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PHASE I INVESTIGATION
OPERABLE UNIT NO. 15 (Site 88)

MCB CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0356

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LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
AST	above ground storage tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
COC	Chain-of-Custody
CTO	Contract Task Order
cis-DCE	cis-1,2-Dichloroethene
trans-DCE	trans-1,2-Dichloroethene
D.O.	dissolved oxygen
DoN	Department of the Navy
°F	degrees Fahrenheit
FFA	Federal Facilities Agreement
ft	feet
gpm	gallons per minute
IDW	investigation derived waste
LANTDIV	Naval Facilities Engineering Command, Atlantic Division
µg/L	micrograms per liter
µg/kg	micrograms per kilogram
MCB	Marine Corps Base
MCL	maximum contaminant level
MWR	Morale, Welfare, and Recreation
NC DEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCWQS	North Carolina Water Quality Standard
No.	Number
NPL	National Priorities List
OD	outside diameter
OHM	OHM Remediation Services Corporation
OU	operable unit
PCB	polychlorinated biphenyl
PCE	Tetrachloroethene
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
pvc	polyvinyl chloride
QA/QC	quality assurance/quality control

LIST OF ACRONYMS
(Continued)

RCRA	Resource Conservation and Recovery Act
RI/FS	Remediation Investigation/Feasibility Study
SOPs	standard operating procedures
SPT	standard penetration test
SSL	soil screening level
TAL	Target Analyte List
TCA	1,1,2,2-tetrachloroethane
TCE	trichloroethene
TCL	Target Compound List
TPH	total petroleum hydrocarbon
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

Marine Corps Base (MCB) Camp Lejeune was place on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List (NPL) effective November 4, 1989 (54 Federal Register 41015, October 4, 1989). Subsequent to this listing, the United States Environmental Protection Agency (USEPA) Region IV, the North Carolina Department of Environment, Health and Natural Resources (NC DEHNR), the United States Department of the Navy (DoN) and the Marine Corps entered into a Federal Facilities Agreement (FFA) for MCB Camp Lejeune in 1991. The primary purpose of the FFA was to ensure that environmental impacts associated with past and present activities at the MCB are throughly investigated, and that appropriate CERCLA response and Resource Conservation Recovery Act (RCRA) corrective action alternatives are developed and implemented as necessary to protect public health and welfare, and the environment (MCB Camp Lejeune FFA, 1989).

The fiscal year 1997 Site Management Plan for MCB Camp Lejeune, a primary document referenced in the FFA, identifies 42 sites that require Remedial Investigation/Feasibility Study (RI/FS) activities. These 42 sites have been divided into 18 Operable Units (OUs). This report describes the Phase I Investigation conducted at OU No. 15, which is comprised of Site 88. The location of OU No. 15 is provided on Figure 1-1.

The Investigation was conducted by Baker Environmental, Inc. (Baker) for the Naval Facilities Engineering Command, Atlantic Division (LANTDIV) Contract Task Order (CTO) 0356 under Contract Number N62470-89-D-4814.

1.1 Scope and Objectives

The scope of the Phase I Investigation was to evaluate the nature and extent of the threat to public health and the environment caused by the release or threatened release of hazardous substances, pollutants, or contaminants. The Phase I Investigation was conducted through the sampling of soil and groundwater at Site 88, evaluating the resultant analytical and geologic data, and performing a qualitative assessment of the soil and groundwater findings.

The objective of the Phase I Investigation was to gather data and to delineate the extent of soil and groundwater contamination. This data is to be used to provide recommendations for Phase II of the Investigation.

1.2 Report Organization

This report is divided into five sections, including Section 1.0 Introduction. Section 2.0 presents the site characteristics. The field Investigation which details procedures and sampling strategies is presented in Section 3.0. Section 4.0 presents the findings of the Phase I Investigation. The conclusions and recommendations for this document are contained in Section 5.0. The appendices referenced throughout the document are included at the end of the report and include Appendices A through C.

1.3 Site Description and History

The sections below summarize information concerning the site description and history. Further information of this type can be found in the draft Site Evaluation Project Plans (Baker, May 1996).

1.3.1 Operable Unit No. 15 - Site 88 (Building 25, MWR Dry Cleaners)

Site 88 is referred to as "Building 25, Morale, Welfare, and Recreation (MWR) Dry Cleaners". The site is located near Post Lane and Virginia Dare Drive (Figure 1-2). Building 25 has been operating as a dry cleaning facility since the 1940s and is located in a flat area surrounded by barracks, office buildings, and other occupied structures. As can be seen on Figure 1-2 the surrounding buildings include Building 37, the Base Chaplain's Office to the north, Building 43, the Cobbler Shop to the west, Building HP57, a dormitory, to the east and Building 80, a warehouse, to the south. The New River is the nearest surface water body, located approximately 3,000 feet west of Building 25.

As shown on Figure 1-2, five former underground storage tanks (USTs) were located on the north side of Building 25. These USTs are known to have been used to store dry cleaning fluids. The USTs were reportedly installed in the 1940s, at the time the building was constructed. These USTs were used in conjunction with the dry cleaning operations until the early 1970s. During this time, Varsol™, a dry cleaning fluid, was stored in the USTs. The Varsol™ was reportedly introduced into the UST by a feed line that is located in the front (south side) of the building and runs under the building to the rear (north side) where the tanks were located. Because of Varsol's flammability, its use was discontinued in the 1970s and replaced with tetrachloroethene (PCE). PCE was stored in 150 gallon aboveground storage tanks (ASTs) outside Building 25 from the 1970s to mid-1980s. Groundwater contamination at Site 88 was suspected during the UST removal action conducted by OHM Remediation Services Corporation (OHM) in November 1995.

Currently, the dry cleaning machines are equipped with self containment units, eliminating the need for ASTs. There are two dry cleaning units in operation. One unit was brought on-line in December, 1986, and the second in March, 1995.

1.4 Previous Investigations and Findings

The following sections provide information on the previous Investigation regarding Site 88. The information summarized in this document is for the purpose of providing relevant background information which has been used to assess the site. For further details, concerning previous investigative work, the reader is referred to Baker's draft Site Evaluation Project Plans.

The five USTs were located on the north side of Building 25. During removal of the tanks in November 1995, soil contamination was identified and impact to the groundwater was suspected.

OHM performed the removal of the five USTs at Building 25. As a follow-up to the removal of the tanks, a four-well site check was conducted in November 1995 by OHM to identify and/or verify the suspected contaminant impact in the subsurface soil and groundwater. The locations of these four initial temporary monitoring wells are shown on Figure 1-2. The activities and findings of the initial Investigation included:

- Installation of three temporary monitoring wells (TW01 through TW03) around the former UST location and one (TW04) on the opposite side (south) of the building.

- Analysis of subsurface soil samples revealed levels of PCE ranging from 13 µg/kg to 55 µg/kg in three of the four well borings, 1,2-dichloroethene (DCE) (total) at a concentration of 9 µg/kg, and two common laboratory contaminants (acetone and methylene chloride). Several metals also were detected in the subsurface soil

samples. No pesticides, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), or semivolatile compounds were detected in any of the subsurface soil samples.

- One groundwater sample was collected from each of the four temporary monitoring wells and analyzed for full target compound list (TCL) organics, target analyte list (TAL) metals and TPH. Iron and nickel were detected above the North Carolina 2L Water Quality Standard (WQS) in all four wells. These metals are not believed to be associated with the site. TPH was detected in two of the groundwater samples at 628 µg/L and 552 µg/L. Bis(2-ethylhexyl)phthalate and naphthalene were detected in the groundwater; however, bis(2-ethylhexyl)phthalate is not likely to be associated with the site and is considered a laboratory contaminant. The TPH and naphthalene could be present as a result of fuel-related USTs in the area. PCE was detected in all the groundwater samples at concentrations ranging from 416 µg/L to 29,200 µg/L. 1,2-dichloroethene was also detected in the samples at concentrations of 154 µg/L and 10,000 µg/L. Trichloroethylene was detected at a concentration of 2,750 µg/L. No pesticides or PCBs were detected in the four groundwater samples.

2.0 SITE CHARACTERISTICS

This section of the report describes the physical setting of Site 88 including topography, drainage characteristics, geology, hydrogeology, and general groundwater flow patterns.

2.1 Topography and Surface Features

Site 88 is located in the industrial/commercial section of MCB Camp Lejeune referred to as the "Hadnot Point Industrial Area". As described in Section 1.0, the site is located near Post Lane and Virginia Dare Drive. The site terrain is relatively flat, with elevations of approximately 25 feet above mean sea level (msl). Most of the area is covered by a combination of existing buildings, asphalted streets, and parking areas. Grass areas exist along with a few trees and ornamental shrubbery in the vicinity of the site.

2.2 Surface Water Hydrology

There are no surface water features at the site. The New River is the nearest surface water body, located approximately 3,000 feet west of Building 25. During storm events, overland drainage off-site is unlikely as most of the site has a relatively flat topography and run-off is collected by underground storm water drainage systems. Storm water drains are located on the south side of the building along Post Lane, as shown on Figure 1-2.

2.3 Site Geology

The sections which follow describe the site specific geology based on the borings completed as part of the Phase I Investigation. When applicable, the local geology is placed in the context of the regional geology, as described in the "Hydrogeologic Framework of U.S. Marine Corps Base at Camp Lejeune, North Carolina", Cardinell, et al., 1993.

A fairly consistent depositional sequence was observed in borings throughout Site 88. The subsurface sediments are typical of the southeastern coastal plain geology. The site is underlain by unconsolidated sediments resulting from a near shore depositional environment. This observed sequence is similar to the generalized North Carolina coastal plain sequence shown in Table 2-1. Table 2-1 shows that the Yorktown, Eastover, and Pungo River Formations lie between the Undifferentiated and Belgrade Formations. The Yorktown, Eastover, and Pungo River Formations, however, have not been identified at Camp Lejeune.

During this Investigation, the Undifferentiated and River Bend Formations were encountered. The presence or absence of the Belgrade Formation at Site 88 is debatable; however, a description of this unit has been included in this report. Shallow borings were advanced to approximately 15 to 20 feet below ground surface (bgs) while four deeper borings were drilled to depths ranging from 47 to 57 feet bgs. The shallow temporary wells installed during this Investigation were screened in the Undifferentiated Formation (surficial aquifer), while the intermediate wells were screened in the River Bend Formation (upper portion of the Castle Hayne aquifer).

The Undifferentiated Formation is comprised of loose to medium dense sands and soft to medium stiff clay. This formation is comprised of several units of Holocene and Pleistocene ages and can consist of a fine to coarse sand, with lesser amounts of silt and clay. At Site 88, this formation typically extends to a depth of approximately 18 feet bgs. The silt and clay layer near the bottom of this formation may be correlated to the regional geology as the Belgrade Formation, or Castle Hayne

Confining unit. As shown by the cross-sections prepared for Site 88, however, this clay layer does not appear consistent.

The Belgrade Formation is typically comprised of fine sand with some shell fragments, silt, and clay of Miocene age. Shell fragments were not identified to be present within the sediments at Site 88, suggesting that the Belgrade Formation may be absent at this location. In general, the Undifferentiated (surficial aquifer) appears to lie immediately above the River Bend Formation (upper portion of the Castle Hayne aquifer), with little to no presence of the Belgrade Formation (Castle Hayne confining unit).

Beneath the Undifferentiated Formation (surficial aquifer) lies the River Bend Formation (upper portion of the Castle Hayne aquifer). This unit is present at Site 88 at depths of approximately 25 to 50 feet bgs.

Figure 2-1 shows the location of two geologic cross-sections constructed to represent the subsurface conditions. Figures 2-2 and 2-3 present geologic cross-section A-A' and B-B', respectively.

As can be seen from cross-sections A-A' and B-B', the soils below the site generally consist of fine sand with a trace to little silt and clay. This unit, extending to a depth of approximately 18 feet bgs, correlates to the Undifferentiated Formation. A laterally discontinuous layer of clay with little to some silt is present approximately 12 to 18 feet bgs which may be representative of the Belgrade Formation. The clay layer is laterally discontinuous and, therefore, the surficial aquifer is hydraulically connected to the upper portions of the underlying Castle Hayne aquifer. The inconsistency of this semi-confining layer has been reported in previous Investigations conducted at the Hadnot Point Industrial Area (ESE, 1990; Law-Catlin, 1996). In addition, previous studies in the area have noted that as distance from the New River increases, the semi-confining unit slopes or "dips" away from the river and tends to increase in thickness.

Beneath the clay layer lies a fine to medium sand with some silt and clay. This unit is indicative of the River Bend Formation, or upper portions of the Castle Hayne aquifer. The unit has a green to greenish-gray and brown color and in some areas contains a little gravel.

2.4 Site Hydrogeology

As shown on Table 2-1, the surficial aquifer resides within the Undifferentiated Formation, the Belgrade Formation resides within the Castle Hayne confining unit, and the Castle Hayne aquifer resides within the River Bend Formation. The 1993 USGS document referenced above reports that the thickness of the surficial aquifer is 17 feet thick in this area (based on water supply well boring logs). This thickness correlates with what was observed in the soil borings at Site 88. Based upon the borings, it appears that the surficial aquifer lies immediately above the Castle Hayne aquifer, with little to no presence of the Castle Hayne confining unit.

At the time of drilling, groundwater was generally encountered from five to 10 feet bgs. A complete picture of the groundwater flow regime in the form of a potentiometric map has not been presented in this report. Instead, only relative groundwater elevations and approximate flow directions are shown on Figure 2-4 for the surficial (shallow wells) and Castle Hayne (intermediate wells) aquifers. Groundwater elevations collected from the temporary monitoring wells were not used for an accurate presentation of groundwater flow due to the fact that measurements were recorded on different days depending on the sampling efforts. The elevations on Figure 2-4 can be used as a guide, however, to give a general indication of the local flow regime.

In general, groundwater elevations seem to be higher in the area of Building 25 and decrease to the west and southwest. This would suggest a local groundwater flow pattern toward the New River which is to be expected. Moreover, this trend is consistent with groundwater flow patterns described in several other Hadnot Point Investigations (ESE, 1990; Baker, 1993; Law-Catlin, 1996). Although difficult to estimate based upon the limited data, groundwater elevations recorded from the intermediate wells suggest a slight variation in groundwater flow direction as compared to the shallow wells. The different flow directions are shown on Figure 2-4 by the different colored arrows. Approximate flow direction of the surficial aquifer is to the south southwest as shown by the red arrow, while the wells screened in the Castle Hayne aquifer indicate a flow direction slightly more to the west as shown by the green arrow. Overall, groundwater from both aquifers appear to flow in the direction of the New River.

Groundwater head differentials between the shallow and intermediate wells were evaluated to determine if a vertical component of flow exists at Site 88. The data demonstrate a downward component of groundwater movement from the surficial aquifer to the Castle Hayne aquifer. This implies that a significant hydraulic connection exists between the surficial and upper portion of the Castle Hayne aquifer. This situation impacts the migration of contaminants as they tend to move downward in the direction of vertical groundwater flow.

In addition to migration of contaminants due to groundwater flow, the orientation or "dip" of the clay layer in the area of Site 88 can have a direct impact on contaminant migration. For example, vertical migration of contaminants will be greater in areas where this unit is thin or absent. In addition, lateral migration of the contaminants will be controlled not only by groundwater flow direction, but also by the orientation or "dip" of the unit. The affect of groundwater flow direction and subsurface conditions on contaminant migration is discussed further in Section 4.0.

2.5 Identification of Water Supply Wells

A database containing information on water supply wells at MCB Camp Lejeune was examined to determine if any water supply wells were in close proximity to Site 88. As shown on Figure 2-5, there are no active wells present within a one mile radius of the site. The nearest active water supply well is HP-642 which is located approximately 1.5 miles east of Site 88. As shown on Figure 2-5, this well falls just outside the boundary of the one mile radius. Table 2-2 provides construction details on HP-642.

3.0 FIELD INVESTIGATION

Section 3.0 provides a description of the field activities and sample analysis associated with the Investigation at Site 88. General activities and standard operating procedures followed the guidelines set forth in the draft Site Evaluation Project Plans. This section discusses the specific field activities and graphically depicts or tabulates appropriate investigative points.

3.1 Field Activities

The Phase I field Investigation activities at Site 88 were conducted in August 1996, and provided the necessary data to estimate the effects of previous site activities on the soil and groundwater. This was accomplished through the acquisition of environmental samples which were analyzed by an on-site with confirmation samples analyzed by a fixed based laboratory. The following tasks were completed at Site 88. Further discussion of the field activities follow.

- Subsurface Soil Sampling
- Temporary Monitoring Well Installation
- Groundwater Sampling
- Land Survey
- Well Abandonment
- Decon Procedures
- Investigative Derived Waste Management

3.1.1 Subsurface Soil Sampling

Standard drilling methods were employed at the site to complete soil borings for temporary monitoring well installation. Soil samples were collected via split-spoon sampling methods in general accordance with the procedures outlined in the American Society for Testing and Materials (ASTM) Standard Method for Penetration Test and Split-Barrel Sampling of Soils (Designation D 1586). Split-spoons of 24-inch (nominal) length were used throughout the Investigation. In most cases, samples were collected continuously from the surface (i.e., ground surface to a depth of twelve inches) at two-foot intervals starting at one foot below ground surface. Continuous sample collection proceeded until the water table. Below this depth, samples were collected at various intervals depending upon site conditions.

Each sample was classified in the field by a geologist using the Unified Soil Classification System (USCS) in accordance with the visual-manual methods described by the American Society for Testing and Materials (ASTM, 1993a). The field descriptions were recorded in a field logbook and later transposed onto boring log records. Soil classification included characterization of soil type, grain size, color, moisture content, relative density, plasticity, and other pertinent information such as any indication of contamination. The Standard Penetration Test (SPT) blow counts were also recorded. In addition, a photoionization detector (PID) was used to screen the samples to detect the presence of any VOCs. The test boring records and well construction records are presented in Appendix A. Sample information such as boring number, sample identification, time and date of sample collection, field sampling team, and analytical parameters were recorded for each of the soil samples.

All drilling and soil sampling activities were performed in Level D personnel protective equipment.

Soil cuttings generated during the Investigation were collected, handled, and stored according to the procedures outlined in Section 3.1.7.

A total of 19 soil borings were advanced at Site 88 to classify the subsurface conditions and collect soil samples for laboratory analysis. Fifteen shallow soil borings were drilled for the installation of the shallow temporary monitoring wells. These borings varied in depth from 15 to 20 feet bgs. Four deeper borings were drilled to depths ranging from 47 to 57 feet bgs. These borings were used for the installation of the intermediate wells at Site 88.

3.1.2 Temporary Monitoring Well Installation

A total of 19 temporary monitoring wells were installed during the Phase I Investigation at Site 88 (August 16, 1996 to August 20, 1996). This included 15 shallow and 4 intermediate wells at the site. Four existing shallow temporary monitoring wells (TW01 through TW04) were installed by OHM in November 1995. All of the wells installed as part of this Investigation were installed using a standard truck mounted drill rig. Use of a standard drill rig enabled the field crew to install intermediate wells which were approximately 50 feet bgs. The wells were situated spatially across the site to provide samples from potentially impacted groundwater, and to characterize the nature and extent of possible contamination. Placement of the temporary wells was based on the previous Investigation, site conditions, locations of underground utilities, and the overall scope and objectives of the project.

All of the monitoring wells were constructed of one-inch diameter, Schedule 40, flush-joint and threaded, polyvinyl chloride (PVC) casing. The wells utilized either a 10-foot or a 15-foot screened interval of No. 10 (i.e., 0.0010 inch) slot screen sections. The screened sections of the wells were covered with a piece of cloth material known as a "well sock", which reduces the amount of fine grained material that moves through the screen and into the monitoring well. The boreholes were backfilled to the surface with natural material and left as "stick-up" for subsequent groundwater sampling. The well identification of each temporary well was written with a permanent marker to identify the location during sampling and surveying activities. Typical temporary monitoring well construction details are shown on Figure 3-1. Well construction records are provided on the Test Boring and Well Construction Records in Appendix A.

