounds	Surface Soil (0-2 feet)			Subsurface Soil (below 2 feet)		
	Detection Frequency	Range of Positive Detections (µg/kg)	Location of Maximum Concentration	Detection Frequency	Range of Positive Detections (µg/kg)	Location of Maximum Concentration
Toluene	1/9	2	SB03	0/9	ND	NA
Total Xylenes	1/9	3	SB03	0/9	ND	NA
Benzoic Acid	2/9	45-280	MW02	0/9	ND	NA
Di-n-butylphthalate	3/9	43-51	MW01	2/9	43-78	MW02
bis(2-Ethyhexyl) phthalate	3/9	44-72	MW02	1/9	62	MW01
4-4'-DDE	1/9	58	SB04	0/9	ND	NA
4-4'-DDD	1/9	53	SB04	0/9	ND	NA
4-4'-DDT	1/9	39	SB04	0/9	ND	NA
Aroclor-1254	1/9	1000	SB02	0/9	ND	NA

TABLE 1 (Continued)

SUMMARY OF POSITIVE DETECTIONS IN SOIL
SITE INSPECTION, 1991
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Inorganic Analytes	Surface Soil (0-2 feet)			Subsurface Soil (below 2 feet)		
	Detection Frequency	Range of Positive Detections (mg/kg)	Location of Maximum Concentration	Detection Frequency	Range of Positive Detections (mg/kg)	Location of Maximum Concentration
Aluminum	8/9	975-8,450	SB01	9/9	1,920-20,500	SB04
Arsenic	4/9	1.4-2.3	SB03	5/9	1.3-9.1	SB06
Barium	3/9	16.9-22.9	SB04	3/9	16.3-41.8	SB04
Calcium	0/9	ND	NA	3/9	79.7-377.0	SB04
Chromium	8/9	1.7-11.3	SB03	9/9	2.0-30.3	SB04
Copper	8/9	2.3-20.3	SB05	9/9	2.9-24.0	SB04
Iron	8/9	741-5980	SB03	9/9	682-16,100	SB01
Lead	8/9	2.2-36.3	SB04	9/9	2.1-8.5	SB04
Magnesium	7/9	32.2-324.0	SB01	9/9	40.9-1020.0	SB04
Manganese	7/9	6.6-22.8	SB04	8/9	4.9-57.1	SB04
Nickel	5/9	2.1-3.9	SB01	7/9	2.2-7.3	SB04
Potassium	4/9	373-697	SB03	7/9	290-2,000	SB04
Vanadium	8/9	2.2-13.8	SB03	9/9	1.6-36.9	SB04
Zinc	6/9	8.4-57.1	SB04	7/9	6.6-33.9	SB04

Notes:

µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram
ND - not detected
NA - not applicable

TABLE 2

SUMMARY OF POSITIVE DETECTIONS IN GROUNDWATER
SITE INSPECTION, 1991
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Potential Contaminant	Detection Frequency	Range of Positive Detections (µg/L)	Location of Maximum Concentration	Comparison Criteria	
				USEPA MCL (µg/L)	State Standard (µg/L)
Carbon Disulfide	2/3	1	MW01, MW02	NE	0.7
Benzoic Acid	1/3	3	MW02	NE	NE
bis(2-Ethylhexyl)phthalate	1/3	9	MW02	NE	NE
Aluminum	3/3	3,650-85,300	MW02	0.05 - 0.2	NE
Barium	3/3	56.1-5,410	MW02	2,000	2,000
Chromium	3/3	4.4-134	MW02	100	50
Iron	3/3	4,320-100,000	MW02	300	300
Lead	3/3	4.3-369	MW02	15[1]	15
Manganese	3/3	50.3-1,020	MW02	50	50

Notes:

µg/L - microgram per liter
[1] USEPA "action level" for lead
NE - Not Established

TABLE 3

SUMMARY OF POSITIVE DETECTIONS IN SURFACE WATER
SITE INSPECTION, 1991
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	Detection Frequency	Range of Positive Detections (µg/L)	FWQSV/ NCWQS (µg/L)
Aluminum	2/2	1,030-1,170	NE
Barium	2/2	26.9-34.8	--/1,000
Calcium	2/2	1,570-2,520	NE
Copper	1/2	6.3	6.54/7.0
Iron	2/2	1,040-1,090	--/1,000
Magnesium	2/2	746-845	NE
Manganese	2/2	10.4-13.6	--/200
Nickel	1/2	10.2	88/25
Sodium	2/2	4,150-4,780	NE
Thallium	1/2	2.0	NE