The four existing temporary monitoring wells installed by OHM in November 1995, were drilled using a GeoProbe drill rig. The wells were installed with five to ten feet of one-inch outside diameter (OD) PVC well screen with approximately 10 feet of riser. A summary of this work is provided in Section 1.4 of this report.

The Phase I Investigation wells were installed after completing a soil boring to the appropriate depth as discussed in Section 3.1.1. The shallow well depths at Site 88 ranged from 15 to 20 feet bgs. In general, the shallow wells were installed approximately 10 feet below the water table encountered during drilling. The intermediate wells were installed to identify the absence or presence of a semi-confining layer (known as the "Castle Hayne Confining Unit") at the site and to characterized the groundwater at this depth. The intermediate wells ranged in depths from 44 to 50 feet bgs. Screened intervals for these wells ranged from 39 to 50 feet bgs (refer to Appendix A and Table 3-1 for test boring and well construction records). Figure 3-2 shows the locations of all of the temporary wells installed at Site 88.

3.1.3 Groundwater Sampling

Groundwater samples were collected to assess whether contamination, that may have resulted from previous activities at Site 88 was present in the shallow aquifer. Based upon the previous investigative results and historical records, the contaminants of potential concern were primarily volatile organic compounds (VOCs). Prior to groundwater purging, a water level measurement from each well was obtained. The total well depth was also recorded from each well to the nearest 0.1-foot. Water level and well depth measurements were used to calculate the volume of water in each well and the volume of water necessary to purge the well.

A minimum of three to five well volumes were purged from each well prior to sampling. Measurements of pH, specific conductance, temperature, turbidity, and dissolved oxygen (D.O.) were taken after each well volume was purged to ensure that the groundwater characteristics had stabilized before sampling These measurements were recorded in a field logbook and are provided on Table 3-2. Purge water was contained and handled as described in Section 3.1.7.

Groundwater sampling involved the use of a low flow well purging and sampling technique. The sampling methodology was developed in response to conversations with USEPA Region IV personnel in Athens, Georgia. A peristaltic pump (GeoPump), with the intake set two to three feet into the static water column, was used to purge each of the wells. While purging groundwater from each of the monitoring wells, a flow rate of less than 0.25 gallons per minute (gpm) was maintained. The groundwater samples were collected directly from the pump discharge. Dedicated sections of polyethylene and silicon pump-head tubing were used during purging and sampling activities at each well. Rinsate blanks were collected from the polyethylene and silicon tubing to verify that proper procedures had been followed.

Documentation of groundwater samples incorporated procedures similar to those described for soil samples. Sample information, including well number, sample identification, time and date of sample collection, sampling team, analytical parameters, were recorded in a field logbook and on the sample labels. Chain-of-custody documentation (provided in Appendix B) accompanied the samples to the laboratory.

3.1.4 Land Survey

A land survey was conducted by Lanier Surveying, a licensed professional surveyor in the State of North Carolina. The surveying was completed under the direction of the Baker Site Manager. The survey of the site included the temporary monitoring wells, locations, buildings, and other relevant features such as trees, utilities, and parking areas. All of the points were surveyed for vertical and horizontal control using North Carolina State Plane Coordinates.

3.1.5 Well Abandonment

Upon completion of the groundwater sampling and surveying activities, all of the temporary monitoring wells were abandon. The PVC pipe was removed from the ground manually by pulling it to the surface using pipe wrenches for leverage. The boreholes were then backfilled to the surface with soil cuttings. As shown on Figure 3-2, several of the wells were installed in traffic areas. Upon removal of the PVC pipe, these boreholes were filled with cement to approximately four inches below the surface and then repaired with an asphalt patch to grade.

3.1.6 Decontamination Procedures

All of the equipment used during the field activities was decontaminated before and after each use to prevent cross-contamination of samples, with the exception of disposable sampling equipment. The disposable sampling equipment was appropriately discarded subsequent to its initial use. Disposable equipment included polyethylene and silicon tubing used for groundwater sampling. Soil samples at Site 88 were collected with split-spoons and stainless steel sampling equipment. Decontamination of these items followed the USEPA Region IV's Standard Operating Procedures (SOPs). The drill rig and all associated drilling and sampling tools were steam cleaned prior to initiating drilling activities and between borings. Decontamination of the sampling equipment involved:

- scrubbing the item with liquinox soap and potable water
- rinsing with distilled water
- rinsing with 10 percent nitric acid
- rinsing with distilled water
- rinsing with isopropanol
- allowing the item to air dry

Meters and instruments used for measuring dissolved oxygen, pH, temperature, specific conductivity, and turbidity were rinsed with distilled water after each use.

3.1.7 Investigation Derived Waste Management

Field Investigation activities associated with CTO-0356 resulted in the generation of various Investigation derived waste (IDW). The IDW included soil cuttings, purge water, and solutions used to decontaminate non-disposable sampling equipment. The general management techniques utilized for the IDW were:

- Collection and containerization of IDW material
- Temporary storage of IDW while awaiting confirmatory analytical data
- Final disposal of aqueous and solid IDW material

The management of the IDW was performed in accordance with guidelines developed by the USEPA Office of Emergency and Remedial Response, Hazardous Site Control Division (USEPA, 1992). IDW soils from Site 88 were transported to a remote area of Lot 203, dumped from the roll-off box and regraded. The purge water from Site 88 was found to contain VOCs and was therefore transported off-site and disposed of at the water treatment plant at Site 82.

3.2 Sample Acquisition and Analytical Program

The following sections provide information on the numbers of samples collected at Site 88, the type of media sampled and the requested analytical procedures. Tables have been prepared which detail the analytical tests and figures are provided which show the sample locations relative to the sites.

3.2.1 Subsurface Soil Sample Acquisition and Analyses

Nineteen soil samples were collected at Site 88 from test borings and analyzed by an on-site mobile laboratory for VOCs according to EPA method 8240. Four of the soil samples were submitted for

fixed based laboratory confirmation. Fixed based confirmation samples were submitted for Contract Laboratory Program (CLP) Target Compound List (TCL) volatile organic analysis (VOA). Table 3-3 lists the analyses performed on the soil samples at Site 88 along with the sample identifications, and sampling depths.

The borings were positioned across the site in an effort to provide complete coverage while taking account for numerous underground utilities. The locations of the borings are presented on Figure 3-2.

3.2.2 Groundwater Sample Acquisition and Analyses

Groundwater samples were collected from Site 88 from the temporary wells. These samples were analyzed in the field with a mobile laboratory for VOCs according to EPA Method 8240. In addition, confirmation samples were collected and submitted for TCL VOAs at a fixed based laboratory. Table 3-4 provides information on the groundwater sample analysis for Site 88. Figure 3-2 illustrates the locations of the groundwater monitoring wells.

3.3.3 Quality Assurance Quality Control

Quality Assurance/Quality Control (QA/QC) samples were collected during the Phase I Investigation. Field QA/QC samples were collected at the site according to the procedures outlined in the USEPA Region IV SOPs. Two types of QA/QC samples were obtained at the site. Field blanks were collected to establish field background conditions and trip blanks were collected to evaluate whether cross-contamination occurred during sampling and shipping of the fixed based samples. Equipment rinsate samples, duplicate samples, and matrix spike/matrix spike duplicates were not collected as part of the Phase I field Investigation. These QA/QC samples were not deemed necessary due to the use of dedicated disposable sampling equipment and the fact that fixed based results were only used for confirmation of the on-site analysis.

The definition of each type of QA/QC sample is provided in the Environmental Compliance Branch SOPs and Quality Assurance Manual, USEPA Region IV (USEPA, 1991). A brief summary of the QA/QC samples collected during this Investigation is provided below.

- Field Blanks: Field blanks were collected to provide analytical data on the water used in the field for decontamination purposes. The results for the field blanks collected during this Investigation can be found in Appendix C.

- Trip Blanks: Trip blanks are prepared prior to the sampling event, placed in the actual sample container, and kept with the investigative samples throughout the sampling event. Results of the trip blanks analyses can be found in Appendix C.

3.3.4 Data Management and Tracking

The management and tracking of data, from time of field collection to receipt of the analytical report, is of primary importance to the overall quality of laboratory results. Samples collected for on-site analysis were identified by recording in a field log book and on the sample container. These samples were immediately transported to the on-site laboratory and logged into a database prior to analysis. Sample identification of those samples analyzed at the fixed based lab were recorded on chain-of-custody forms, provided in Appendix B. Chain-of-custody forms were reviewed by data

management personnel to verify that appropriate laboratory analyses had been requested. Upon receipt of laboratory analytical results, a further comparison was performed to verify that each sample received by the laboratory was analyzed for the correct parameters.

The management and tracking of data from the time of sample collection until receipt of the analytical results was completed to determine the following items:

- Identify and correct chain-of-custody discrepancies prior to laboratory analysis
- Verify the receipt of all samples by the laboratory
- Confirm that requested sample analyses were performed
- Ensure the delivery of a complete data set

4.0 FINDINGS OF THE PHASE I INVESTIGATION STUDY

This section of the report presents the findings of the Phase I Investigation Study. It includes results of soil sampling and groundwater sampling for OU 15 (Site 88). The analytical results for QA/QC samples also are presented in this section.

Presentation of the analytical data in this section includes a comparison of the site data to established federal and state standards and criteria. The standards and criteria chosen for evaluation are media specific and help to provide a reasonable assessment of site conditions. An explanation and justification for using each of the standards and criteria are presented in section 4.1.

4.1 Screening Standard Comparisons

The qualitative assessment for soil and groundwater data was completed using state and federal standards and criteria to evaluate the contaminant levels detected in the media. The sections below are presented to define the screening standards applied to each of the media

4.1.1 Subsurface Soil

The screening standard applied to subsurface soil is based on the following sources:

- USEPA Region III soil screening levels for transfer from soil to groundwater (USEPA, May 1996a). The soil screening levels (SSLs) established by USEPA Region III provide reasonable maximum estimates of transfer of contaminants from soil to other media. Soil concentrations protective of groundwater are used to qualitatively assess the soil. Protective is defined as a residential contact scenario that will yield a fixed upper bound risk of 10^{-6} or fixed hazard quotient of 1 [(whichever occurs at the lower concentration). (USEPA May, 1996a)]

4.1.2 Groundwater

The screening standard applied to groundwater is based on the following sources:

- North Carolina Water Quality Standards (NC WQS, 1994) - North Carolina WQSs are the maximum allowable concentrations, resulting from any discharge of contaminants to the lands or waters of the state, that may be tolerated without threatening human health or otherwise rendering the groundwater unsuitable for its intended purposes.

- USEPA Maximum Contaminant Levels (MCLs), February, 1996 - MCLs are enforceable standards for public water supplies, designed to protect human health and promulgated under the Safe Drinking Water Act. MCLs also account for the technical feasibility of removing contamination from a public water supply. MCLs are based on laboratory or epidemiological studies and are applied to analyses of drinking water supplies consumed by a minimum of 25 persons. MCLs establish limits under which 70 kg adults, drinking 2 liters of water a day for 70 years, can avoid detrimental health effects.

4.2 Non-Site Related Analytical Results

Some of the organic compounds detected in the environmental media may be attributable to non-site related conditions. Two primary sources of non-site related analytical results include laboratory contaminants and contaminants introduced during field activities such as decontamination procedures. A brief discussion of non-site related analytical results is provided in the section which follows.

4.2.1 Laboratory Contaminants

Field blank and trip blank samples provide a measure of contamination that may have been introduced into a sample set during the collection, transportation, preparation, or analysis of samples. To remove non-site related constituents from further consideration, the concentrations of chemicals detected in blanks were compared with concentrations of the same chemicals detected in environmental samples.

As the scope of the Phase I Investigation was limited to estimating the extent of contamination through on-site screening, limited QA/QC samples were collected. The QA/QC samples included trip blanks that accompanied confirmatory samples to the fixed based laboratory and field blanks of the potable water source used during drilling operations. The trip blank samples did not detect any contaminants . The field blank samples collected from the potable water source used during drilling operations detected low concentrations of chloroform. This compound was common in all the groundwater samples collected from borings in which water was used while drilling (typically the intermediate wells). As the chloroform was present in the potable water source used for drilling, its detection in the environmental samples was not considered to be site related. The concentrations of the chloroform detections in the groundwater samples were similar to those detected in the potable water supply. Due to the analytical similarities between the groundwater samples and the field blanks, detected concentrations of chloroform were not reported on the analytical tables or figures.

4.3 Site Analytical Sample Results

This section presents the results of the soil and groundwater Investigations performed as part of the Phase I Investigation. The data are presented by the individual media; soil and groundwater. The results are discussed and presented in corresponding tables which show all of the positive detections and a summary table which includes comparison to the appropriate "screening standard". The positive detections are also included on figures in this section to illustrate the spatial relationships of the data.

4.3.1 Subsurface Soil

A total of 19 soil samples were collected at Site 88 using standard drilling and sampling procedures as described in Section 3.1.1. The majority of the samples were collected from the shallow subsurface, at or just above the water table. However, several soil samples were collected below the watertable to compare results to that of the shallow subsurface results. All of the samples were analyzed on-site by a mobile laboratory in accordance with EPA Method 8240. The results of this analysis are presented on Table 4-1. Three VOCs were detected in the soil samples analyzed on site, including cis-1,2-DCE, TCE and PCE. Cis-1,2-DCE was detected in one soil sample 88-TW15 at a concentration of 21 µg/kg, TCE was detected at concentrations ranging from 0.1 µg/kg to 8.5

µg/kg, and PCE was detected at concentrations ranging from 0.1 µg/kg 237.6 µg/kg. These results are summarized on Table 4-2 and illustrated on Figure 4-1. As shown on Table 4-2, the detection of PCE at 237.6 µg/kg at TW08 exceeded the established screening criteria estimated for subsurface soils.

Four of the soil samples were split and submitted to a fixed based laboratory to confirm the precision and accuracy of the on-site analytical findings. The selected samples were chosen to confirm high, medium, low, and nondetect concentrations. Correlations of the on-site to the fixed based results indicate that nondetect results were reported to be one to one. However, for positive findings the on-site laboratory levels were elevated compared to the fixed based results. This difference could be attributable to the time between sampling and analysis and/or preparation of the sample for analysis. However, the integrity of the data is considered acceptable because both analytical methods were able to confirm nondetects and trace level concentrations. The only VOC detected in the fixed based soil samples was PCE at a concentration of 53 µg/kg in sample 88-TW08-03. A complete report of the fixed based results are shown on Table 4-3. Chain-of-custody documentation is provided in Appendix B.

In general, the impact to the soil at Site 88 appears to be concentrated in the area of Building 25 and the parking area across the street to the northwest near Building 43. The presence of VOCs in the soils near the parking area may be a result of migration of contaminants along preferential pathways such as underground utilities, or lateral migration along confining units. Based upon the on-site screening analytical data the estimated area of impacted soils is shown on Figure 4-1. As shown on the figure, concentrations of VOCs north, south, and east of Building 25 decrease dramatically at a short distance from the source area. The boundary of the soil contamination to the northwest is estimated to extend to Building 43. At the present time, the presence of contaminants near Building 43 are suspected to have originated from Building 25 as there are no known sources for these contaminants at Building 43.

4.3.2 Groundwater

The groundwater Investigation at Site 88 entailed the collection of groundwater samples from 23 temporary monitoring wells. Each of the groundwater samples collected were analyzed according to EPA Method 8240. In addition, seven samples were analyzed by the fixed based laboratory for full TCL VOAs using CLP protocols. The positive detections for on-site analyses are included on Table 4-4. Table 4-5 provides the results of the fixed based results and Table 4-6 summarizes these results.

Five VOCs were detected in the groundwater samples analyzed on-site including, cis-1,2-DCE, trans-1,2-Dichloroethene (trans-1,2-DCE), 1,1,1-trichloroethane (1,1,1-TCA), TCE, and PCE. Trans-1,2-DCE was detected in one groundwater sample at a concentration of 38 µg/L and cis-1,2-DCE was detected at concentrations ranging from 3 µg/L to 3,725 µg/L. 1,1,1-TCA was detected in three samples at concentrations ranging from 0.2 µg/L to 0.5 µg/L. TCE was detected in 14 of the 23 groundwater samples at concentrations ranging from 0.2 µg/L to 3,030 µg/L. PCE was the most frequently detected compound, present in 19 of the 23 samples. The concentrations ranged from 0.2 µg/L to 53,703 µg/L. The concentrations of the compounds cis-1,2-DCE, TCE, and PCE exceeded both the federal MCLs and the NC WQSs. Table 4-4 presents the positive detections for the on-site analysis.

The seven samples submitted for fixed based confirmation were selected to measure the precision

and accuracy of the on-site laboratory. These samples were selected based upon the on-site analytical findings and to represent high, medium, low, and nondetect concentrations. A strong correlation was shown between the on-site and fixed based results at the nondetect and trace concentration level. At the higher concentration ranges, greater than 1,000 µg/L, the on-site results indicated that contaminant levels were higher than the fixed based. This difference could be due to the potential loss of volatiles between time of sampling and time of analysis (head space) and/or the sample preparation. The analytical findings for the on-site and fixed based analysis are reliable information and have been used to assist in the delineation of the extent of groundwater contamination. Table 4-5 presents the fixed based analytical findings. Additionally, a comparison of on-site to fixed based analytical findings is presented on Table 4-6.

Figure 4-2 presents the results of the volatile organic compounds detected in the shallow groundwater samples from the on-site analyses. The on-site data demonstrate groundwater contamination of the surficial aquifer at Site 88. The area which has been impacted has been estimated on the figure and includes all of the area around Building 25. In addition, the data suggest that the plume has extended west-northwest of the source area, moving across the street in the direction of Building 43. Relatively high levels of VOCs were detected at TW08 possibly due to the migration of contaminants along underground utility lines, lateral migration along clay units, or movement due to seasonal variations in groundwater flow patterns. As mentioned in Section 2.0, the semiconfining unit in the area of Site 88 is discontinuous and may dip in the direction of Building 43. The discontinuous nature and orientation of clay layers can impact the migration of contaminants as they move along semiconfining beds laterally, and then move downward in areas where the clay layer pinches out.

The four intermediate wells at Site 88 provide data to estimate the vertical extent of the groundwater contamination. Data collected at intermediate monitoring wells TW04IW, TW05IW, and TW08IW demonstrate groundwater contamination in the upper portion of the Castle Hayne aquifer in the area near Building 25. Figure 4-3 provides the results of the analytical results from the intermediate wells. These wells are screened at depths ranging from approximately 40 to 50 feet bgs. Based on these findings, it is possible to estimate the vertical extent of groundwater contamination to be at least 50 feet bgs in this area. Although a lower permeability clay and silt layer is present in some locations at Site 88, it is discontinuous and has not completely impeded the migration of contaminants into the underlying aquifer.

The furthest intermediate temporary well was installed approximately 630 feet west of Building 25. Intermediate well TW19IW is screened 45 to 50 feet bgs. Analysis of the groundwater sample from this well did not detect any VOCs in the groundwater. Likewise, there was no detection of shallow groundwater contamination in TW19.

In summary, the data collected during the Phase I Investigation confirms the presence of VOCs in both soil and groundwater at Site 88. Groundwater contamination is present in both the surficial and upper portion of the Castle Hayne aquifers. The concentrations observed in the groundwater samples collected during the Investigation exceed both federal MCLs and NC WQSs. Shallow groundwater contamination exists in the area surrounding Building 25 and extends some distance to the north northwest in the direction of Building 43; however, the Phase I Investigation data does not fully delineate the horizontal and vertical extent of groundwater contamination. Shallow groundwater contamination has been adequately defined in the area local to Building 25, however, it extends some distance in the direction of Building 43 (west northwest of Building 25). Additional groundwater information is required in the area of Building 43 to define this portion of the plume.

Groundwater contamination in the upper portion of the Castle Hayne aquifer has been confirmed to depths of 40 to 50 feet bgs in the areas of Buildings 25 and 43 (TW08IW). Further information is required from the intermediate and deep zone of the aquifer to establish the total depth of contamination. As noted on the corresponding tables and figure, TW08IW which is screened at a depth of 39 to 44 feet bgs, detected PCE at 53,703.8 µg/L. Permanent Type III monitoring wells will be required to collect the necessary data to establish the vertical extent of contamination in the area of Building 25 and Building 43.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the findings of the Phase I Investigation at OU No. 15, Site 88. The conclusions and recommendations developed from the data collected at Site 88 are presented separately.

5.1 Conclusions

The Phase I Investigation has confirmed the presence of both soil and groundwater contamination at Site 88. The source of the contamination is assumed to be the former UST system at the site. The tanks and the soil immediately surrounding them were removed from the site in November 1995, therefore, with the exception of contaminated soil beneath Building 25, the source of groundwater contamination has been eliminated. However, concentrations of VOCs in the groundwater are significantly higher than allowable state and federal standards, therefore a remedial alternative to treat contaminated groundwater will need to be developed. Prior to any remedial efforts however, further investigative work will be necessary to define the vertical and horizontal extent of contamination.

Specific conclusions for soil and groundwater at Site 88 are presented below. In general, the text focuses only on those compounds detected at concentrations above the screening standards, or regulatory levels.

5.1.1 Subsurface Soil

Three VOCs were detected in the subsurface soil samples collected from Site 88, including cis-1,2-DCE, TCE, and PCE. The impact to the soils at the site appears to be concentrated in the area near Building 25 and extending slightly to the north-northwest in the direction of Building 43. In general, concentrations of VOCs in the soil were shown to have decreased with distance from Building 25 and the area of the former USTs.

5.1.2 Groundwater

Five VOCs were detected in the groundwater at Site 88. The compounds included cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, TCE, and PCE. PCE was the most frequently detected compound and demonstrated the highest concentrations in the groundwater samples. The concentrations of cis-1,2-DCE, TCE, and PCE exceeded NC WQSs and federal MCLs. The data demonstrate groundwater contamination at the site both in the shallow and intermediate zones in the area of Building 25. Groundwater contamination surrounds Building 25 and extends to the north northwest in the direction of Building 43.

5.2 Recommendations

The recommendations for Site 88 are presented below. The recommendations are general in nature and do not include specific design considerations or sampling strategy. These items are beyond the current scope of work for this CTO. Details concerning future investigative work at the site must be presented in formal work plans submitted to LANTDIV and MCB Camp Lejeune.

The contamination at Site 88 appears to be concentrated in the area of Building 25, however, it has not been thoroughly defined to the west northwest in the direction of Building 43. The horizontal and vertical extent of contamination at Site 88 must be delineated through further sampling efforts. This may be accomplished by completing the following items:

- Installation of permanent shallow (Type II) monitoring wells around the perimeter of the estimated contaminant plume.

- Installation of both intermediate and deep permanent (Type III) wells at points within the defined plume boundary and in the direction of contaminant migration. Intermediate wells will extend to approximately 50 feet bgs, while deep wells may extend another 40 to 50 feet into the aquifer.

- Collection of soil samples during shallow, intermediate, and deep monitoring well installation. In addition to environmental testing, geotechnical analyses should be conducted on these samples to assist in the preparation of groundwater migration and transport models and in the selection and design of a remedial alternative.

- Further definition of the local geology and its effect on both horizontal and vertical contaminant migration.

- Groundwater sampling from shallow, intermediate and deep permanent monitoring wells for the contaminants of concern (i.e., VOCs).

- Measurement of groundwater elevations to establish the local groundwater flow regime in the shallow aquifer and an examination of potential head differences between shallow and deeper monitoring wells.

- Completion of aquifer tests (slug tests) to establish the hydraulic conductivity of the aquifer in question. A comparison of vertical and horizontal conductivity values should be made.

- Upon completion of aquifer tests and the establishment of local groundwater flow patterns, estimates of groundwater flow velocity can be made and corresponding contaminant transport.

It is estimated that a total of approximately 10 shallow and 10 intermediate/deep wells will be necessary to establish the vertical and horizontal extent of groundwater contamination at Site 88. Once the plume geometry has been established both horizontally and vertically, preparation of a remedial action plan can commence.

6.0 REFERENCES

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TABLES

TABLE 2-1

GEOLOGIC AND HYDROGEOLOGIC UNITS OF
NORTH CAROLINA'S COASTAL PLAIN
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION STUDY, CTO-0356
MCB, CAMP LEJEUNE, NORTH CAROLINA

Geologic Units			Hydrogeologic Units
System	Series	Formation	Aquifer and Confining Unit
Quaternary	Holocene/Pleistocene	Undifferentiated	Surficial aquifer
Tertiary	Pliocene	Yorktown Formation[1]	Yorktown confining unit
	Miocene	Eastover Formation[1]	Yorktown Aquifer
		Pungo River Formation[1]	Pungo River confining unit
			Pungo River Aquifer
		Belgrade Formation[2]	Castle Hayne confining unit
	Oligocene	River Bend Formation	Castle Hayne Aquifer
	Eocene	Castle Hayne Formation	Beaufort confining unit[3]
	Paleocene	Beaufort Formation	Beaufort Aquifer
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee confining unit
			Peedee Aquifer
		Black Creek and Middendorf Formations	Black Creek confining unit
			Black Creek Aquifer
		Cape Fear Formation	Upper Cape Fear confining unit
			Upper Cape Fear Aquifer
			Lower Cape Fear confining unit
			Lower Cape Fear Aquifer
	Lower Cretaceous[1]	Unnamed deposits[1]	Lower Cretaceous confining unit
			Lower Cretaceous Aquifer[1]
Pre-Cretaceous basement rocks		--	--

Notes:

[1] Geologic and hydrologic units probably not present beneath MCB,. Camp Lejeune.
[2] Constitutes part of the surficial aquifer and Castle Hayne confining unit in the study area.
[3] Estimated to be confined to deposits of Paleocene age in the study area.

Source: Harned et al., 1989.

TABLE 2-2

WATER SUPPLY WELL INFORMATION
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION STUDY, CTO-0356
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number	Well Diameter (inches)	Casing Material	Date Installed (year)	Status (on/off/closed)	Date Closed	Depth (bgs)	Screen Top Depth	Screen Bottom Depth	Pump Depth	Airline Depth	Approx. Direction and Distance
HP-642	--	--	--	On	NA	178	--	--	96	112	6,732 ft

Notes:

NA = Not applicable
-- = Data unavailable

TABLE 3-1

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION STUDY, CTO-0356
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number	Date Installed	Top of Casing Elevation (ft. above msl)[1]	Ground Surface Elevation (ft. above msl)	Boring Depth (ft, bgs)[2]	Well Depth (ft, bgs)	Screen Interval Depth (ft, bgs)
88-TW04IW	8/16/96	28.55	26.46	56.0	50.0	45.0-50.0
88-TW05	8/16/96	28.18	25.73	15.0	15.0	5.0-15.0
88-TW05IW	8/18/96	27.89	26.02	57.0	50.0	45.0-50.0
88-TW06	8/16/96	25.64	25.62	15.0	15.0	5.0-15.0
88-TW07	8/16/96	28.60	26.50	15.0	15.0	5.0-15.0
88-TW08	8/16/96	26.80	24.71	15.0	15.0	5.0-15.0
88-TW08IW	8/18/96	25.63	24.71	47.0	44.0	39.0-44.0
88-TW09	8/16/96	27.89	25.73	18.0	18.0	8.0-18.0
88-TW10	8/17/96	--	--	15.0	15.0	5.0-15.0
88-TW11	8/17/96	28.22	26.08	15.0	15.0	5.0-15.0
88-TW12	8/17/96	27.18	26.62	20.0	20.0	10.0-20.0
88-TW13	8/17/96	26.06	25.16	19.0	19.0	9.0-19.0
88-TW14	8/17/96	29.06	26.06	15.0	15.0	5.0-15.0
88-TW15	8/17/96	27.08	24.67	18.0	18.0	8.0-18.0
88-TW16	8/18/96	27.26	23.87	17.0	17.0	7.0-17.0
88-TW17	8/18/96	26.02	25.02	19.0	19.0	9.0-19.0
88-TW18	8/19/96	24.38	22.26	16.0	15.0	5.0-15.0
88-TW19	8/20/96	24.90	23.24	18.0	18.0	8.0-18.0
88-TW19IW	8/19/96	25.87	23.24	50.0	50.0	45.0-50.0

Notes:

[1] msl = mean sea level
[2] ft, bgs = feet, below ground surface

TABLE 3-2

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION, CTO-0356
MCB CAMP LEJEUNE, NORTH CAROLINA

Well Number / Date of Measurement	Measuring Time	Well Volume	Purge Volume (gals.)	Field Parameters: Specific Conductance at 25°C (µmhos/cm)	Temperature at 25°C (°C)	pH (S.U.)	Turbidity (T.U.)	Dissolved Oxygen (mL/L)
88-TW04IW	1400	1	3	461	26.1	7.02	48.5	1.6
08/15/96	1428	2	6	460	25.9	7.02	8.5	1.6
	1455	3	9	450	26.0	7.09	2.5	1.7
88-TW05[1]	1535	N/A	1	--	--	--	50	--
08/16/96	1545	N/A	N/A	--	--	--	70	--
	1555	N/A	N/A	--	--	--	42.5	--
	1545	N/A	N/A	--	--	--	--	--
	1630	N/A	N/A	--	--	--	70	--
	1640	N/A	N/A	--	--	--	33	--
	1650	N/A	N/A	--	--	--	12	--
	1700	N/A	N/A	--	--	--	8	--
88-TW05IW	1250	1	3	668	25.4	6.37	55	2.0
08/18/96	1308	2	6	608	24.4	6.42	2.6	2.6
	1327	3	9	565	24.4	6.57	0.7	2.6
88-TW06	0812	1	0.7	225	28.1	6.42	13	4.0
08/17/96	0900	2	1.4	217	18.5	6..25	3.4	3.4
	0933	3	2.1	213	29.0	6.21	1.2	3.8
88-TW07	0957	1	0.7	201	25.0	5.53	24	2.6
08/17/96	1008	2	1.4	203	24.6	5.46	16	2.5
	1015	3	2.1	225	24.0	4.87	95	2.0
	1025	4	3.0	221	24.3	4.81	19.5	1.8
	1030	N/A	N/A	--	--	--	10	--
88-TW08	1057	1	.5	149	26.4	4.51	--	2.8
08/17/96	1100	2	1	104	26.5	4.34	--	2.0
	1120	3	1.5	885	25.7	4.70	--	19
	1116	4	2	87	25.7	4.64	20	2.0
	1130	6	3	885	26.1	4.89	--	2.0
	1220	N/A	N/A	--	--	--	68	--
	1225	N/A	N/A	--	--	--	60	--
	1230	N/A	N/A	--	--	--	44	--
	1240	N/A	N/A	--	--	--	30	--
	1245	N/A	N/A	--	--	--	22	--

TABLE 3-2 (Continued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION, CTO-0356
MCB CAMP LEJEUNE, NORTH CAROLINA

Well Number / Date of Measurement	Measuring Time	Well Volume	Purge Volume (gals.)	Field Parameters: Specific Conductance at 25°C (µmhos/cm)	Temperature at 25°C (°C)	pH (S.U.)	Turbidity (T.U.)	Dissolved Oxygen (mL/L)
88-TW08IW	1445	1	2.4	359	26.7	6.73	93	12
08/18/96	1502	2	5	378	25.3	6.83	17	1.6
	1525	3	7.5	404	24.9	6.80	4	1.4
88-TW09	1305	1	.5	133	28.2	5.39	50	3.8
08/17/96	1313	2	1	101	26.6	526	3.5	3.8
	1320	3	1.5	1005	25.9	5.11	2.5	4.0
88-TW10	1350	1	0.7	127	28.5	5.69	10	3.8
	1402	2	1.4	720	28.7	5.75	3	3.6
	1413	3	2.1	118	28.2	5.72	2.5	4.0
88-TW11	1434	1	.7	139	23.4	4.36	158	1.2
08/17/96	1439	2	1.4	137	23.1	4.14	128	1.4
	1446	3	2.1	136	23.1	4.19	50	1.6
	1450	4	3	--	--	--	19	--
	1458	5	3.5	--	--	--	7	--
88-TW12	1525	1	0.4	158	23.9	5.04	11.5	3.8
08/17/96	1535	2	0.8	140	23.7	5.16	2.7	40
	1600	3	1.5	140	23.3	5.32	1	40
88-TW13	1623	1	0.6	99	26.4	4.47	101	3.2
08/17/96	1629	2	1.2	99.5	27.0	4.62	38	3.0
	1635	3	2	99	26.4	4.63	160	30
	1338	--	--	--	--	--	120	--
	1642	--	--	--	--	--	94	--
	1648	--	--	--	--	--	26	--
	1651	--	--	--	--	--	17	--
	1655	--	--	--	--	--	13.5	--
88-TW14	0742	1	0.7	226	22.9	4.51	55	3.0
08/18/96	0755	2	1.5	224	23.0	4.48	1	3.4
	0806	3	2.5	225	23.1	4.37	1	3.0
88-TW15	0828	1	3.6	202	31.6	4.21	87	3.0
	0835	2	1.2	181	32.1	4.23	5	2.8
	0842	3	2.0	166	32.0	4.17	2.2	2.4
88-TW16	1620	1	.7	121	27.0	5.19	31	2.4
08/18/96	1632	2	1.5	109	25.9	5.11	15	2.4
	1643	3	2.5	105	25.8	5.30	2.3	2.4

TABLE 3-2 (Continued)

SUMMARY OF FIELD PARAMETERS
FOR GROUNDWATER SAMPLING
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION, CTO-0356
MCB CAMP LEJEUNE, NORTH CAROLINA

Well Number / Date of Measurement	Measuring Time	Well Volume	Purge Volume (gals.)	Field Parameters: Specific Conductance at 25°C (µmhos/cm)	Temperature at 25°C (°C)	pH (S.U.)	Turbidity (T.U.)	Dissolved Oxygen (mL/L)
88-TW17	0822	1	1	76	26.4	4.71	1.1	2.4
08/20/96	0832	2	1.5	70	26.6	4.57	1.5	3.0
	0842	3	2	69	26.7	4.53	7.0	3.0
88-TW18	0914	1	0.6	155	23.1	5.96	>200	4.0
08/20/96	0926	2	1.5	166	23.1	6.03	>200	4.0
	0937	3	2.2	171	23.2	6.09	195	4.0
	0945	N/A	N/A	--	--	--	99	--
	0955	N/A	N/A	--	--	--	48	--
	1005	N/A	N/A	--	--	--	32	--
88-TW19	1537	1	0.9	113	23.2	4.44	.21	21
	1548	2	1.8	112	23.0	4.33	26	2.2
	1549	3	2.7	113	23.2	4.36	48	2.2
	1555	N/A	N/A	--	--	--	24	--
	1605	N/A	N/A	--	--	--	5	--
88-TW19IW	1204	1	3	141	24.2	6.0	194	4.6
08/20/96	1341	2	6	122	23.8	5.79	7	5
	1513	3	9	105	23.8	5.61	9	5

Notes:

(1) = Insufficient amount of water for readings
°C = Degrees Centigrade
S.U. = Standard Units
µmhos/cm = Micro ohms per Centimeters
N.T.U. = Neophelometric Turbidity Units
-- = Not measured
N/A = Not applicable

TABLE 3-3

SOIL SAMPLING SUMMARY, TEST BORINGS
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION, CTO-0356
MCB, CAMP LEJEUNE, NORTH CAROLINA

Sample Location	Depth of Borehole Feet, bgs[1]	Sampling Interval Feet, bgs[1]	Analytical Parameters	
			EPA 8240[2]	TCL VOA[3]
88-TW04IW-03	56	6-8	●	
88-TW04IW-10	56	20-22	●	
88-TW05-04	15	6-8	●	
88-TW06-03	15	4-6	●	
88-TW07-03	15	4-6	●	●
88-TW08-03	15	4-6	●	●
88-TW09-04	18	6-8	●	●
88-TW09-06	18	10-12	●	
88-TW10-02	15	4-6	●	
88-TW11-02	15	2-4	●	
88-TW12-05	20	8-10	●	
88-TW13-03	19	5-7	●	
88-TW13-05	19	9-11	●	
88-TW14-03	15	4-6	●	
88-TW15-04	18	8-10	●	●
88-TW16-04	17	7-9	●	
88-TW17-04	19	7-9	●	
88-TW18-03	16	4-6	●	
88-TW19-03	18	6-8	●	

Notes:

[1] Below Ground Surface
[2] Analysis by on-site mobile laboratory
[3] Analysis by fixed based laboratory

● = Sample analyzed for indicated parameter

TABLE 3-4

GROUNDWATER SAMPLING SUMMARY
OPERABLE UNIT 15 (SITE 88)
PHASE I INVESTIGATION, CTO-0356
MCB, CAMP LEJEUNE, NORTH CAROLINA

Sample Location	Analytical Parameters	
	EPA 8240[1]	TCL VOA[2]
88-TW01	●	
88-TW02	●	
88-TW03	●	
88-TW04	●	
88-TW04IW	●	
88-TW05	●	●
88-TW05IW	●	●
88-TW06	●	
88-TW07	●	●
88-TW08	●	●
88-TW08IW	●	●
88-TW09	●	●
88-TW10	●	
88-TW11	●	
88-TW12	●	
88-TW13	●	
88-TW14	●	
88-TW15	●	●
88-TW16	●	
88-TW17	●	
88-TW18	●	
88-TW19	●	●
88-TW19IW	●	●

Notes:

(1) On-site laboratory
(2) Fixed based laboratory

TCL = Target Compound List
VOA = Volatile Organic Analysis
● = Sample analyzed for indicated parameter

TABLE 4-1
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
SUBSURFACE SOIL
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW04IW-03	88-TW04IW-11	88-TW05-04	88-TW06-03	88-TW07-03	88-TW08-03
SAMPLE DATE	08/16/96	08/16/96	08/16/96	08/16/96	08/16/96	08/16/96
SAMPLE DEPTH (FT)	6-8	20-22	6-8	4-6	4-6	4-6
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
VOLATILES						
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	0.2	0.1	0.1	ND	ND	0.8
TETRACHLOROETHENE	14.8	1.5	1.2	0.4	0.1	237.6

NOTES
ug/kg = micrograms per kilogram.
ND = Not Detected.

TABLE 4-1 (continued)
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
SUBSURFACE SOIL
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW09-04	88-TW09-06	88-TW10-02	88-TW11-02	88-TW12-05	88-TW13-03	88-TW13-05
SAMPLE DATE	08/17/96	08/17/96	08/17/96	08/17/96	08/17/96	08/17/96	08/17/96
SAMPLE DEPTH (FT)	6-8	10-12	4-6	2-4	8-10	5-7	9-11
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
VOLATILES							
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	3.3	0.5	ND	ND	ND	ND	ND
TETRACHLOROETHENE	22.6	3.1	ND	ND	ND	1.5	0.9

NOTES
ug/kg = micrograms per kilogram.
ND = Not Detected.

TABLE 4-1 (continued)
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
SUBSURFACE SOIL
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW14-03	88-TW15-04	88-TW16-04	88-TW17-04	88-TW18-03	88-TW19-03
SAMPLE DATE	08/17/96	08/17/96	08/18/96	08/18/96	08/20/96	08/20/96
SAMPLE DEPTH (FT)	4-6	8-10	7-9	7-9	4-6	6-8
UNITS	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
VOLATILES						
CIS-1,2-DICHLOROETHENE	ND	21	ND	ND	ND	ND
TRICHLOROETHENE	ND	8.5	ND	ND	ND	ND
TETRACHLOROETHENE	0.3	11.6	0.2	0.2	ND	ND

NOTES
ug/kg = micrograms per kilogram.
ND = Not Detected.