µg/L - micrograms per liter
FWQSV - Fresh Water Quality Screening Value (USEPA Region IV, 1994).
NCWQS - North Carolina Water Quality Value for fresh water aquatic life or more stringent standard to support additional uses.
NE - Not Established

TABLE 4

SUMMARY OF POSITIVE DETECTIONS IN SEDIMENT
SITE INSPECTION, 1991
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	Detection Frequency	Range of Positive Detections (mg/kg)	Effects Range Low[1] (mg/kg)
Aluminum	2/2	803-13,400	NE
Arsenic	1/2	3.5	8.2
Barium	2/2	2.7-34.2	NE
Beryllium	1/2	0.31	NE
Calcium	1/2	160	NE
Chromium	2/2	1.7-17.3	81
Copper	2/2	16.8-76.8	34
Iron	2/2	376-5750	NE
Lead	2/2	3.4-90.0	46.7
Magnesium	2/2	36.5-525	NE
Manganese	2/2	2.7-14.7	NE
Nickel	2/2	3.5-8.2	20.9
Potassium	1/2	873	--
Vanadium	2/2	1.6-24.0	--
Zinc	2/2	3.5-19.0	150

Notes:

mg/kg - milligrams per kilogram
[1] Region IV - Effects Range Low from Long, et. al., 1995.
NE - Not Established

TABLE 5

SUMMARY OF SITE CONTAMINATION
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction (units)	Detected Contaminants or Analytes	Comparison Criteria		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above		Distribution of Positive Detections
			Screening Standard	Base Background					Screening Standard	Base Background	
Surface Soil	Volatile (µg/kg)	ND	Soil SL	NA				0/46			
	Semivolatile (µg/kg)	Nitrosodiphenylamine	200	NA	51 J	51 J	SB12	1/45	0/45	NA	adjacent to 63-GW01
		Di-n-butylphthalate	120,000	NA	78 J	78 J	63-TW06	1/45	0/45	NA	southeast
		BEHP	11,000	NA	41 J	4,400	SB12	7/45	0/45	NA	1 exceeds blank conc.
	Pesticide (µg/kg)	Dieldrin	1.0	NA	3 J	4.1 J	SB32	3/46	3/46	NA	central, scattered
		4-4'-DDE	500	NA	2.7 J	55 J	SB35	7/45	0/45	NA	central, scattered
		4-4'-DDD	700	NA	12	26 J	SB35	2/45	0/45	NA	central and eastern
		Endosulfan Sulfate	NA	NA	1.9 J	2.8 J	SB18	4/45	NA	NA	central and northern
		4-4'-DDT	1,000	NA	2 J	50 J	SB29	11/45	0/45	NA	central, scattered
		alpha-Chlordane	NA	NA	3.5	16	SB35	2/45	NA	NA	central and eastern
		gamma-Chlordane	NA	NA	2.7 J	9	SB35	2/45	NA	NA	central and eastern
	PCB (µg/kg)	Aroclor-1260	NA	NA	28 J	97	SB30	2/45	NA	NA	central
	Metal (1) (mg/kg)	Arsenic	15	1.3	0.32	3.7	SB21	36/46	0/46	5/46	scattered
		Barium	32	17.3	3.0	53.1	SB35	46/46	3/46	8/46	scattered
		Beryllium	180	0.2	0.1 J	0.27	SB32	5/46	0/46	1/46	central
		Cadmium	6	0.7	1.0	3.1	SB21	2/46	0/46	2/46	central and eastern
		Chromium	NA	6.6	1.1	11.1	SB21	44/46	NA	6/46	scattered
		Copper	NA	7.1	0.47	74.8	SB29	29/46	NA	10/46	scattered
		Iron	NA	3,702	590	22,400	SB21	46/46	NA	9/46	scattered
		Lead	NA	23.4	2.6	107	SB29	46/46	NA	5/46	scattered
		Manganese	NA	18.5	3.4 J	348 J	SB03	46/46	NA	13/46	scattered
		Mercury	3	0.09	0.06	0.21 J	SB23	4/46	0/46	1/46	central
		Nickel	21	3.5	0.62 J	9.8	SB21	33/46	0/46	2/46	central
		Silver	NA	0.9	0.72	0.97	SB29	2/46	NA	1/46	central
		Zinc	42,000	13.8	0.98	1,860	SB21	36/46	0/46	7/46	scattered