TABLE 4-2

SUMMARY OF SITE SOIL CONTAMINATION
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25 MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

Media	Fraction	Contaminants	Comparison Criteria	Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above USEPA Screening Levels [1]
			USEPA Screening Levels [1]					
Subsurface Soil [1] (on-site lab)	Volatiles	Cis-1,2-Dichloroethene	200	21	21	88-TW15-04	1/19	0
		Trichloroethene	20	0.1	8.5	88-TW15-04	7/19	0
		Tetrachloroethene	40	0.1	237.6	88-TW08-03	14/19	1
Subsurface Soil [1] (fixed-base lab)	Volatiles	Tetrachloroethene	40	53	53	88-TW08-03	1/4	1

(1) - Soil concentrations compared to USEPA Region III Soil Screening Levels for Transfer from Soil to Groundwater (May, 1996)
Concentrations in ug/kg

TABLE 4-3
FIXED BASE DETECTION SUMMARY
SUBSURFACE SOIL
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE_NO	88-TW07-03	88-TW08-03	88-TW09-04	88-TW15-04
LAB_ID	9608G930-004	9608G930-002	9608G930-003	9608G930-005
DATE SAMPLED	08/16/96	08/16/96	08/16/96	08/17/96
UNITS	UG/KG	UG/KG	UG/KG	UG/KG
VOLATILES				
CHLOROMETHANE	12 U	12 U	11 U	12 U
BROMOMETHANE	12 U	12 U	11 U	12 U
VINYL CHLORIDE	12 U	12 U	11 U	12 U
CHLOROETHANE	12 U	12 U	11 U	12 U
METHYLENE CHLORIDE	12 U	12 U	11 U	12 U
ACETONE	18 UJ	27 UJ	30 UJ	29 UJ
CARBON DISULFIDE	12 U	12 U	11 U	12 U
1,1-DICHLOROETHENE	12 U	12 U	11 U	12 U
1,1-DICHLOROETHANE	12 U	12 U	11 U	12 U
1,2-DICHLOROETHENE (TOTAL)	12 U	12 U	11 U	12 U
CHLOROFORM	12 U	12 U	11 U	12 U
1,2-DICHLOROETHANE	12 U	12 U	11 U	12 U
2-BUTANONE	12 U	12 U	11 U	12 U
1,1,1-TRICHLOROETHANE	12 U	12 U	11 U	12 U
CARBON TETRACHLORIDE	12 U	12 U	11 U	12 U
BROMODICHLOROMETHANE	12 U	12 U	11 U	12 U
1,2-DICHLOROPROPANE	12 U	12 U	11 U	12 U
CIS-1,3-DICHLOROPROPENE	12 U	12 U	11 U	12 U
TRICHLOROETHENE	12 U	12 U	11 U	12 U
DIBROMOCHLOROMETHANE	12 U	12 U	11 U	12 U
1,1,2-TRICHLOROETHANE	12 U	12 U	11 U	12 U
BENZENE	12 U	12 U	11 U	12 U
TRANS-1,3-DICHLOROPROPENE	12 U	12 U	11 U	12 U

QUALIFIER DEFINITIONS
U = Not detected at reported quantitation limit.
UJ = Reported quantitation limit is estimated.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-3 (continued)
FIXED BASE DETECTION SUMMARY
SUBSURFACE SOIL
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE_NO	88-TW07-03	88-TW08-03	88-TW09-04	88-TW15-04
LAB_ID	9608G930-004	9608G930-002	9608G930-003	9608G930-005
DATE SAMPLED	08/16/96	08/16/96	08/16/96	08/17/96
UNITS	UG/KG	UG/KG	UG/KG	UG/KG
VOLATILES (cont)				
BROMOFORM	12 U	12 U	11 U	12 U
4-METHYL-2-PENTANONE	12 U	12 U	11 U	12 U
2-HEXANONE	12 U	12 U	11 U	12 U
TETRACHLOROETHENE	12 U	53	11 U	12 U
1,1,2,2-TETRACHLOROETHANE	12 U	12 U	11 U	12 U
TOLUENE	12 U	12 U	11 U	12 U
CHLOROBENZENE	12 U	12 U	11 U	12 U
ETHYLBENZENE	12 U	12 U	11 U	12 U
STYRENE	12 U	12 U	11 U	12 U
XYLENE (TOTAL)	12 U	12 U	11 U	12 U

QUALIFIER DEFINITIONS
U = Not detected at reported quantitation limit.
UJ = Reported quantitation limit is estimated.

NOTES
ug/kg = micrograms per kilogram.

TABLE 4-4
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW01	88-TW02	88-TW03	88-TW04	88-TW04IW	88-TW05
SAMPLE DATE	08/01/96	08/01/96	08/01/96	08/01/96	08/16/96	08/16/96
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
VOLATILES						
TRANS-1,2-DICHLOROETHENE	ND	9	6	1	ND	ND
CIS-1,2-DICHLOROETHENE	4	445	1184	63	21	3
1,1,1-TRICHLOROETHANE	ND	ND	0.2	0.2	ND	ND
TRICHLOROETHENE	17.7	81.5	838.1	229.9	5.5	20.8
TETRACHLOROETHENE	157.2	649.1	14090	32839.4	21	1381.7

NOTES
ug/L = micrograms per liter.
ND = Not Detected.

TABLE 4-4 (continuted)
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW05IW	88-TW06	88-TW07	88-TW08	88-TW08IW	88-TW09
SAMPLE DATE	08/18/96	08/17/96	08/17/96	08/17/96	08/18/96	08/17/96
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
VOLATILES						
TRANS-1,2-DICHLOROETHENE	1	ND	ND	2	11	ND
CIS-1,2-DICHLOROETHENE	89	ND	ND	271	883	14
1,1,1-TRICHLOROETHANE	ND	ND	ND	0.5	ND	ND
TRICHLOROETHENE	71.2	ND	ND	341.2	822.7	70.8
TETRACHLOROETHENE	1142.7	ND	0.2	53703.8	1314.4	969.2

NOTES
ug/L = micrograms per liter.
ND = Not Detected.

TABLE 4-4 (continuted)
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW10	88-TW11	88-TW12	88-TW13	88-TW14	88-TW15	88-TW16
SAMPLE DATE	08/18/96	08/17/96	08/17/96	08/18/96	08/18/96	08/18/96	08/18/96
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
VOLATILES							
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	38	ND
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	3725	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	0.2	0.2	ND	0.6	ND	3030.9	ND
TETRACHLOROETHENE	0.1	1.3	1.5	44.3	0.1	4931.8	0.2

NOTES
ug/L = micrograms per liter.
ND = Not Detected.

TABLE 4-4 (continuted)
ONSITE LABORATORY POSITIVE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE NORTH CAROLINA
CTO-0356

SAMPLE ID	88-TW17	88-TW18	88-TW19	88-TW19IW
SAMPLE DATE	08/20/96	08/20/96	08/20/96	08/20/96
UNITS	(ug/L)	(ug/L)	(ug/L)	(ug/L)
VOLATILES				
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND
TETRACHLOROETHENE	0.2	ND	ND	ND

NOTES
ug/L = micrograms per liter.
ND = Not Detected.

TABLE 4-5
FIXED BASE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE_NO	88-TW05-01	88-TW08-01	88-TW09-01	88-TW19-01	88-TW05IW-01	88-TW08IW-01	88-TW19IW-01
LAB_ID	9608G126-005	9608G126-007	9608G126-003	9608G126-002	9608G126-004	9608G126-006	9608G126-001
DATE SAMPLED	08/28/96	08/28/96	08/27/96	08/27/96	08/28/96	08/28/96	08/27/96
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
VOLATILES							
CHLOROMETHANE	10 UJ	10 UJ	10 UJ	10 U	10 UJ	10 UJ	10 UJ
BROMOMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 J	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	160	210 J	8 J	10 U	120 J	1800	10 U
CHLOROFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-BUTANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	34	230 J	54	10 U	72 J	1100	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U

QUALIFIER DEFINITIONS
J = Estimated value.
U = Not detected at reported quantitation limit.
UJ = Reported quantitation limit is estimated.

NOTES
ug/L = micrograms per liter.

TABLE 4-5 (continued)
FIXED BASE DETECTION SUMMARY
GROUNDWATER
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25, MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE_NO	88-TW05-01	88-TW08-01	88-TW09-01	88-TW19-01	88-TW05IW-01	88-TW08IW-01	88-TW19IW-01
LAB_ID	9608G126-005	9608G126-007	9608G126-003	9608G126-002	9608G126-004	9608G126-006	9608G126-001
DATE SAMPLED	08/28/96	08/28/96	08/27/96	08/27/96	08/28/96	08/28/96	08/27/96
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
VOLATILES (cont)							
BROMOFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	150	27000	1100	10 U	1900	1700	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
TOLUENE	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ETHYLBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U
STYRENE	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U

QUALIFIER DEFINITIONS
J = Estimated value.
U = Not detected at reported quantitation limit.
NOTES
ug/L = micrograms per liter.

TABLE 4-6

SUMMARY OF SITE GROUNDWATER CONTAMINATION
OPERABLE UNIT NO. 15 (SITE 88)
BUILDING 25 MWR DRY CLEANERS
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

Media	Fraction	Contaminants	Comparison Criteria (1)		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Comparison	Above Criteria
			NC WQS	Federal MCL					NC WQS	Federal MCL
Groundwater (1) (on-site lab)	Volatiles	Trans-1,2-Dichloroethene	70	100	1	38	88-TW15	7/23	0	0
		Cis-1,2-Dichloroethene	70	70	3	3725	88-TW15	11/23	6	6
		1,1,1-Trichloroethane	NE	200	0.2	0.5	88-TW08	3/23	0	0
		Trichloroethene	2.8	5	0.2	3030	88-TW15	14/23	11	11
		Tetrachloroethene	1	5	0.2	53703	88-TW08	19/23	14	11
Groundwater (1) (fixed based lab)	Volatiles	Dichloroethene (total)	70	100	8J	1,800	88-TW08IW	5/7	4	4
		Trichloroethene	2.8	5	34	1,100	88-TW08IW	5/7	5	5
		Tetrachloroethene	1	5	150	27,000	88-TW08	5/7	5	5

(1) - Groundwater concentrations compared to North Carolina Water Quality Standards for Groundwater/USEPA Maximum Contaminant Levels
NE - Not Established

FIGURES

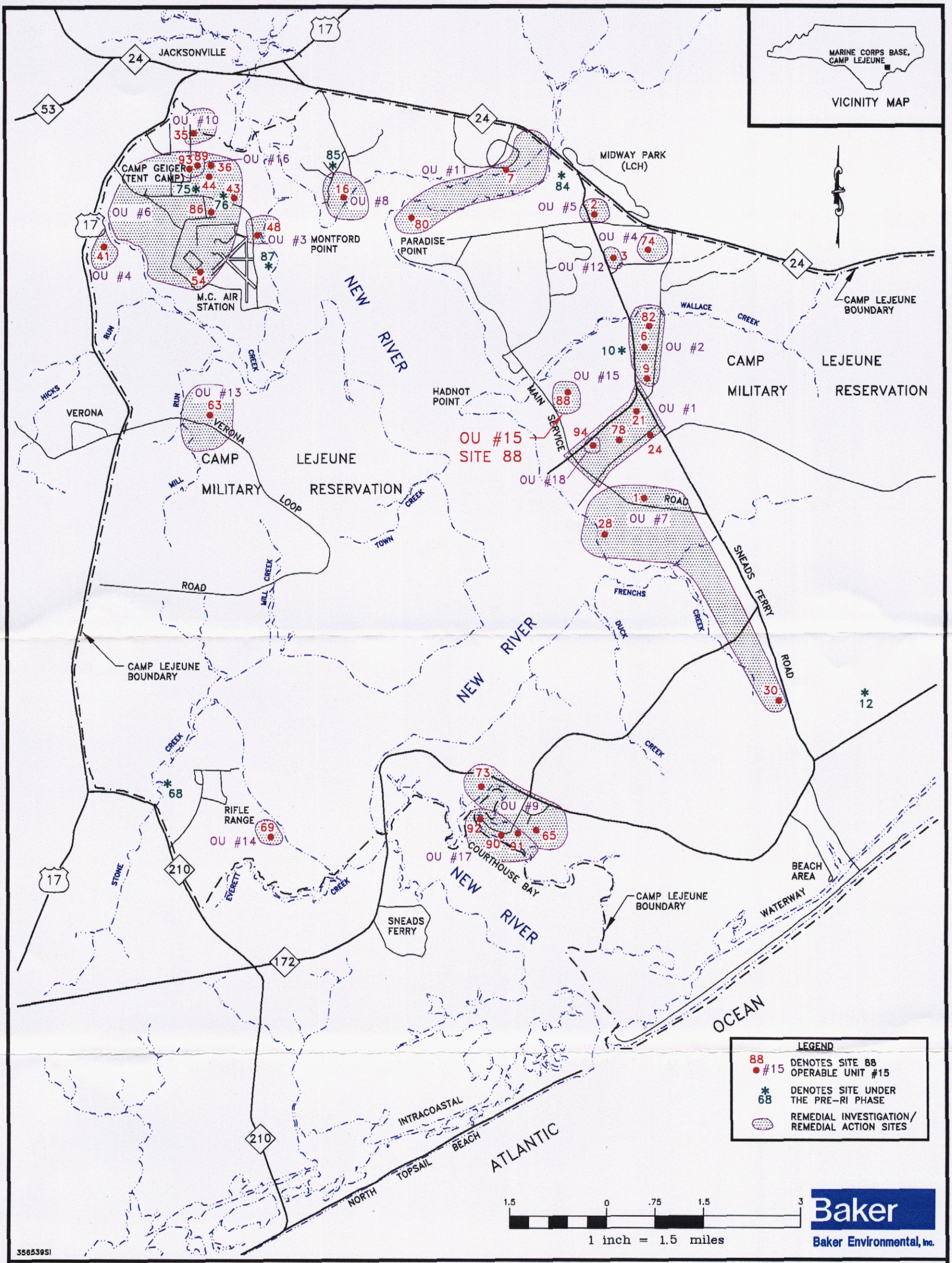

FIGURE 1-1
OPERABLE UNITS AND SITE LOCATIONS AT
MARINE CORPS BASE CAMP LEJEUNE
CTO - 0356

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

017478014

MAIN SERVICE ROAD

BLDG. S299

PARKING LOT

BLDG. 38

BLDG. 3

VIRGINIA DARE DRIVE

S94

BLDG. 43

BUILDING 4

PARKING LOT

PARKING LOT

GRASS AREA

PARKING

PARKING LOT

FIRE ALARM

APPROXIMATE LOCATION OF FORMER USTs

TW03

TW02

TW04

WOOD SHED

TW01

WOOD SHED SEWER CLEAN OUT

POST LANE

BUILDING 25

BUILDING 37

PARKING LOT

ELEC. BOX

COVERED AREA

BUILDING 80

STEAM

BLDG 25A

BLDG. HP57

NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

70 0 35 70

1 inch = 70 ft.

356500SI

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LEGEND

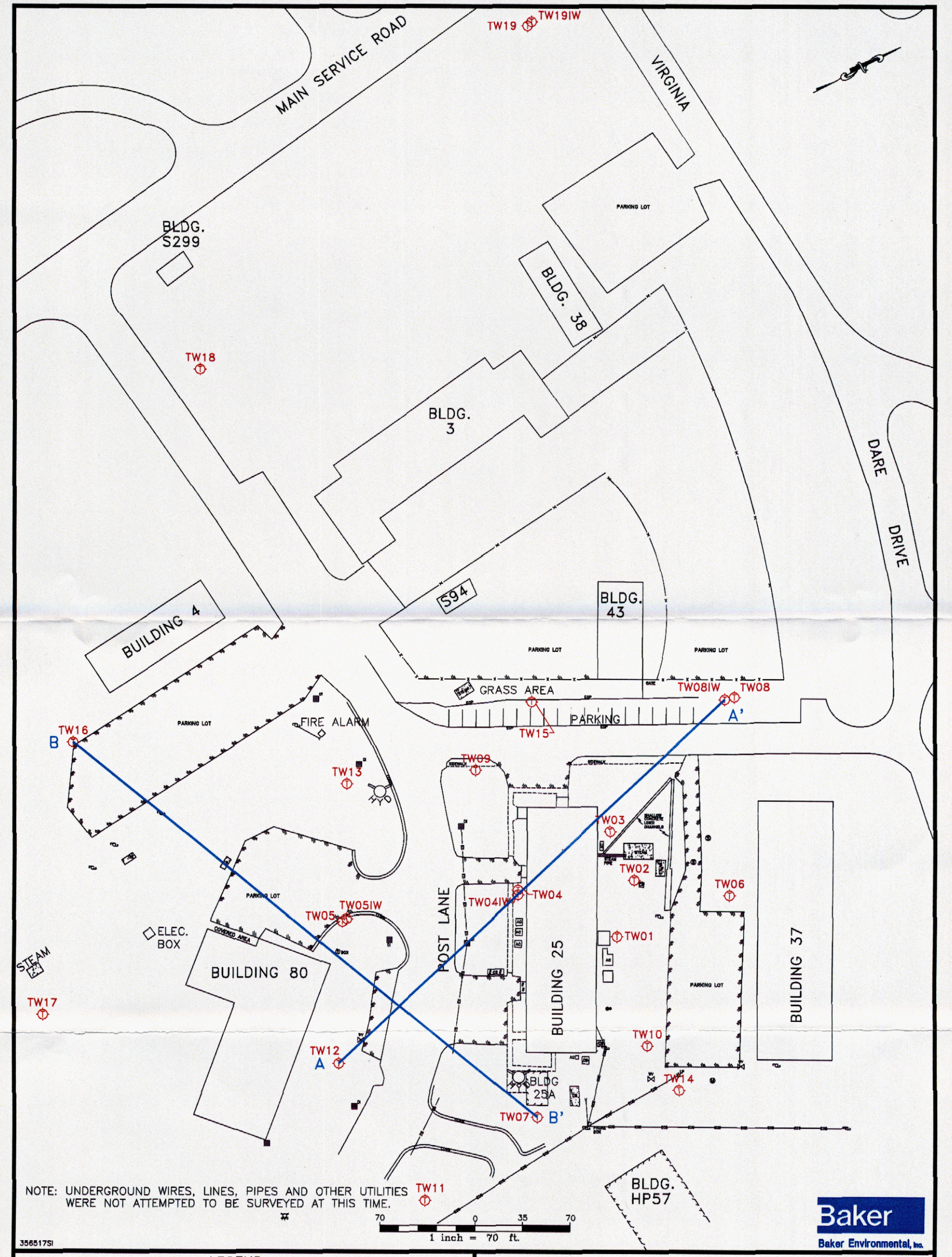
- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW01 TEMPORARY MONITORING WELL
- ES STORM DRAIN
- FENCE
- EOE POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