TABLE 5 (Continued)

SUMMARY OF SITE CONTAMINATION
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction (units)	Detected Contaminants or Analytes	Comparison Criteria		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above		Distribution of Positive Detections
			Screening Standard	Base Background					Screening Standard	Base Background	
Subsurface Soil	Volatile (µg/kg)	Styrene	2,000	NA	41	41	SB15	1/50	0/50	NA	northwest
	Semivolatile (µg/kg)	Nitrosodiphenylamine	200	NA	94 J	350 J	SB19	2/49	1/49	NA	northern
		BEHP	11,000	NA	41 J	4,700	SB19	12/49	0/49	NA	3 exceed blank conc.
	Pesticide (µg/kg)	Dieldrin	1.0	NA	2.1 J	5.0 J	SB32	2/50	2/50	NA	northern and western
		4,4'-DDE	500	NA	2.6 J	2.8 J	SB22	2/50	0/50	NA	central
		4,4'-DDD	700	NA	5.6	5.6	SB22	1/50	0/50	NA	central
		4,4'-DDT	1,000	NA	7.8	7.8	SB20	1/50	0/50	NA	northern
	PCB (µg/kg)	ND	Soil SL	NA				0/50			
	Metal (1) (mg/kg)	Aluminum	NA	7,413	312	16,000	SB07	50/50	NA	32/50	scattered
		Antimony	NA	6.5	2.5 J	16.2 J	SB23	7/42	NA	1/42	central
		Arsenic	15	2	0.4	16	SB14	47/50	1/50	28/50	scattered
		Barium	32	14.4	2.5	1,120	SB23	50/50	2/50	8/50	scattered
		Beryllium	180	0.2	0.08	0.29	63-TW08	18/50	0/50	6/50	scattered
		Chromium	NA	12.5	1.2	84.4	SB23	50/50	NA	27/50	scattered
		Copper	NA	2.4	0.55	160	SB23	38/50	NA	27/50	scattered
		Iron	NA	7,135	425 J	149,000	SB23	50/50	NA	20/50	scattered
		Lead	NA	8.3	2 J	1,650	SB23	50/50	NA	11/50	scattered
		Manganese	NA	8.0	1.5	586	SB23	50/50	NA	18/50	scattered
		Nickel	21	3.7	1.0	76.1	SB26	44/50	7/50	19/50	scattered
		Silver	NA	0.9	1.8	5.3	SB23	2/50	NA	2/50	central
		Zinc	42,000	6.7	1.3	1,130	SB23	38/50	0/50	16/50	scattered
Groundwater	Volatile (µg/L)	ND	NCWQS/ MCL	NA				0/11			
	Semivolatile (µg/L)	ND	NCWQS/ MCL	NA				0/11			
	Pesticide (µg/L)	ND	NCWQS/ MCL	NA				0/10			
	PCB (µg/L)	ND	NCWQS/ MCL	NA				0/10			
	Total Metal (µg/L)	Iron	300	NA	73.5	24,300	63-TW05	8/11	4/11	NA	central
		Manganese	50	NA	1.8	311	63-GW02	11/11	4/11	NA	central
		Zinc	2,100	NA	4.9	17,100	63-TW07	6/11	1/11	NA	eastern

TABLE 5 (Continued)

SUMMARY OF SITE CONTAMINATION
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Media	Fraction (units)	Detected Contaminants or Analytes	Comparison Criteria		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above		Distribution of Positive Detections
			Screening Standard	Base Background					Screening Standard	Base Background	
Surface Water	Volatile (µg/L)	ND	NCWQS	NA				0/5			
	Semivolatile (µg/L)	ND	NCWQS	NA				0/5			
	Pesticide (µg/L)	ND	NCWQS	NA				0/5			
	PCB (µg/L)	ND	NCWQS	NA				0/5			
	Metal (2) (µg/L)	Aluminum	87	1,350	602	688	63-SW05	5/5	5/5	0/5	maximum downstream
Sediment	Volatile (µg/kg)	ND	NOAA ER-L	NA				0/5			
	Semivolatile (µg/kg)	ND	NOAA ER-L	NA				0/5			
	Pesticide (µg/kg)	4,4'-DDE	2	NA	4.2 J	4.2 J	63-SD04	1/5	1/5	NA	adjacent to site
		4,4'-DDD	2	NA	2.6 J	11 J	63-SD04	2/5	2/5	NA	adjacent to site
		4,4'-DDT	1	NA	1.6 J	1.6 J	63-SD04	1/5	1/5	NA	adjacent to site
		alpha-Chlordane	0.5	NA	4.7 J	4.7 J	63-SD04	1/5	1/5	NA	adjacent to site
		gamma-Chlordane	0.5	NA	6.2 J	6.2 J	63-SD04	1/5	1/5	NA	adjacent to site
	PCB (µg/kg)	ND	NOAA ER-L	NA				0/5			
	Metal (2) (mg/kg)	ND above screening val	NOAA ER-L	Background					0/5	0/5	