FIGURE 1-2
SITE LOCATION MAP
SITE 88
BUILDING 25, MWR DRY CLEANERS

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E02Y



LEGEND

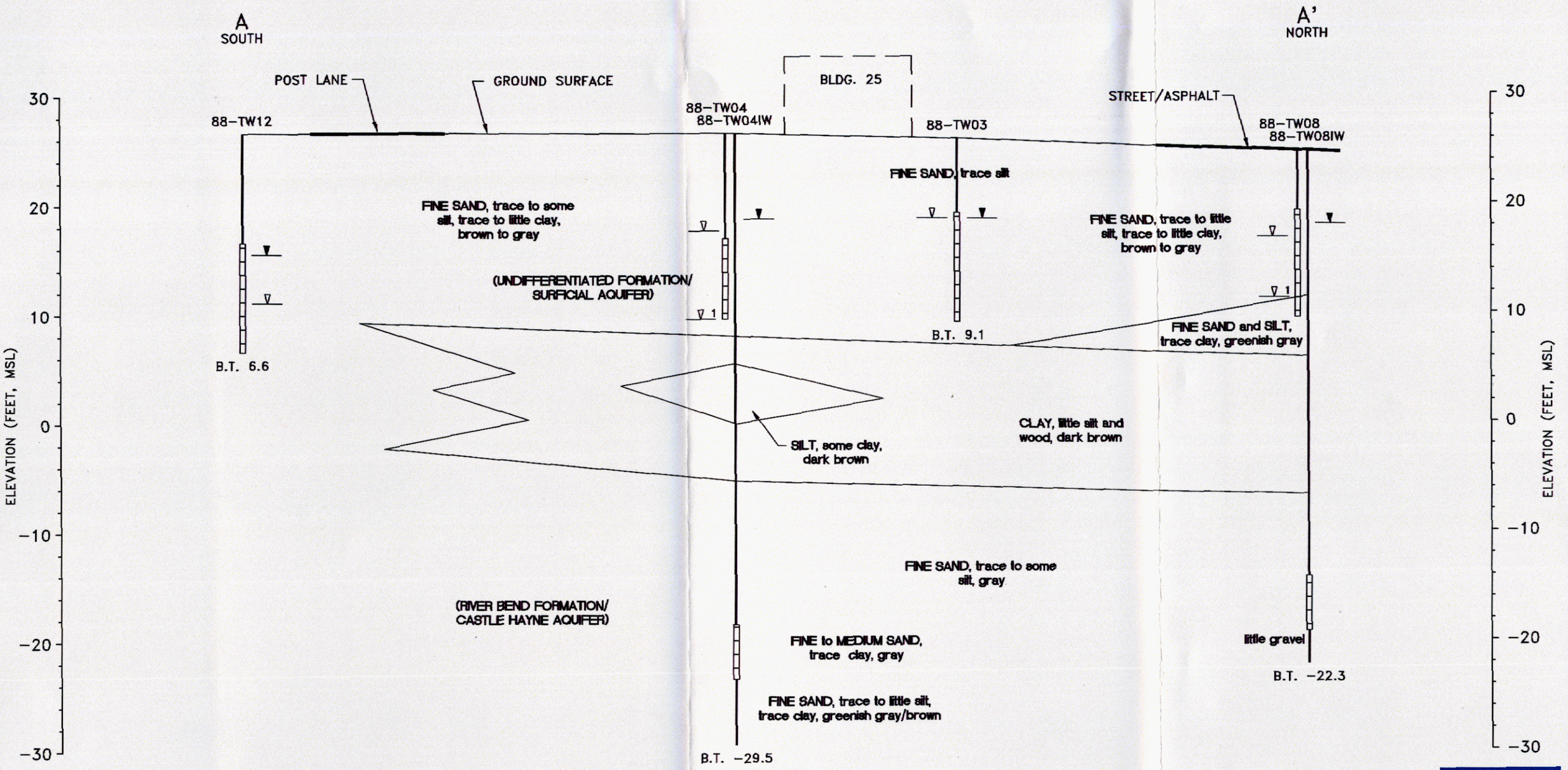
- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- EXISTING WELLS
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW19 TEMPORARY MONITORING WELL
- STORM DRAIN
- FENCE
- POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

FIGURE 2-1
CROSS-SECTION LOCATION MAP
SITE 88
BUILDING 25, MWR DRY CLEANERS

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

0174F03Y



LEGEND

- ▽ STATIC GROUNDWATER ELEVATION IN SHALLOW WELL
- ▽ 1 STATIC GROUNDWATER ELEVATION IN INTERMEDIATE WELL
- ▼ GROUNDWATER ENCOUNTERED DURING DRILLING
- B.T. X' BORING TERMINATED, ELEVATION MSL
- WELL SCREEN INTERVAL
- ——— ESTIMATED
- – – – – PROJECTED

40 0 20 40 80

Horizontal Scale: 1 inch = 40 ft.

10 0 5 10 20

Vertical Scale: 1 inch = 10 ft.

THE SOIL BORING INFORMATION IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. SUBSURFACE CONDITIONS INTERPOLATED BETWEEN BORINGS ARE ESTIMATED BASED ON ACCEPTED SOIL ENGINEERING PRINCIPLES AND GEOLOGIC JUDGEMENT.

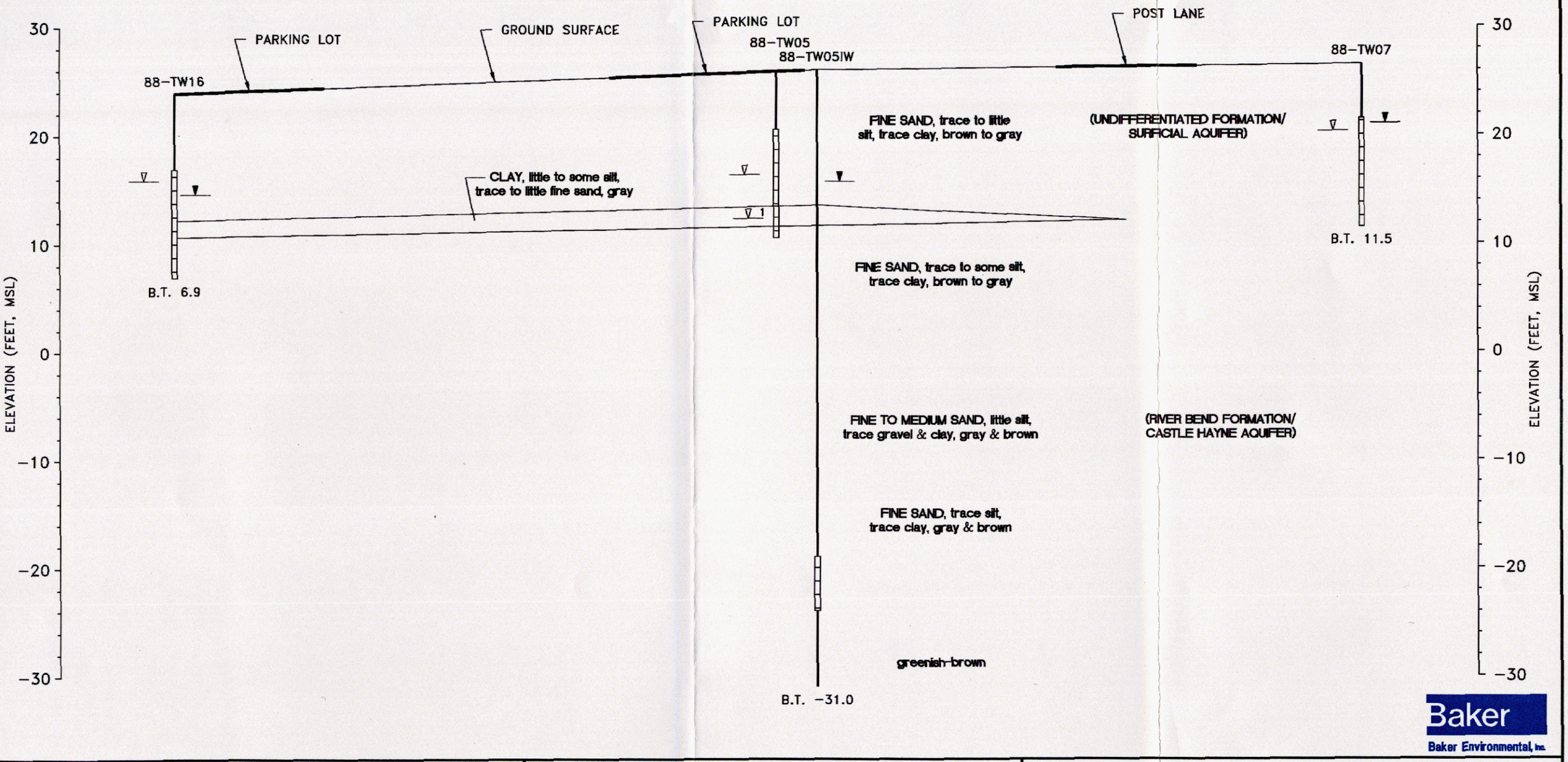
FIGURE 2-2
HYDROGEOLOGIC CROSS-SECTION A-A'
SITE 88 - BLDG. 25 MWR DRY CLEANERS
PHASE I INVESTIGATION

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E047

B
WEST

B'
EAST



LEGEND

- STATIC GROUNDWATER ELEVATION IN SHALLOW WELL
- STATIC GROUNDWATER ELEVATION IN INTERMEDIATE WELL
- GROUNDWATER ENCOUNTERED DURING DRILLING
- B.T. X' — BORING TERMINATED, ELEVATION MSL
- WELL SCREEN INTERVAL
- ESTIMATED
- PROJECTED

40 0 20 40 80
Horizontal Scale: 1 inch = 40 ft.

10 0 5 10 20
Vertical Scale: 1 inch = 10 ft.

THE SOIL BORING INFORMATION IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. SUBSURFACE CONDITIONS INTERPOLATED BETWEEN BORINGS ARE ESTIMATED BASED ON ACCEPTED SOIL ENGINEERING PRINCIPLES AND GEOLOGIC JUDGEMENT.

FIGURE 2-3
HYDROGEOLOGIC CROSS-SECTION B-B'
SITE 88 - BLDG. 25 MWR DRY CLEANERS
PHASE I INVESTIGATION

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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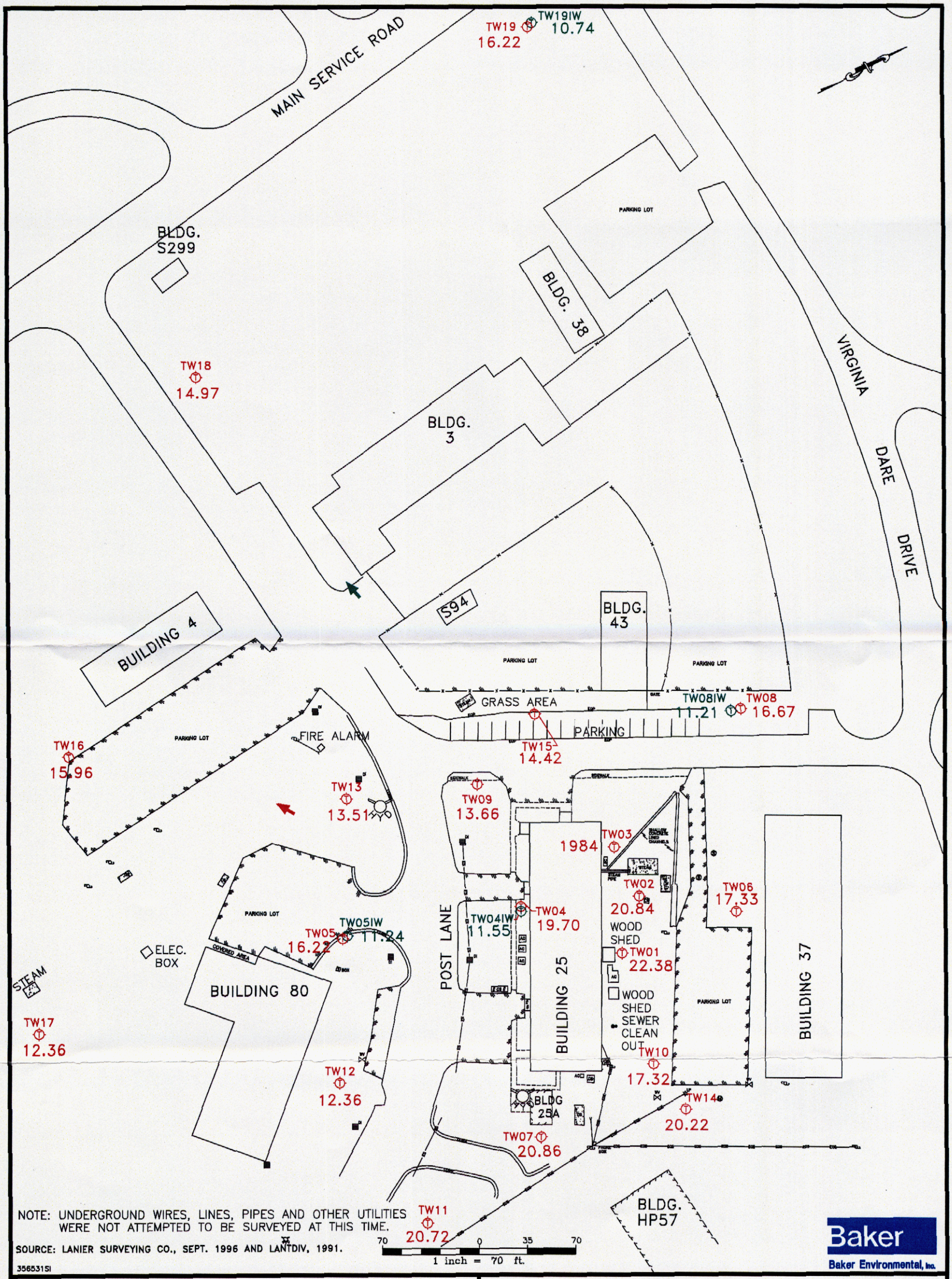
A17H7E057



NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

356531SI

LEGEND

- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- EXISTING WELLS
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW19 TEMPORARY MONITORING WELL
- APPROXIAMTE GROUNDWATER FLOW DIRECTION SURFICIAL AQUIFER
- TW05IW TEMPORARY MONITORING WELL
- APPROXIAMTE GROUNDWATER FLOW DIRECTION
- STORM DRAIN
- FENCE
- POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE

FIGURE 2-4
GROUNDWATER ELEVATIONS
SITE 88
BUILDING 25, MWR DRY CLEANERS

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E06X

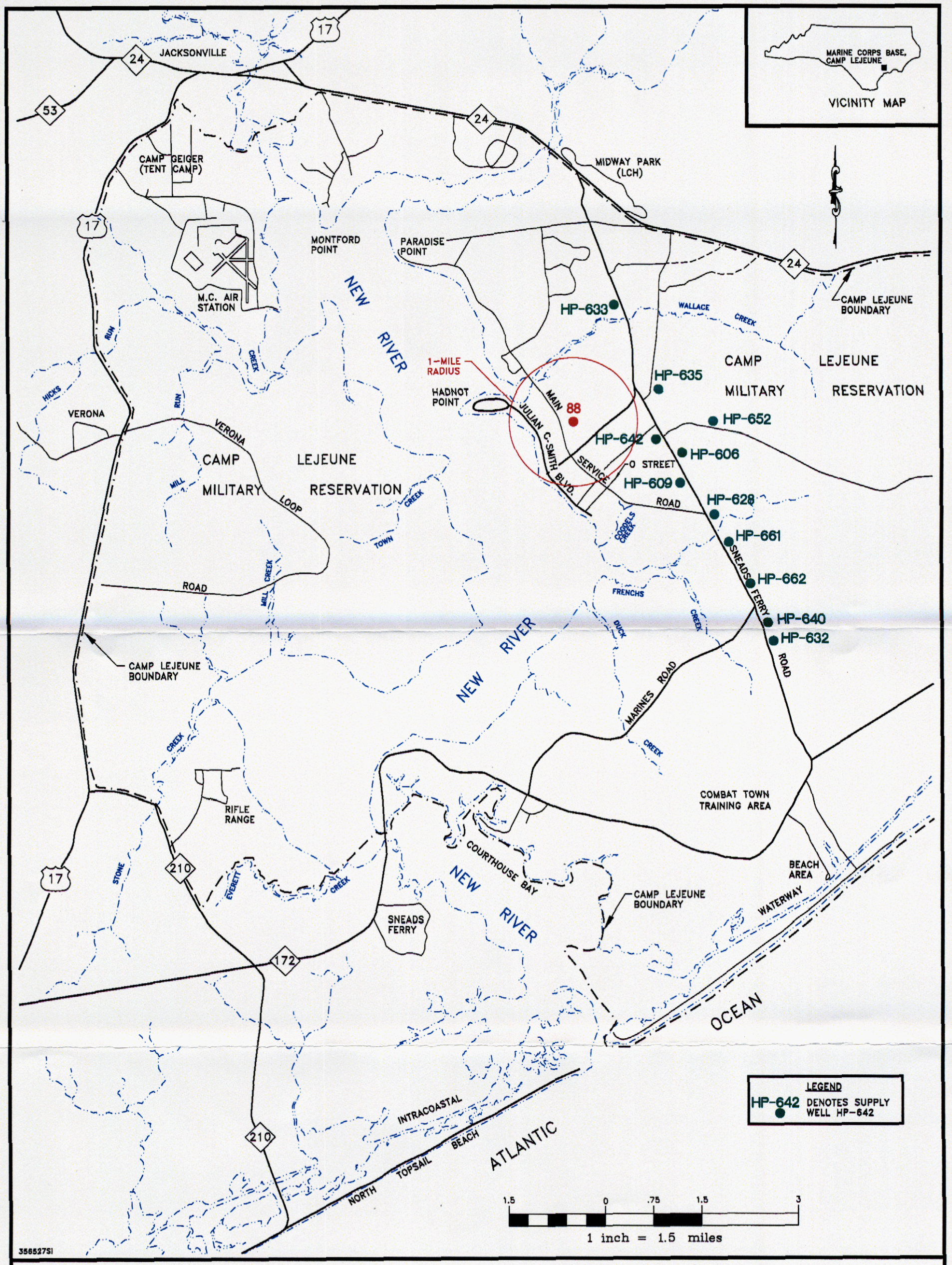
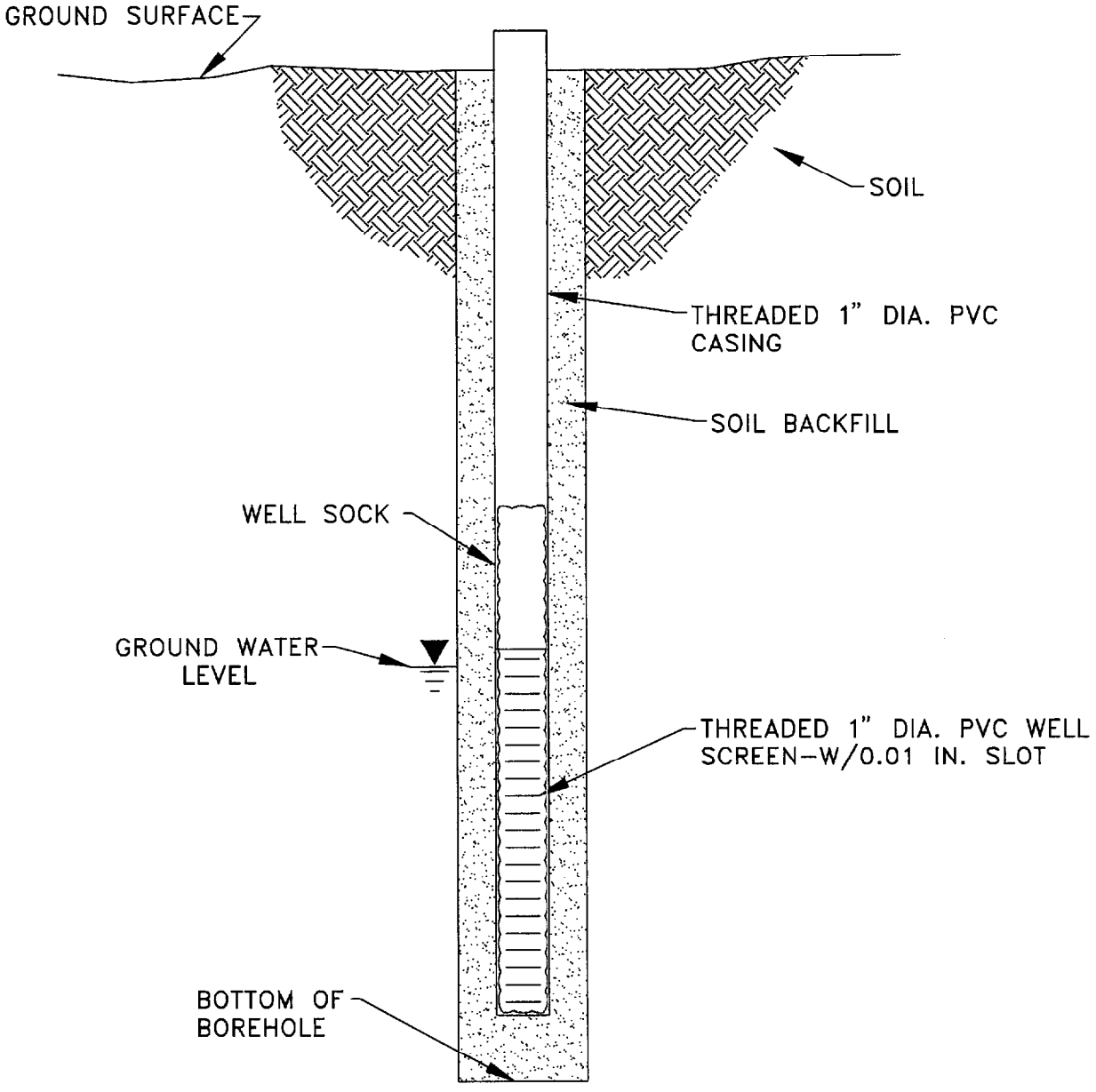


FIGURE 2-5
ACTIVE WATER SUPPLY WELL LOCATIONS
SITE 88
CTO-0356

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

0174E07Y

356501SI

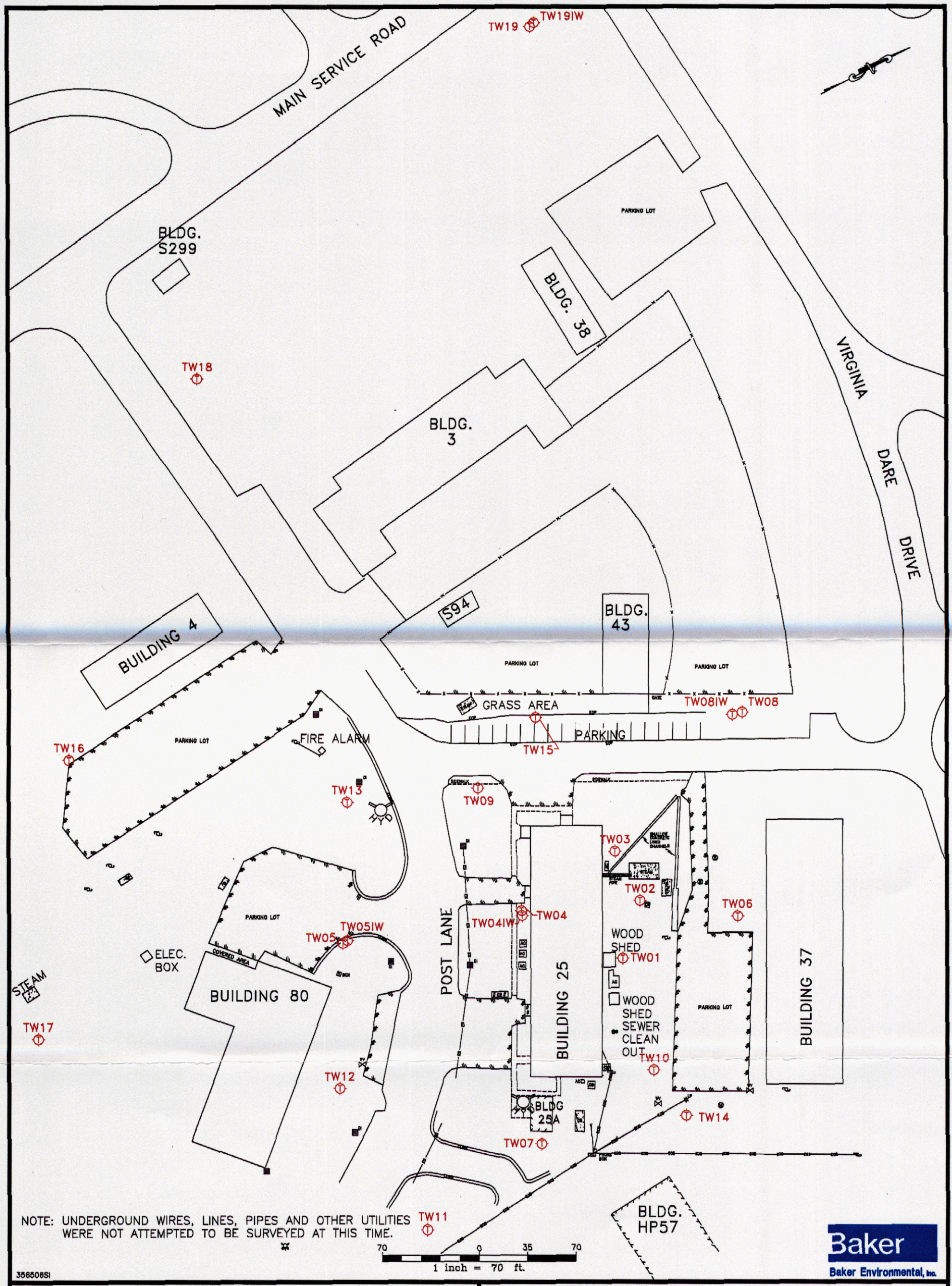


N.T.S.

Baker

Baker Environmental, Inc.

FIGURE 3-1
TYPICAL TEMPORARY MONITORING WELL
CONSTRUCTION DIAGRAM
PHASE I INVESTIGATION
CTO - 0356
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTE: UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.

356506SI

LEGEND

- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- EXISTING WELLS
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW19 TEMPORARY MONITORING WELL
- STORM DRAIN
- FENCE
- POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

FIGURE 3-2
TEMPORARY MONITORING WELL LOCATIONS
SITE 88
BUILDING 25, MWR DRY CLEANERS

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E08Y

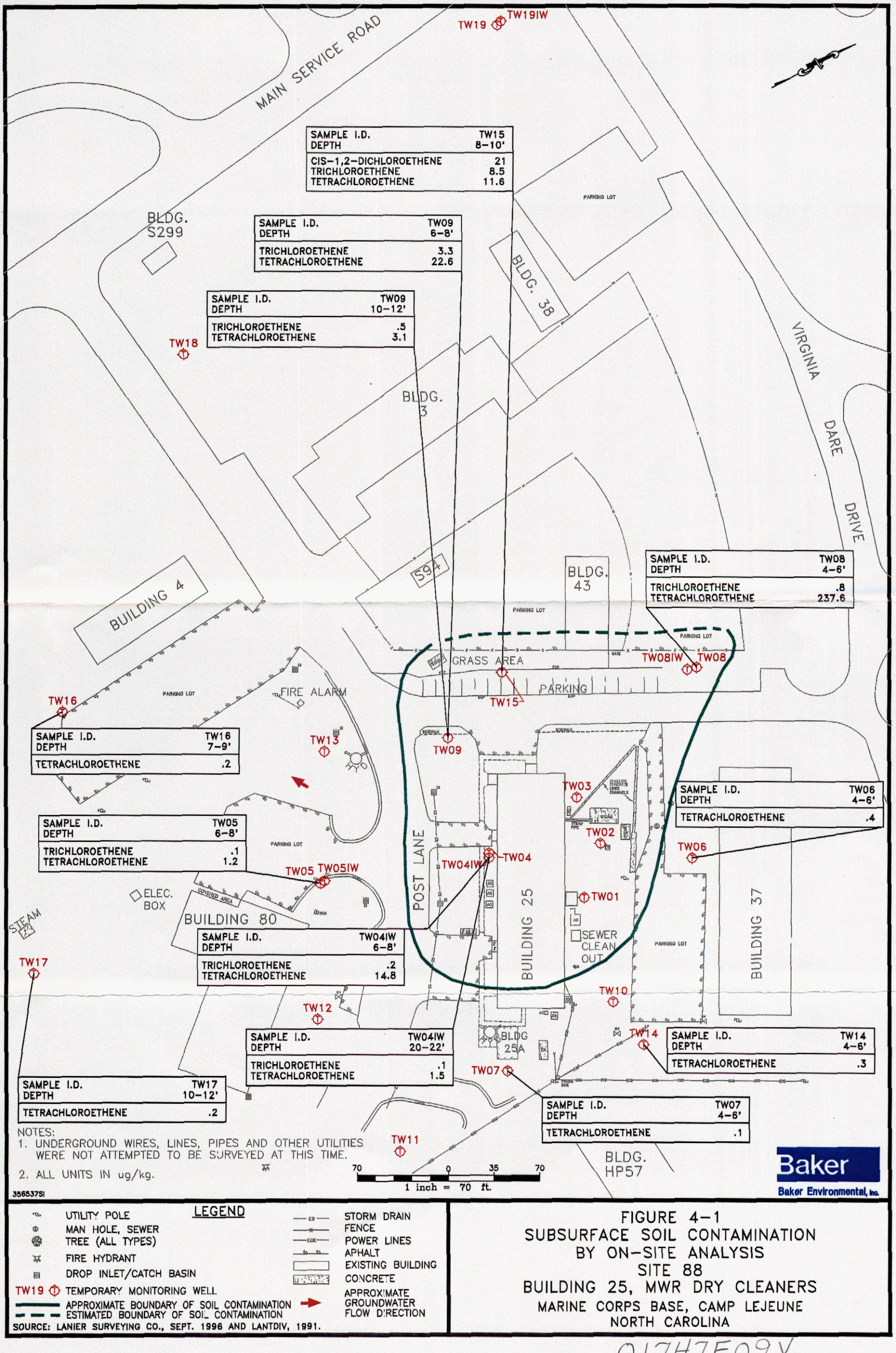


FIGURE 4–1
SUBSURFACE SOIL CONTAMINATION
BY ON–SITE ANALYSIS
SITE 88
BUILDING 25, MWR DRY CLEANERS
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E09Y

FEDERAL MAXIMUM CONTAMINATION LEVELS AND NORTH CAROLINA WATER QUALITY STANDARDS CLASS GA STANDARDS

ORGANIC CONTAMINANTS	MCL (ug/L)	N.C. REGULATION (ug/L)
VOLATILES		
TRICHLOROETHENE	5	2.8
CIS-1,2-DICHLOROETHENE	70	70
TRANS-1,2-DICHLOROETHENE	100	70
TETRACHLOROETHENE	5.0	0.7
1,1,1-TRICHLOROETHENE	200	200

CONTAMINANT CONCENTRATIONS ARE EXPRESSED IN MICROGRAMS PER LITER (ug/L).

CONTAMINANTS THAT EXCEED N.C. REGULATIONS ARE COLORED GREEN.

CONTAMINANTS THAT EXCEED BOTH N.C. REGULATIONS AND MCLs ARE COLORED RED.

SAMPLE I.D.	TW08
TRANS-1,2-DICHLOROETHENE	2
CIS-1,2-DICHLOROETHENE	271
1,1,1-TRICHLOROETHANE	.5
TRICHLOROETHENE	341.2
TETRACHLOROETHENE	53703.8

SAMPLE I.D.	TW15
TRANS-1,2-DICHLOROETHENE	38
CIS-1,2-DICHLOROETHENE	3725
TRICHLOROETHENE	3030.9
TETRACHLOROETHENE	4931.8

SAMPLE I.D.	TW16
TETRACHLOROETHENE	.2

SAMPLE I.D.	TW09
CIS-1,2-DICHLOROETHENE	14
TRICHLOROETHENE	70.8
TETRACHLOROETHENE	4931.8

SAMPLE I.D.	TW03
TRANS-1,2-DICHLOROETHENE	6
CIS-1,2-DICHLOROETHENE	1184
1,1,1-TRICHLOROETHANE	.2
TRICHLOROETHENE	838.1
TETRACHLOROETHENE	14090

SAMPLE I.D.	TW13
TRICHLOROETHENE	.6
TETRACHLOROETHENE	44.3

SAMPLE I.D.	TW04
TRANS-1,2-DICHLOROETHENE	1
CIS-1,2-DICHLOROETHENE	63
1,1,1-TRICHLOROETHANE	.2
TRICHLOROETHENE	229.9
TETRACHLOROETHENE	32839.4

SAMPLE I.D.	TW02
TRANS-1,2-DICHLOROETHENE	9
CIS-1,2-DICHLOROETHENE	445
TRICHLOROETHENE	81.5
TETRACHLOROETHENE	649.1

SAMPLE I.D.	TW05
CIS-1,2-DICHLOROETHENE	3
TRICHLOROETHENE	20.8
TETRACHLOROETHENE	1381.7

SAMPLE I.D.	TW01
CIS-1,2-DICHLOROETHENE	4
TRICHLOROETHENE	17.7
TETRACHLOROETHENE	157.2

SAMPLE I.D.	TW12
TETRACHLOROETHENE	1.5

SAMPLE I.D.	TW10
TRICHLOROETHENE	0.2
TETRACHLOROETHENE	0.1

SAMPLE I.D.	TW11
TRICHLOROETHENE	.2
TETRACHLOROETHENE	1.3

SAMPLE I.D.	TW17
TETRACHLOROETHENE	.2

SAMPLE I.D.	TW14
TETRACHLOROETHANE	.1

SAMPLE I.D.	TW07
TETRACHLOROETHANE	.2

NOTES:
1. UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.
2. ALL UNITS IN ug/L.

70 0 35 70
1 inch = 70 ft.

356536SI

LEGEND

- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW19 TEMPORARY MONITORING WELL
- APPROXIMATE BOUNDARY OF GROUNDWATER CONTAMINATION
- ESTIMATED BOUNDARY OF GROUNDWATER CONTAMINATION
- STORM DRAIN
- FENCE
- POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE
- APPROXIMATE GROUNDWATER FLOW DIRECTION

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

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FIGURE 4-2
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (SHALLOW WELLS) BY ON-SITE ANALYSIS
SITE 88
BUILDING 25, MWR DRY CLEANERS
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E10Y

FEDERAL MAXIMUM CONTAMINATION LEVELS AND NORTH CAROLINA WATER QUALITY STANDARDS CLASS GA STANDARDS

ORGANIC CONTAMINANTS	MCL (ug/L)	N.C. REGULATION (ug/L)
VOLATILES		
TRICHLOROETHENE	5	2.8
CIS-1,2-DICHLOROETHENE	70	70
TRANS-1,2-DICHLOROETHENE	100	70
TETRACHLOROETHENE	5.0	0.7
1,1,1-TRICHLOROETHENE	200	200

CONTAMINANT CONCENTRATIONS ARE EXPRESSED IN MICROGRAMS PER LITER (ug/L).

CONTAMINANTS THAT EXCEED N.C. REGULATIONS ARE COLORED GREEN.

CONTAMINANTS THAT EXCEED BOTH N.C. REGULATIONS AND MCLs ARE COLORED RED.

SAMPLE I.D.	TW08IW
TRANS-1,2-DICHLOROETHENE	11
CIS-1,2-DICHLOROETHENE	883
TRICHLOROETHENE	822.7
TETRACHLOROETHANE	1314.4

SAMPLE I.D.	TW05IW
TRANS-1,2-DICHLOROETHENE	1
CIS-1,2-DICHLOROETHENE	89
TRICHLOROETHENE	71.2
TETRACHLOROETHENE	1142.7

SAMPLE I.D.	TW04IW
CIS-1,2-DICHLOROETHENE	21
TRICHLOROETHENE	5.5
TETRACHLOROETHENE	21

MAIN SERVICE ROAD
BLDG. S299
BLDG. 38
BLDG. 3
VIRGINIA DARE DRIVE
BUILDING 4
S94
BLDG. 43
PARKING LOT
GRASS AREA
PARKING
FIRE ALARM
BUILDING 80
POST LANE
BUILDING 25
WOOD SHED
WOOD SHED SEWER CLEAN OUT
BLDG 25A
BUILDING 37
ELEC. BOX
STEAM
BLDG. HP57
TW19
TW19IW
TW18
TW16
TW13
TW09
TW03
TW02
TW06
TW04IW
TW04
TW05IW
TW05
TW01
TW17
TW12
TW10
TW14
TW07
TW08IW
TW08
TW15
TW11

NOTES:
1. UNDERGROUND WIRES, LINES, PIPES AND OTHER UTILITIES WERE NOT ATTEMPTED TO BE SURVEYED AT THIS TIME.
2. ALL UNITS IN ug/L.

70 0 35 70
1 inch = 70 ft.

3565385I

LEGEND

- UTILITY POLE
- MAN HOLE, SEWER
- TREE (ALL TYPES)
- FIRE HYDRANT
- DROP INLET/CATCH BASIN
- TW19 TEMPORARY MONITORING WELL
- APPROXIMATE BOUNDARY OF GROUNDWATER CONTAMINATION
- ESTIMATED BOUNDARY OF GROUNDWATER CONTAMINATION
- STORM DRAIN
- FENCE
- POWER LINES
- APHALT
- EXISTING BUILDING
- CONCRETE
- APPROXIMATE GROUNDWATER FLOW DIRECTION

SOURCE: LANIER SURVEYING CO., SEPT. 1996 AND LANTDIV, 1991.

Baker
Baker Environmental, Inc.