Notes: - Concentrations are presented in µg/L for liquid and µg/kg for solids (parts per billion), metal concentrations for soils and sediments are presented in mg/kg (parts per million).

(1) Metals in both surface and subsurface soils were compared to twice the average base background positive concentrations for aluminum, barium, iron, manganese and priority pollutant metals only (priority pollutant metals include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, zinc).

(2) Total metals in surface water and sediment were compared to the range of positive detections in upgradient samples at MCB, Camp Lejeune.

BEHP - bis(2-Ethylhexyl)phthalate

NA - Not applicable

ND - Not detected

MCL - Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system. U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories.

NCWQS - North Carolina Water Quality Standards. Separate Values Applicable to Groundwater (North Carolina Administrative Code, Title 15A, Subchapter 2L) and Surface Water (North Carolina Administrative Code, Title 15A, Subchapter 2B).

NOAA ER-L - USEPA Region IV Sediment Effects-Range Low Screening Values, established by the National Oceanic and Atmospheric Administration.

Soil SL - USEPA Region III Soil Screening Levels for Protection of Groundwater, established by the Office of Solid Waste Emergency Response: R.L. Smith (October 4, 1995).

TABLE 6

SUMMARY OF CURRENT AND FUTURE POTENTIAL SITE RISKS
REMEDIAL INVESTIGATION, 1995
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Receptors	Surface Soil		Subsurface Soil		Groundwater		Surface Water/Sediment		Total	
	ICR	HI	ICR	HI	ICR	HI	ICR	HI	ICR	HI
Current Military Personnel	1.3E-07	0.02	5.0E-07	0.1	NA	NA	2.1E-08	<0.01	6.5E-07	0.12
Current Adolescent Trespasser	2.8E-07	0.02	NA	NA	NA	NA	8.4E-08	0.01	3.7E-07	0.03
Future Child Resident	2.2E-06	0.2	NA	NA	8.6E-06	10	2.5E-07	0.05	1.1E-05	10.3
Current Adult Trespasser	1.8E-07	<0.01	NA	NA	NA	NA	1.6E-07	<0.01	3.4E-07	<0.01
Future Adult Resident	1.5E-06	0.03	NA	NA	1.8E-05	4.5	1.6E-07	<0.01	2.0E-05	4.5
Future Construction Worker	4.7E-08	0.03	1.8E-07	0.15	NA	NA	NA	NA	2.3E-07	0.18

Notes:

ICR = Incremental Lifetime Cancer Risk
HI = Hazard Index
Total = Soil + Groundwater + Surface Water/Sediment
NA = Not Applicable
Boxed values indicate risk values that exceed the acceptable risk value of 1.0 for noncarcinogens.

TABLE 7

SUMMARY OF TERRESTRIAL QUOTIENT INDICES
REMEDIAL INVESTIGATION, 1995
SITE 63 - VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	Red Fox	Bobwhite Quail	Cottontail Rabbit	Raccoon	Whitetail Deer
4,4'-DDE	1.94e-07	6.64e-05	3.41e-05	9.48e-07	2.97e-07
4,4'-DDT	1.88e-07	6.04e-05	2.56e-05	9.67e-07	1.90e-07
Dieldrin	5.94e-06	6.61e-05	3.79e-03	8.97e-05	5.45e-08
Endosulfan Sulfate	2.20e-07	1.59e-06	3.49e-04	2.28e-06	4.17e-06
Aluminum	5.72e-03	3.21e-01	9.16e-01	1.22e+01	5.79e-03
Arsenic	7.77e-04	1.89e-04	2.27e-03	3.31e-03	5.91e-05
Barium	2.50e-02	3.48e-02	2.20e-01	8.39e-02	1.15e-02
Beryllium	4.16e-06	1.20e-04	6.09e-04	2.09e-05	4.71e-06
Chromium	7.44e-05	9.06e-05	2.83e-04	3.84e-04	5.53e-06
Cobalt	1.96e-05	9.14e-04	3.50e-03	9.40e-05	8.10e-05
Copper	1.42e-04	6.41e-03	7.49e-02	4.04e-04	4.70e-03
Iron	6.74e-03	6.63e-02	3.78e-01	1.93e-02	6.47e-03
Lead	1.47e-04	8.66e-03	6.80e-02	1.27e-03	2.07e-03
Manganese	5.95e-04	1.16e-03	4.22e-02	3.53e-03	2.79e-03
Mercury	3.09e-05	3.07e-03	2.48e-02	3.25e-05	8.16e-04
Nickel	1.34e-06	2.02e-04	6.37e-03	9.63e-05	1.75e-04
Zinc	6.87e-03	1.49e-02	2.54e-01	2.98e-04	8.15e-03
Total Quotient Index	**4.61e-02**	**4.58e-01**	**2.00e+00**	**1.23e+01**	**4.26e-02**

Note:

Boxed values represent Quotient Indices that exceed "1"