FIGURE 4-3
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER (INTERMEDIATE WELLS) BY ON-SITE ANALYSIS
SITE 88
BUILDING 25, MWR DRY CLEANERS
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01747E11Y

APPENDIX A
TEST BORING AND WELL CONSTRUCTION RECORDS

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW04IW
COORDINATES: EAST: 2496472.1436 NORTH: 3393.77.4643
ELEVATION: SURFACE: 26.46 TOP OF PVC CASING: 28.55

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/16/96	0.0 - 56.0	Sunny, 70s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	45
Sch 40, 10-Slot, PVC Screen	1"	45	50

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	S-1	2.0	2	--	0.3	F SAND, some silt; dk		
2		100%	3		0.3	brown; loose; damp		
2.0			3					
3	S-2	1.8	4	--	0.2	little silt, trace clay; brown;		
4		90%	2		0.2	moist		
4.0			3					
5	S-3	--	5	--	0.2			
6			6		0.2			
6.0			1					
7	S-4	1.0	3	03	0.2	little silt; mottled gray,		
8		50%	4		0.2	brown, orange; moist to		
8.0			4			wet **Water @ 8.0'**		
9	S-5	1.5	6	--	0.2	wet		
10		75%	2		0.2			
10.0			4					
						Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW04IW SHEET 1 OF 4

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW041W

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-6	1.5 / 75%	5 4 6	--	0.4 / 0.4	Continued from Sheet 1 trace silt; gray		
12 12.0								
13	S-7	0.0 / 0%	4 3 6 6	--	--	No recovery		
14 14.0								
15	S-8	1.2 / 60%	4 6 7 8	--	0.3 / 0.3	some silt, trace clay; m dense		
16 16.0								
17	S-9	2.0 / 100%	4 5 5 5	--	0.3 / 0.3			
18 18.0						18.0		
19	S-10	1.7 / 85%	WOR/ 24"	--	0.2 / 0.2	CLAY, little silt, dk brown; v soft; wet		
20 20.0						20.0		
21	S-11	1.5 / 75%	WOH/ 12" 3 1	--	0.2 / 0.2	SILT, some clay; dk brown; soft; moist; solvent odor noted		
22 22.0								
23	S-12	1.2 / 60%	1 2 1 2	--	0.2 / 0.2			
24 24.0						24.8		
25	S-13	1.4 / 70%	WOR 1 1 1	--	0.2 / 0.2	CLAY, little silt & wood; dk brown; m stiff; wet		
26 26.0								
27	S-14	1.2 / 60%	3 2 4 6	--	0.2 / 0.2	some wood, little silt; soft; moist		
28 28.0								
29	S-15	0.8 / 40%	1 1 2 4	--	0.2 / 0.2			
30 30.0						30.0		
			4			Match to Sheet 3		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW041W SHEET 2 OF 4

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW04IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
31		S-16	1.2	6	--	0.2	Continued from Sheet 2		
			60%	7		0.2	F SAND, trace silt; gray;		
32	32.0			8			m dense; wet		
				4					
33		S-17	1.4	4	--	0.2	little silt		
			70%	6		0.2			
34	34.0			8					
				4					
35		S-18	1.0	8	--	0.2	trace silt		
			50%	14		0.2			
36	36.0			12					
				10					
37		S-19	1.7	14	--	0.2	trace to little silt		
			85%	14		0.2			
38	38.0			15					
				1					
39		S-20	1.1	2	--	0.2	trace silt; loose		
			55%	2		0.2			
40	40.0			2					
				2					
41		S-21	0.9	1	--	0.2	little silt; v loose		
			45%	1		0.2			
42	42.0			1					
				1					
43		S-22	1.7	1	--	0.1			
			85%	3		0.1			
44	44.0			7					
				4					
45		S-23	0.9	4	--	0.1	F/M SAND, trace silt;		
			45%	6		0.1	gray; loose		
46	46.0			8					
				5					
47		S-24	1.9	6	--	0.1			
			95%	12		0.1			
48	48.0			12					
				2					
49		S-25	1.1	4	--	0.1			
			55%	6		0.1			
50	50.0			8					
				2					

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW04IW SHEET 3 OF 4

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW04IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
51	S-26	0.9	2		0.1	Continued from Sheet 3		
		45%	4		0.1	F SAND, trace silt;		
52 52.0			6			greenish-gray		
			6					
53	S-27	1.1	10		0.1	little silt, trace clay laminae;		
		55%	16		0.1	greenish-brown; m dense;		
54 54.0			25			moist		
			20					
55	S-28	1.5	24		0.1			
		75%	28		0.1			
56 56.0			24			56.0		56.0
57						BOH @ 56.0'		
58								
59								
60								
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW04IW SHEET 4 OF 4

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356
BORING NO.: 88-TW05
COORDINATES: EAST: 2496448.9332 NORTH: 339249.2886
ELEVATION: SURFACE: 25.73 TOP OF PVC CASING: 28.18

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/16/96	0.0 - 15.0	P Sunny, 70s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 2 3 4 / 4.0	A-N	--	--	--	--	F SAND, trace to little silt; brown; damp		
5 / 6.0	S-1	2.0 100%	2 3 6 7	--	0.2 0.2	trace silt; brown; loose; damp		
7 8 / 8.0	S-2	1.1 55%	6 12 10 11	04	0.2 0.2	gray w/ brown & orange laminae; m dense; moist		
9 10 / 10.0	S-3	2.0 100%	6 6 8 10	--	0.2 0.2			
			3			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff
DRILLER: Chip Lafever
BAKER REP.: Mark DeJohn
BORING NO.: 88-TW05

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW05

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	2.0	6	--	0.2			
		100%	7		0.2			
12 12.0			7					
			4					
13	S-5	2.0	6	--	0.2	13.1		
		100%	4		0.2			
14 14.0			6			CLAY, some silt, trace		
	A-N	--	--	--	--	f sand; gray; stiff; moist		
15 15.0						15.0	15.0	
16						BOH @ 15.0'		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW05 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW05IW
COORDINATES: EAST: 2496448.6554 NORTH: 339251.5837
ELEVATION: SURFACE: 26.02 TOP OF PVC CASING: 27.89

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/18/96	0.0 - 57.0	Sunny, 70s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	45
Sch 40, 10-Slot, PVC Screen	1"	45	50

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1								
2								
3								
4								
5	A-N	--	--	--	--	Refer to the log for well 88-TW05 for descriptions from 0 - 15'		
6								
7								
8								
9								
10						Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW05IW SHEET 1 OF 4

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW05IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT		PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11						Continued from Sheet 1		
12								
13	A-N	--	--	--	--			
14								
15 15.0								
16	S-1	0.9 45%	10 5 6	--	--	F SAND, some silt; gray w/ orange-brown layers;		
17 17.0			7			m dense; wet		
18	A-N	--	--	--	--			
19								
20 20.0								
21	S-2	1.6 80%	4 6 6	--	--	some silt, trace clay; gray w/ trace brown laminae		
22 22.0			7					
23	A-N	--	--	--	--			
24								
25								
26	S-3	1.4 70%	WOH 1 2	--	--	little silt; gray w/ little orange laminae; loose		
27 27.0			6					
28	A-N	--	--	--	--			
29								
30 30.0								
			2			Match to Sheet 3		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW05IW SHEET 2 OF 4

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW05IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
31		S-4	1.4 70%	4 3 7	--	--	Continued from Sheet 2 F/M SAND, little silt, trace gravel & clay; gray & brown		
32	32.0								
33		A-N	--	--	--	--			
34									
35	35.0								
36		S-5	1.3 65%	WOR/ 18"	--	--	F SAND, little silt, trace clayey laminae; gray; v loose		
37	37.0			3					
38		A-N	--	--	--	--			
39									
40	40.0								
41		S-6	1.0 50%	WOH/ 24"	--	--	trace silt; gray & brown layers		
42	42.0								
43		A-N	--	--	--	--			
44									
45	45.0								
46		S-7	2.0 100%	4 5 6	--	--	little silt; gray		
47	47.0			7					
48		A-N	--	--	--	--			
49									
50	50.0								
				2			Match to Sheet 4		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW05IW SHEET 3 OF 4

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW05IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
51	S-8	1.0	5			Continued from Sheet 3		
52 52.0		50%	19 22	--	--	little silt, trace clay; lt. greenish-brown; m dense; moist to wet		
53	A-N	--	--	--	--			
54 55 55.0								
56	S-9	0.6	5 7	--	--	trace silt & clay; lt green; wet		
57 57.0		30%	19 >26			57.0	57.0	
58						BOH @ 57.0'		
59								
60								
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								

DRILLING CO.: Parratt - Wolff
DRILLER: Chip Lafever
BAKER REP.: Mark DeJohn
BORING NO.: 88-TW05IW SHEET 4 OF 4

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW06
COORDINATES: EAST: 2496527.2219 NORTH: 339522.7162
ELEVATION: SURFACE: 25.62 TOP OF PVC CASING: 25.64

Rig: Diedrich D-50									
	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/16/96	0.0 - 15.0	M Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 – 2.0	A-N	--	--	--	--	Asphalt pavement & subbase		
3 – 4.0	S-1	2.0 100%	4 6 5 5	--	0.1 0.1	F SAND, some silt; mottled orange & brown; m dense damp		
5 – 6.0	S-2	1.1 55%	4 5 6 7	03	0.1 0.1	little silt; gray w/ orange stained layers; moist		
7 – 8.0	S-3	2.0 100%	6 4 4 6	--	0.1 0.1	loose; wet **Water @ 6.0'**		
9 – 10.0	S-4	0.0 0%	2 2 2 4	--	--	No recovery		
			1			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW06 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW06

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-5	0.8	1	--	0.1	Continued from Sheet 1		
		40%	2		0.1	little silt, trace clay; gray;		
12			2			v loose; wet		
12.0						12.0		
			3			F SAND, some silt, ltl clay;		
13	S-6	2.0	2	--	0.1	gray; v loose; wet		
		100%	2		0.1	13.0		
14			2			CLAY, some silt, trace		
14.0	A-N	--	--	--	--	f sand; gray; stiff; moist		
15						15.0		15.0
15.0						BOH @ 15.0'		
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW06 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356
COORDINATES: EAST: 2496634.4204 NORTH: 339333.8703
ELEVATION: SURFACE: 26.50 TOP OF PVC CASING: 28.60
BORING NO.: 88-TW07

Rig: Diedrich D-50									
	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/16/96	0.0 - 15.0	M Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	S-1	1.7 85%	5 2 2 3	--	--	F SAND, little silt & brick frag; brown & black; loose; damp		
2								
3	S-2	1.1 55%	3 3 5 5	--	--	little silt; brown; moist		
4	4.0							
5	S-3	1.3 65%	3 4 4 4	03	--	mottled, brown & orange;		
6	6.0							
7	S-4	1.6 80%	3 4 6 5	--	0.1 0.1	wet **Water @ 6.0'**		
8	8.0							
9	S-5	0.8 40%	5 5 5 6	--	0.2 0.2	some silt, trace clay; gray		
10	10.0							
			2			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff
DRILLER: Chip Lafever
BAKER REP.: Mark DeJohn
BORING NO.: 88-TW07

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW07

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-6	1.3	2	--	0.2	Continued from Sheet 1		
		65%	2		0.2	little silt; brown & gray		
12			2			layers		
12.0								
			2					
13	S-7	1.2	4	--	0.2	gray		
		60%	4		0.2			
14			5					
14.0	A-N	--	--	--	--			
15						15.0	15.0	
15.0						BOH @ 15.0'		
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW07 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW08
COORDINATES: EAST: 2496390.0017 NORTH: 339575.5495
ELEVATION: SURFACE: 24.71 TOP OF PVC CASING: 26.80

Rig: Diedrich D-50					Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
	Split Spoon	Casing	Augers	Core Barrel					
Size (ID)	1-3/8"	--	2-3/4"	--	8/16/96	0.0 - 15.0	M Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	A-N	--	--	--	--	Asphalt pavement & subbase		
2								
3	S-1	1.6	2	--	0.3	F SAND, little silt, trace		
		80%	3		0.3	clay; mottled, brown &		
4 4.0			2			gray; loose; moist		
5	S-2	1.0	4	03	0.3			
		50%	4		0.3			
6 6.0			5					
7	S-3	1.3	6	--	0.2	trace silt; brown & gray		
		65%	7		0.2	layers; m dense; moist to		
8 8.0			6			wet **Water @ 7.5'**		
9	S-4	1.0	6	--	0.2	gray		
		50%	6		0.2			
10 10.0			6					
			2			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW08 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW08

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11		S-5	1.0	2	--	0.2	Continued from Sheet 1		
			50%	2		0.2	little silt; loose		
12	12.0			3					
				4					
13		S-6	--	6	--	--	tan; m dense		
				7					
14	14.0			7					
		A-N	--	--	--	--			
15	15.0						15.0	15.0	
16							BOH @ 15.0'		
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW08 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW08IW
COORDINATES: EAST: 2496389.2768 NORTH: 339568.3202
ELEVATION: SURFACE: 24.71 TOP OF PVC CASING: 25.63

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/18/96	0.0 - 47.0	M Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	39
Sch 40, 10-Slot, PVC Scr	1"	39	44

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
1								
2								
3								
4								
5	A-N	--	--	--	--	Refer to the log for well 88-TW08 for descriptions from 0 - 15'		
6								
7								
8								
9								
10						Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW08IW SHEET 1 OF 3

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW08IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT		PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
11							Continued from Sheet 1		
12									
13		A-N	--	--	--	--			
14									
15	15.0								
16		S-1	1.7	8 5	--	--	F SAND & SILT, trace		
			85%	4			clay; greenish-gray;		
17	17.0			4			stiff; wet		
18									
		A-N	-- .	--	--	--			
19									
20	20.0						20.0		
21		S-2	2.0	WOH/ 12"	--	--	CLAY, little silt, trace		
			100%	1			f sand; dk brown; v soft;		
22	22.0			1			moist		
23									
		A-N	--	--	--	--			
24									
25									
26		S-3	2.0	WOH 2	--	--	little silt & wood, trace		
			100%	1			f sand; dk brown; soft		
27	27.0			2					
28									
		A-N	--	--	--	--			
29									
30	30.0								
				2			Match to Sheet 3		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW08IW SHEET 2 OF 3

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW08IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
31	S-4	1.3 65%	4 6 8	--	--	Continued from Sheet 2		
32 32.0						F SAND, some silt; 31.3 dk gray; m dense; wet		
33 34 35 35.0	A-N	--	--	--	--			
36 37 37.0	S-5	1.4 70%	1 1 1 1	--	--	little silt; bright gray; v loose		
38 39 40 40.0	A-N	--	--	--	--			
41 42 42.0	S-6	2.0 100%	1 1 1 1	--	--	gray		
43 44 45 45.0	A-N	--	--	--	--			
46 47 47.0	S-7	1.3 65%	13 14 22 26	--	--	little silt & gravel; lt gray; dense; damp - begining at 46.7' 47.0		47.0
48 49 50						BOH @ 47.0'		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW08IW SHEET 3 OF 3

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW09
COORDINATES: EAST: 2496376.9323 NORTH: 339377.8448
ELEVATION: SURFACE: 25.73 TOP OF PVC CASING: 27.89

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel
Size (ID)	1-3/8"	--	2-3/4"	--
Length	2'	--	5'	--
Type	Stainless	--	HSA	--
Hammer Wt.	140 #	--	--	--
Fall	30"	--	--	--
Stickup	--	--	--	--

Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
8/16/96	0.0 - 18.0	M Sunny, 80s	--	--

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	8
Sch 40, 10-Slot, PVC Screen	1"	8	18

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1								
2	A-N	--	--	--	--	F SAND, trace to little silt; dk brown; damp		
3								
4 4.0								
			3			little silt & clay; brown to		
5	S-1	1.1	3	--	--	dk brown; loose; damp		
		55%	3			5.6		
6 6.0			4					
			4			little silt; mottled, gray &		
7	S-2	1.7	6	04	--	brown' m dense; moist		
		85%	7					
8 8.0			8					
			4					
9	S-3	2.0	6	--	--	gray w/ orange stains		
		100%	7					
10 10.0			5					
			5			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW09 SHEET 1 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW09

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	1.4	7	--	--	Continued from Sheet 1		
		70%	6			trace silt; mottled, brown &		
12 12.0			9			gray; m dense; moist		
			6					
13	S-5	1.5	7	--	--	little silt; gray w/ orange		
		75%	10			stains; wet		
14 14.0			10			**Water @ 12.0'**		
			4					
15	S-6	1.3	7	--	--	some silt, trace clay;		
		65%	9			moist to wet		
16 16.0			8					
			6					
17	S-7	2.0	8	--	--	little silt, trace clay; gray;		
		100%	9			m dense; wet		
18 18.0			10			18.0	18.0	
19						BOH @ 18.0'		
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW09 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW10
COORDINATES: EAST: Not Recorded NORTH: Not Recorded
ELEVATION: SURFACE: Not Recorded TOP OF PVC CASING: Not Recorded

Rig: Diedrich D-50					Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
	Split Spoon	Casing	Augers	Core Barrel					
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 15.0	Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	A-N	--	--	--	--	Asphalt pavement & subbase		
2 2.0								
3	S-1	0.8	1 2	02	--	F SAND, little silt; brown;		
		40%	2			loose; damp		
4 4.0			2					
5	S-2	1.7	1 1	--	--	trace silt; gray; v loose		
		85%	1			wet **Water @ 4.5'**		
6 6.0			4					
7	S-3	0.1	4 3	--	--	loose		
		5%	3					
8 8.0			2					
9	S-4	0.7	1 2	--	--	little silt		
		35%	2					
10 10.0			4					
			3			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW10 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW10

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-5	1.1	4	--	--	Continued from Sheet 1		
		55%	3					
12 12.0			4					
			3					
13	S-6	1.0	4	--	--	some silt		
		50%	2					
14 14.0			2					
	A-N	--	--	--	--			
15 15.0						15.0	15.0	
16						BOH @ 15.0'		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW10 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW11
COORDINATES: EAST: 2496665.3044 NORTH: 339235.1036
ELEVATION: SURFACE: 26.08 TOP OF PVC CASING: 28.22

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 15.0	Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	S-1	1.9 95%	4 4 3 4	--	--	F SAND, little silt; brown to black; loose; damp		
2						1.6		
3	S-2	1.1 55%	3 2 3 3	02	--	F SAND, little silt, trace clay; gray; loose; moist		
4	4.0							
5	S-3	1.0 50%	3 3 2 2	--	--	brownish-gray; wet **Water @ 4.0'**		
6	6.0							
7	S-4	1.6 80%	3 3 4 4	--	--	little silt; mottled, brown & gray		
8	8.0							
9	S-5	1.4 70%	7 12 13 11	--	--	trace silt; gray; m dense		
10	10.0							
			6			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW11 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW11

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-6	1.4	5	--	--	Continued from Sheet 1		
		70%	5					
12 12.0			5					
			5					
13	S-7	1.8	5	--	--	trace silt & clay		
		90%	7					
14 14.0			10					
	A-N	--	--	--	--			
15 15.0						15.0	15.0	
16						BOH @ 15.0'		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW11 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW12
COORDINATES: EAST: 2496547.7784 NORTH: 339210.0789
ELEVATION: SURFACE: 26.62 TOP OF PVC CASING: 27.18

Rig: Diedrich D-50									
	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 20.0	P Sunny, 70s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	10
Sch 40, 10-Slot, PVC Screen	1"	10	20

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1								
2	A-N	--	--	--	--	F SAND, trace to little silt; dk brown, becoming		
3						brown to tan; damp		
4 4.0								
5	S-1	1.9 95%	4 5 4	--	--	trace silt; tan w/ orange stains; loose		
6 6.0			6					
7	S-2	1.7 85%	5 12 13	--	--	changing to lt gray @ 7.0'; m dense		
8 8.0			14					
9	S-3	1.8 90%	8 8 10	05	--	layer of brown f sand		
10 10.0			14					
			11			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW12 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW12

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	1.9	11	--	--	Continued from Sheet 1		
		95%	11			brown to orangish-brown		
12 12.0			9			w/ gray mottles; wet		
			5			**Water @ 11.5'**		
13	S-5	1.8	6	--	--	little silt, trace clay; tan		
		90%	7					
14 14.0			9					
			3					
15	S-6	1.0	5	--	--	gray		
		50%	7					
16 16.0			7					
			4					
17	S-7	2.0	6	--	--	some silt, trace to little		
		100%	6			clay		
18 18.0			9					
			2					
19	S-8	2.0	2	--	--	some silt, little clay; gray		
		100%	2			w/ orange stains; loose		
20 20.0			4			20.0	20.0	
21						BOH @ 20.0'		
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW12 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW13
COORDINATES: EAST: 2496354.8031 NORTH: 339285.1525
ELEVATION: SURFACE: 25.16 TOP OF PVC CASING: 26.06

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 19.0	Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	9
Sch 40, 10-Slot, PVC Screen	1"	9	19

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 2 3 4 5 5.0	A-N	--	--	--	--			
6 7 7.0	S-1	2.0 100%	5 4 5 6	03	--	F SAND, little silt; brownish-gray; loose; damp		
8 9 9.0	S-2	1.3 65%	5 7 8 9	--	--	mottled brown & gray; m dense		
10	S-3	1.8 90%	6 6 6	05	--	Match to Sheet 2 10.5		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW13 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW13

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	11.0			5			Continued from Sheet 1		
12		S-4	2.0 100%	6 6 7	--	--	F SAND, little silt & clay; brown w/ orange stains; m dense; wet		
13	13.0			10			**Water @ 10.5'**		
14		S-5	1.8 90%	4 4 5	--	--	gray w/ orange stains		
15	15.0			4					
16		S-6	2.0 100%	2 1 1	--	--			
17	17.0			4					
18		S-7	1.6 80%	3 5 6	--	--			
19	19.0			8			19.0	19.0	
20							BOH @ 19.0'		
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW13 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT:	Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune			
CTO NO.:	62470-356		BORING NO.:	88-TW14
COORDINATES:	EAST:	2496650.7554	NORTH:	339439.0566
ELEVATION:	SURFACE:	26.06	TOP OF PVC CASING:	29.06