FIGURES

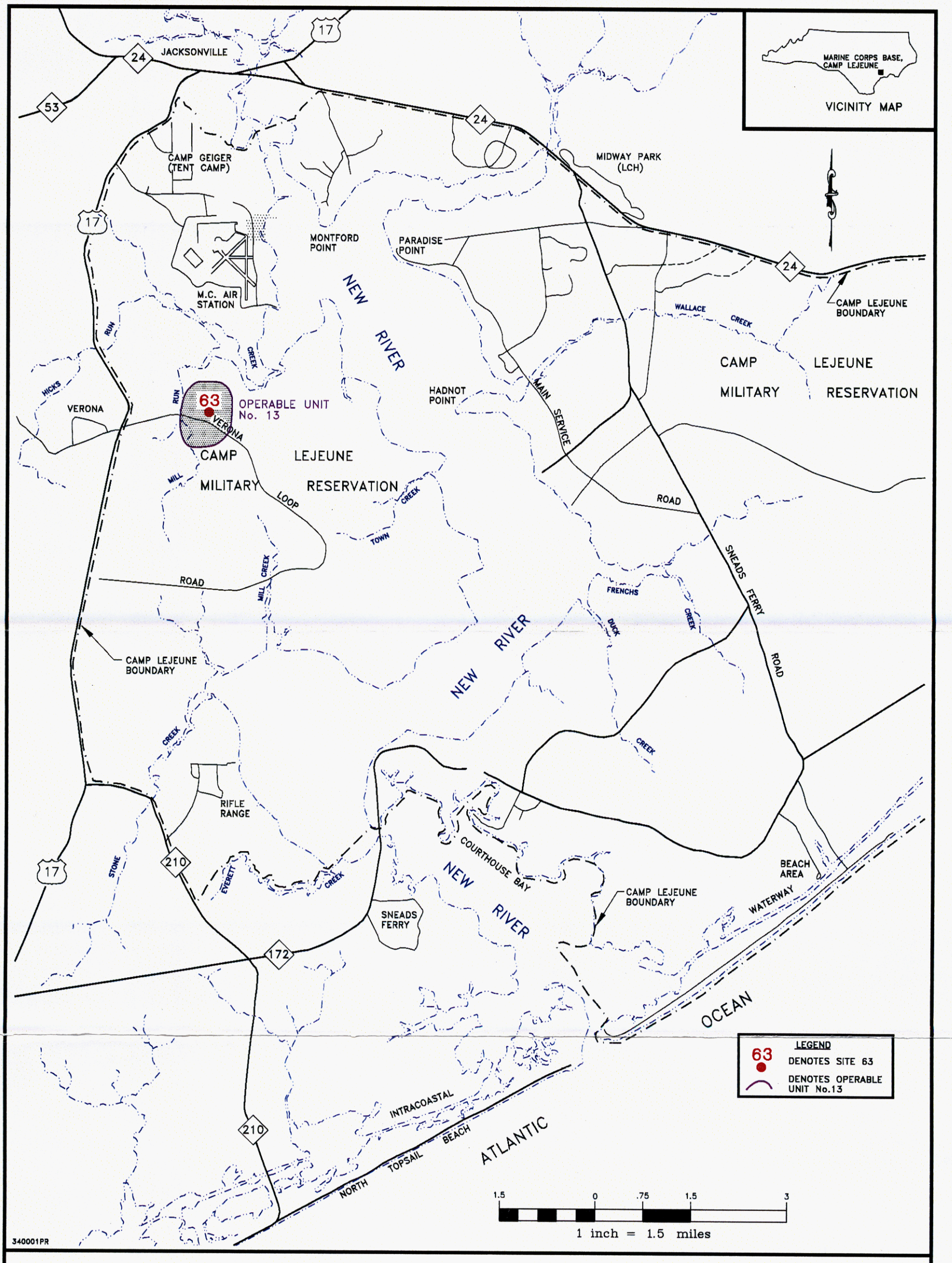

FIGURE 1
OPERABLE UNIT 13 – SITE 63
PROPOSED REMEDIAL ACTION PLAN, CTO–0340

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

02132DDB2Y

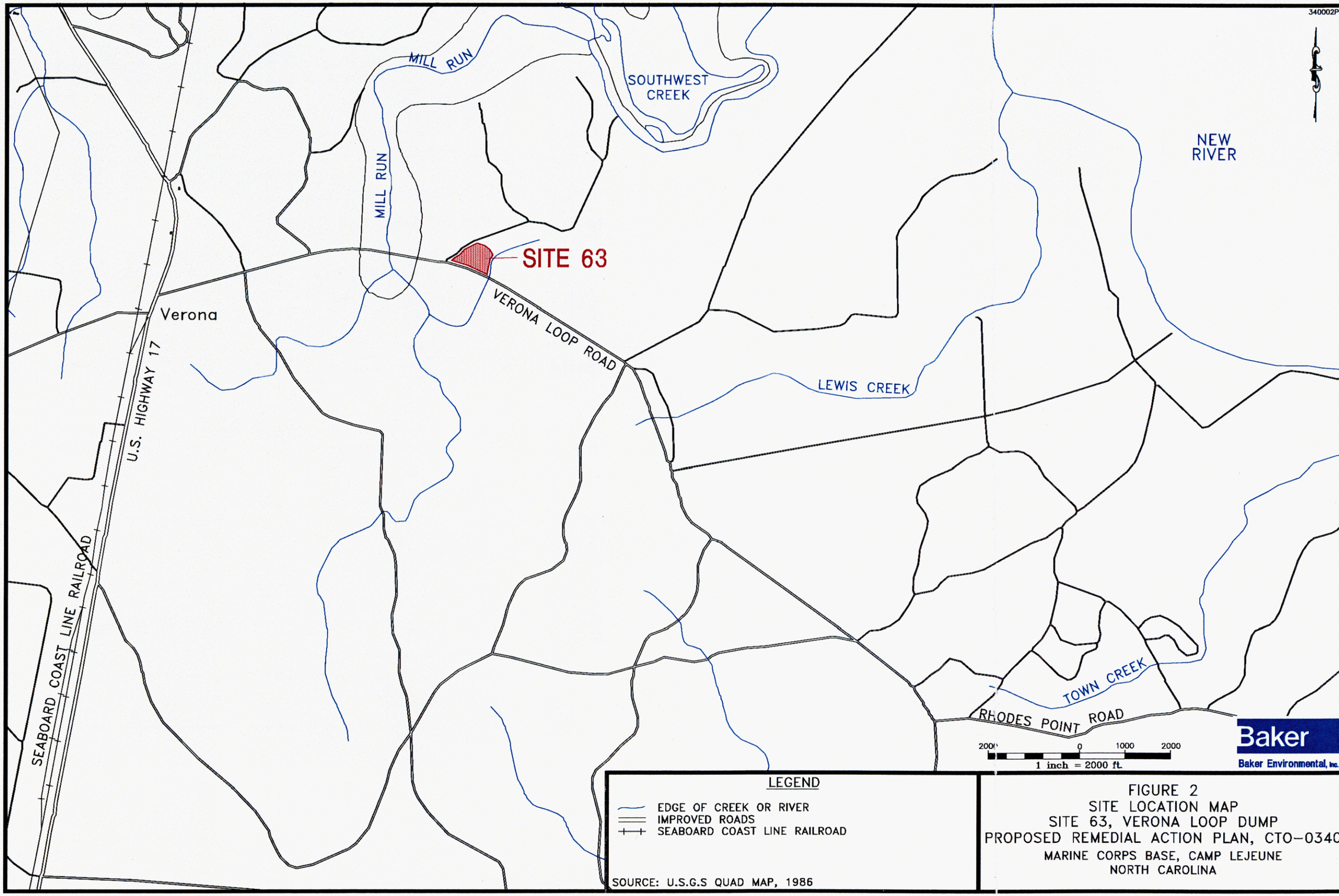

FIGURE 2
SITE LOCATION MAP
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

340003PR

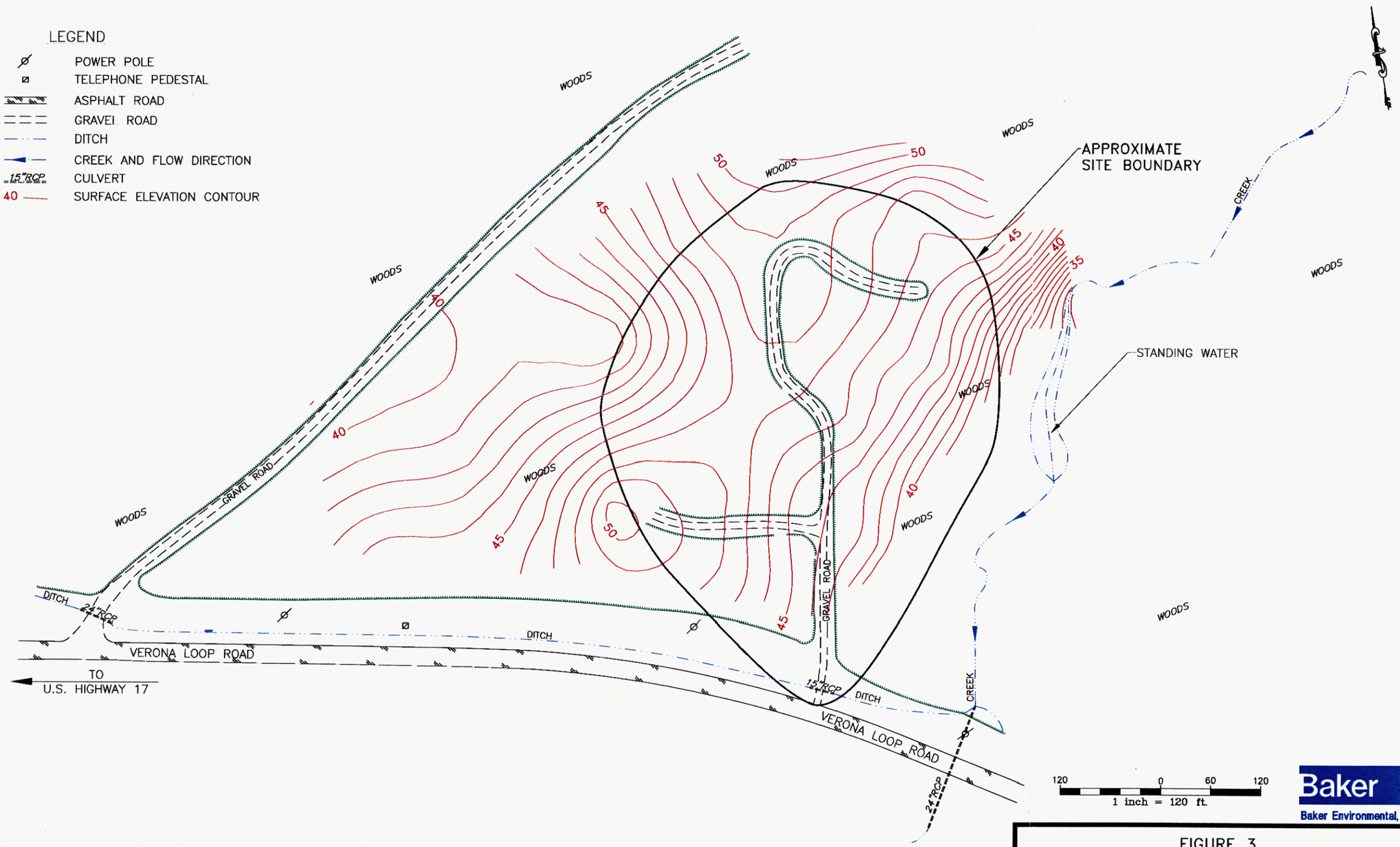

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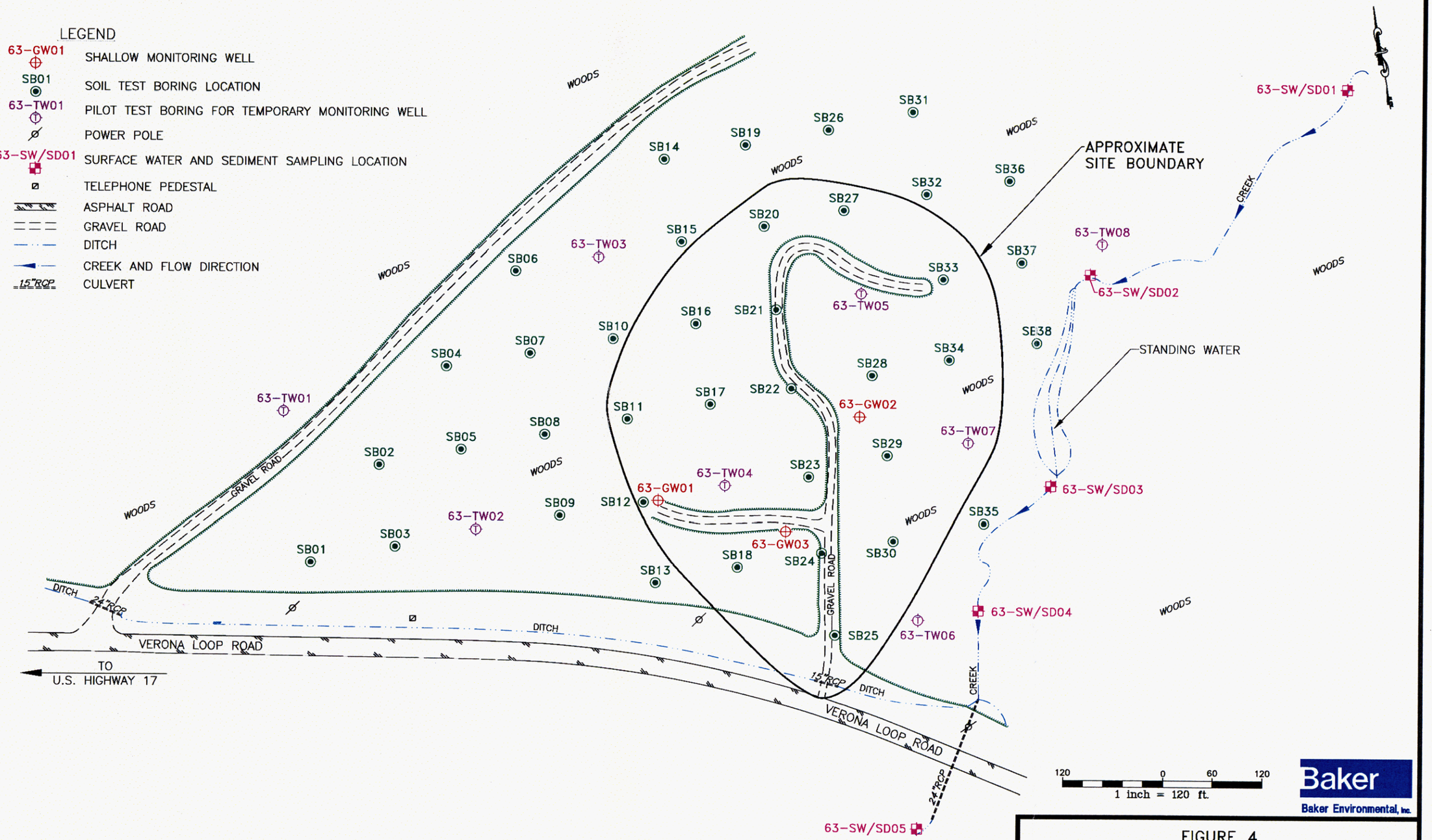
FIGURE 3
SITE MAP AND SURFACE CONTOURS
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: LANTDIV, 1992
SURVEY: W.K. DICKSON & ASSOC., 1995

340005PR



Baker
Baker Environmental, Inc.

FIGURE 4
REMEDIAL INVESTIGATION SAMPLING LOCATIONS
SITE 63, VERONA LOOP DUMP
PROPOSED REMEDIAL ACTION PLAN, CTO-0340
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

SOURCE: LANTDIV, 1992
SURVEY: W.K. DICKSON & ASSOC., 1995