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 15.0	Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE

S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1	S-1	1.0 50%	6 7 6 6	--	--	F SAND, little silt & root; dk brown; m dense; moist		
2								
3	S-2	1.6 80%	3 4 6 7	--	--	little silt, trace clay; gray w/ orange stains; wet **Water @ 5.5'**		
4	4.0							
5	S-3	1.9 95%	5 5 5 5	03	--			
6	6.0							
7	S-4	1.5 75%	5 7 6 5	--	--			
8	8.0							
9	A-N	--	--	--	--			
10						Match to Sheet 2		

DRILLING CO.:	Parratt - Wolff	BAKER REP.:	Mark DeJohn
DRILLER:	Chip Lafever	BORING NO.:	88-TW14 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW14

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11						Continued from Sheet 1		
12	A-N	--	--	--	--			
13								
14								
15 15.0						15.0	15.0	
16						BOH @ 15.0'		
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW14 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW15
COORDINATES: EAST: 2496343.2427 NORTH: 339433.8913
ELEVATION: SURFACE: 24.67 TOP OF PVC CASING: 27.08

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/17/96	0.0 - 18.0	Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	8
Sch 40, 10-Slot, PVC Screen	1"	8	18

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 2 3 4 4.0	A-N	--	--	--	--			
5 6 6.0	S-1	1.7 85%	3 3 3 3	--	--	F SAND, little silt; brown w/ orange stains; loose; damp		
7 8 8.0	S-2	1.6 80%	4 4 6 5	--	--			
9 10 10.0	S-3	2.0 100%	4 4 5 3	04	--	brown & gray w/ orange stains; wet **Water @ 9.5'**		
			2			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW15 SHEET 1 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW15

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	1.1	2	--	--	Continued from Sheet 1		
		55%	2					
12 12.0			4					
			2					
13	S-5	2.0	2	--	--			
		100%	3					
14 14.0			3					
			3					
15	S-6	0.7	7	--	--			
		35%	9					
16 16.0			8					
			8					
17	S-7	1.7	8	--	--	gray w/ orange stains		
		85%	9					
18 18.0			13			18.0	18.0	
19						BOH @ 18.0'		
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW15 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW16
COORDINATES: EAST: 2496258.4829 NORTH: 339106.7734
ELEVATION: SURFACE: 23.87 TOP OF PVC CASING: 27.26

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/18/96	0.0 - 17.0	M Sunny, 90	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	7
Sch 40, 10-Slot, PVC Screen	1"	7	17

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 2 3 4 5 5.0	A-N	--	--	--	--			
6 7 7.0	S-1	1.4 70%	4 3 2 2	--	--	F SAND, little silt; trace clay; brownish-gray; loose; moist		
8 9 9.0	S-2	2.0 100%	8 7 8 6	04	--	little silt; gray w/ orange laminae; m dense; moist		
10	S-3	1.9 95%	6 11 14	--	--	gray w/ orange stains; wet **Water @ 9.0'** Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW16 SHEET 1 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW16

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)		Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	11.0			16			Continued from Sheet 1		
12		S-4	1.7 85%	7 8 9	--	--	12.2		
13	13.0			18			CLAY, little f sand & silt; gray; v stiff; damp 13.0		
14		S-5	1.3 65%	5 2 4	--	--	F SAND, some silt, trace to little clay; gray; m stiff; moist, wet at 14.5'		
15	15.0			3					
16		S-6	1.4 70%	2 4 7	--	--	little silt & clay; stiff; moist		
17	17.0			9			17.0	17.0	
18							BOH @ 17.0'		
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW16 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW17
COORDINATES: EAST: 2496440.8958 NORTH: 339018.1440
ELEVATION: SURFACE: 25.02 TOP OF PVC CASING: 26.02

Rig: Diedrich D-50									
	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/18/96	0.0 - 19.0	M Sunny, 90	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	9
Sch 40, 10-Slot, PVC Screen	1"	9	19

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1 2 3 4 5 5.0	A-N	--	--	--	--			
6 7 7.0	S-1	1.9 95%	4 4 5 8	--	--	F SAND, some silt; brownish-gray; loose; damp		
8 9 9.0	S-2	1.4 70%	6 9 17 19	04	--	trace silt, lt gray; m dense; damp		
10	S-3	2.0 100%	3 3 2	--	--	CLAY, trace silt & f sand; gray w/ iron stains; m stiff; moist-wet 9.4 Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW17 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW17

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11 11.0			4					
12	S-4	2.0 100%	3 3 5 4	--	--	Continued from Sheet 1 10.8 **Water @ 10.5'** F SAND, little silt & clay; gray w/ orange stains; m stiff; wet		
13 13.0								
14	S-5	1.8 90%	3 3 2 2	--	--			
15 15.0								
16	S-6	2.0 100%	3 3 2 2	--	--			
17 17.0								
18	S-7	1.6 80%	2 3 4 6	--	--			
19 19.0						19.0	19.0	
20						BOH @ 19.0'		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW17 SHEET 2 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW18
COORDINATES: EAST: 2496030.6776 NORTH: 339286.6393
ELEVATION: SURFACE: 22.26 TOP OF PVC CASING: 24.38

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/19/96	0.0 - 16.0	M Sunny, 80s	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	5
Sch 40, 10-Slot, PVC Screen	1"	5	15

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1								
2	A-N	--	--	--	--			
3								
4 4.0								
			1					
5	S-1	0.9	1	--	--	F SAND, little silt; dk		
		45%	2			brown to gray; v loose;		
6 6.0			2			damp		
			3					
7	S-2	1.5	3	03	--	gray; loose; wet		
		75%	4			**Water @ 6.0'**		
8 8.0			3					
			3					
9	S-3	1.7	3	--	--			
		85%	6					
10 10.0			7					
			3			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW18 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW18

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	1.3	4	--	--	Continued from Sheet 1		
		65%	7			m dense		
12 12.0			11					
			6					
13	S-5	2.0	9	--	--	trace clay begining @ 13.6'		
		100%	9					
14 14.0			11					
			6					
15	S-6	--	4	--	--	little silt; brown w/ orange		
			10			stains; m dense		
16 16.0			12			16.0	16.0	
17						BOH @ 16.0'		
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW18 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW19
COORDINATES: EAST: 2495871.5093 NORTH: 339599.5696
ELEVATION: SURFACE: 23.24 TOP OF PVC CASING: 24.90

Rig: Diedrich D-50	Split Spoon	Casing	Augers	Core Barrel
Size (ID)	1-3/8"	--	2-3/4"	--
Length	2'	--	5'	--
Type	Stainless	--	HSA	--
Hammer Wt.	140 #	--	--	--
Fall	30"	--	--	--
Stickup	--	--	--	--

Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
8/20/96	0.0 - 18.0	M Sunny, 70s	--	--

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	8
Sch 40, 10-Slot, PVC Screen	1"	8	18

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab. Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
1								
2	A-N	--	--	--	--			
3								
4 4.0								
5	S-1	2.0	4 5	--	0.7	F SAND, little silt; dk		
		100%	4		0.7	brown; loose; moist		
6 6.0			3					
7	S-2	1.9	4 8	04	0.8	7.2		
		95%	5		0.8			
8 8.0			5			F SAND, little silt, trace clay; mottled brown, gray & orange; stiff; moist wet **Water @ 8.0'**		
9	S-3	1.1	2 2	--	0.6			
		55%	3		0.6			
10 10.0			3					
			2			Match to Sheet 2		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW19 SHEET 1 OF 2

Baker
Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW19

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp.	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL)
11	S-4	1.7	1	--	0.5	Continued from Sheet 1		
		85%	1		0.5	v soft		
12 12.0			1					
			3					
13	S-5	1.6	4	--	0.5	little silt; gray; m dense		
		80%	8		0.5			
14 14.0			9					
			6					
15	S-6	1.4	6	--	0.4	little silt; trace clay;		
		70%	6		0.4	brownish-gray w/ orange		
16 16.0			7			stains @ 15.5'		
			3					
17	S-7	1.5	8	--	0.4	dk gray @ 17.6'		
		75%	8		0.4			
18 18.0			8			18.0	18.0	
19						BOH @ 18.0'		
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW19 SHEET 2 OF 2

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW19IW
COORDINATES: EAST: 2495869.6872 NORTH: 339603.2772
ELEVATION: SURFACE: 23.24 TOP OF PVC CASING: 25.87

Rig: Diedrich D-50									
	Split Spoon	Casing	Augers	Core Barrel	Date	Progress (Ft.)	Weather	Depth to Water (Ft.)	Time
Size (ID)	1-3/8"	--	2-3/4"	--	8/19/96	0.0 - 50.0	M Sunny, 90	--	--
Length	2'	--	5'	--					
Type	Stainless	--	HSA	--					
Hammer Wt.	140 #	--	--	--					
Fall	30"	--	--	--					
Stickup	--	--	--	--					

Remarks:

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston
N = No Sample

WELL INFORMATION

Type	Diam.	Top Depth (Ft.)	Bottom Depth (Ft.)
Sch 40, PVC Riser	1"	0	45
Sch 40, 10-Slot, PVC Scre	1"	45	50

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
5	A-N	--	--	--	--	Refer to the log for well 88-TW19 for descriptions from 0 - 15'		

Match to Sheet 2

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW19IW SHEET 1 OF 3

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW19IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Samp = Depth interval of soil sample submitted to mobile lab

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT		PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
11						Continued from Sheet 1		
12								
13	A-N	--	--	--	--			
14								
15 15.0								
16	S-1	1.1	4 5	--	--	F SAND, little to some silt;		
17 17.0		55%	6 9			gray, becoming brown; m dense; wet		
18	A-N	--	--	--	--			
19								
20 20.0						20.0		
21	S-2	0.9	6 9	--	--	F SAND some silt & clay,		
22 22.0		45%	17 22			trace wood; dk brown; v stiff; wet		
23	A-N	--	--	--	--			
24								
25						25.0		
26	S-3	1.0	4 3	--	--	F SAND, little silt, trace		
27 27.0		50%	4 4			clay; gray; m stiff; wet		
28	A-N	--	--	--	--			
29								
30 30.0								
			8			Match to Sheet 3		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW19IW SHEET 2 OF 3

Baker Environmental

TEST BORING AND WELL CONSTRUCTION RECORD

PROJECT: Phase I Investigation at Sites 88, 89, and 93 - MCB Camp Lejeune
CTO NO.: 62470-356 BORING NO.: 88-TW19IW

SAMPLE TYPE
S = Split Spoon A = Auger
T = Shelby Tube W = Wash
R = Air Rotary C = Core
D = Denison P = Piston N = No Sample

DEFINITIONS
SPT = Standard Penetration Test (ASTM D1586)
PID = Photo Ionization Detector measurement
Lab Class = USCS (ASTM D2487)

Depth (Ft.)	Sample Type & No.	Sample Rec. (Ft.,%)	SPT	Lab Samp	PID (ppm)	Visual Description	Well Installation Detail	Elevation (Ft. MSL
31	S-4	1.2	11	--	--	Continued from Sheet 2		
32 32.0		60%	14 19			trace silt; gray; m dense		
33 34 35 35.0	A-N	--	--	--	--			
36	S-5	1.4	12 15	--	--	little silt		
37 37.0		70%	12 16					
38 39 40 40.0	A-N	--	--	--	--			
41	S-6	1.7	6 1	--	--	brown, green begining		
42 42.0		85%	1 3			at 41.9'; v loose		
43 44 45 45.0	A-N	--	--	--	--			
46	S-7	1.7	3 4	--	--	brown & green; loose		
47 47.0		85%	4 5					
48 49 50 50.0	A-N	--	--	--	--	50.0		50.0
						BOH @ 50.0'		

DRILLING CO.: Parratt - Wolff BAKER REP.: Mark DeJohn
DRILLER: Chip Lafever BORING NO.: 88-TW19IW SHEET 3 OF 3

APPENDIX B
CHAIN-OF-CUSTODY RECORDS

356-_07

WESTON Analytics Use Only

Custody Transfer Record/Lab Work Request

WESTON

Page 1 of 1

Client: [illegible] ENVIRONMENTAL, INC.
Est. Final Proj. Sampling Date: 8/30/96
Work Order #:
Project Contact/Phone #: M. Bartman/412-269-2053
AD Project Manager: D. Woltman
QC: Del: TAT:
Date Rec'd: Date Due:
Account #:

Refrigerator #		
#/Type Container	Liquid	
	Solid	
Volume	Liquid	
	Solid	
Preservatives		

ANALYSES REQUESTED →

ORGANIC				INORG		
VOA	BNA	Pest/PCB	Herb	Metal	CN	No. of bottles

WESTON Analytics Use Only

MATRIX CODES: S - Soil; SE - Sediment; SO - Solid; SL - Sludge; W - Water; O - Oil; A - Air; DS - Drum Solids; DL - Drum Liquids; L - EP/TCLP Leachate; WI - Wipe; X - Other; F - Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1996	Time Collected	VOA	BNA	Pest/PCB	Herb	Metal	CN	No. of bottles
	88-TW19IW-01A			W	8/27	1335	X						2
	88-TW19-01A			W	8/27	1410	X						2
	88-TW09-01A			W	8/27	1455	X						2
	88-TW05IW-01A			W	8/28	1230	X						2
	88-TW05-01A			W	8/28	1720	X						2
	88-TW08IW-01A			W	8/28	1030	X						2
	88-TW08-01A			W	8/28	0915	X						2
	88-TB04			W	8/29	0800	X						2

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:
FED-EX Airbill # 1369799115

DATE/REVISIONS:
1.
2.
3.
4.
5.
6.

WESTON Analytics Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___ Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N
COC Record Present Upon Sample Rec't Y or N

Relinquished by	Received by	Date	Time
J.P.T.	FED-EX	8/29/96	1600

Relinquished by	Received by	Date	Time

Discrepancies Between Samples Labels and COC Record? Y or N
NOTES:

RFW 21-21-001/A-7/91 ___ L372 ___ L373 ___ L375 ___ L377 ___ L378 Ref# _____ Cooler# _____ 381-596a

WESTON Analytics Use Only

Custody Transfer Record/Lab Work Request

356-006

WESTON MANAGERS DESIGNERS/CONSULTANTS

Client: BAKER ENVIRONMENTAL INC.
Est. Final Proj. Sampling Date: 8/30/96
Work Order #:
Project Contact/Phone #: MJ Bedman / 412-269-2054
Air Project Manager: D. Wolfman
QC: Del: TAT:
Date Rec'd: Date Due:
Account #:

Refrigerator #:
#/Type Container: Liquid / Solid
Volume: Liquid / Solid
Preservatives:

ANALYSES REQUESTED →

ORGANIC: VOA, BNA, Pest/PCB, Herb
PAHs, Ref. Std. (Naphthalene)
INORG: Metal, CN

MATRIX CODES: Soil, Sediment, Solid, Sludge, Water, Oil, Air, Drum Solids, Drum Liquids, TCLP Extract, Leachate, Wipe, Other, Fish

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected	Time Collected	WESTON Analytics Use Only
	88-BOX01-01			S	8/30/96	1145	X X
	88-TNK01-01			W	8/30/96	1120	X X X X
	88-TRIP01			W	8/30/96	1345	X
	88-TWN1-03			S	8/30/96	1430	X
	88-TWN1-04			S	8/30/96	1435	X
	88-TWN3-03			S	8/30/96	1515	X
	88-TWN5-04			S	8/30/96	1510	X

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:
88-BOX01-01 2 4oz. Soils for extra volume.
88-TNK01-01 1 1 liter amber for extra volume.
Fed-Ex Airbill # 136979104

DATE/REVISIONS:
1.
2.
3.
4.
5.
6.

WESTON Analytics Use Only

Samples were:
1) Shipped ___ or Hand Delivered ___ Airbill # _____
2) Ambient or Chilled
3) Received in Good Condition Y or N
4) Labels Indicate Properly Preserved Y or N
5) Received Within Holding Times Y or N

COC Tape was:
1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N

COC Record Present Upon Sample Rec't Y or N

Discrepancies Between Samples Labels and COC Record? Y or N
NOTES:

Relinquished by	Received by	Date	Time
J.P.T.	FED-EX	8/31/96	1700

Relinquished by	Received by	Date	Time

RFW 21-21-001/A-7/91 ____ L372 ____ L373 ____ L375 ____ L377 ____ L378 Ref# _____ Cooler# _____ 381-596a

APPENDIX C
QA/QC DATA

QA/QC SUMMARY
TRIP BLANKS
VOLATILE ORGANIC COMPOUNDS
OPERABLE UNIT NO. 15 (SITE 88)
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE NO	88-TB03	88-TB04
LAB ID	9608G686-008	9608G930-001
DATE SAMPLED	08/06/96	08/16/96
UNITS	UG/L	UG/L
VOLATILES		
CHLOROMETHANE	10 U	10 U
BROMOMETHANE	10 U	10 U
VINYL CHLORIDE	10 U	10 U
CHLOROETHANE	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U
ACETONE	10 U	10 U
CARBON DISULFIDE	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U
CHLOROFORM	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U
2-BUTANONE	10 UJ	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U
TRICHLOROETHENE	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U
BENZENE	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U
BROMOFORM	10 U	10 U
4-METHYL-2-PENTANONE	10 UJ	10 U
2-HEXANONE	10 UJ	10 U
TETRACHLOROETHENE	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U
TOLUENE	10 U	10 U
CHLOROBENZENE	10 U	10 U
ETHYLBENZENE	10 U	10 U
STYRENE	10 U	10 U
XYLENE (TOTAL)	10 U	10 U

FIXED BASE QA/QC SUMMARY
RINSATE AND TRIP BLANKS
OPERABLE UNIT NO. 15
SITES 88
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE NO	88-TB03	88-TB04
LAB ID	9608G686-008	9608G930-001
DATE SAMPLED	08/06/96	08/16/96
UNITS	UG/L	UG/L
VOLATILES		
CHLOROMETHANE	10 U	10 U
BROMOMETHANE	10 U	10 U
VINYL CHLORIDE	10 U	10 U
CHLOROETHANE	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U
ACETONE	10 U	10 U
CARBON DISULFIDE	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U
CHLOROFORM	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U
2-BUTANONE	10 UJ	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U
TRICHLOROETHENE	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U
BENZENE	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U
BROMOFORM	10 U	10 U
4-METHYL-2-PENTANONE	10 UJ	10 U
2-HEXANONE	10 UJ	10 U
TETRACHLOROETHENE	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U
TOLUENE	10 U	10 U
CHLOROBENZENE	10 U	10 U
ETHYLBENZENE	10 U	10 U
STYRENE	10 U	10 U
XYLENE (TOTAL)	10 U	10 U

FIXED BASE QA/QC SUMMARY
RINSATE AND TRIP BLANKS
OPERABLE UNIT NO. 15
SITES 88
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE NO	88-TB03	88-TB04
LAB ID	9608G686-008	9608G930-001
DATE SAMPLED	08/06/96	08/16/96
UNITS	UG/L	UG/L
SEMIVOLATILES		
PHENOL	NA	NA
BIS(2-CHLOROETHYL)ETHER	NA	NA
2-CHLOROPHENOL	NA	NA
1,3-DICHLOROBENZENE	NA	NA
1,4-DICHLOROBENZENE	NA	NA
1,2-DICHLOROBENZENE	NA	NA
2-METHYLPHENOL	NA	NA
2,2'-OXYBIS(1-CHLOROPROPANE)	NA	NA
4-METHYLPHENOL	NA	NA
N-NITROSO-DI-N-PROPYLAMINE	NA	NA
HEXACHLOROETHANE	NA	NA
NITROBENZENE	NA	NA
ISOPHORONE	NA	NA
2-NITROPHENOL	NA	NA
2,4-DIMETHYLPHENOL	NA	NA
BIS(2-CHLOROETHOXY)METHANE	NA	NA
2,4-DICHLOROPHENOL	NA	NA
1,2,4-TRICHLOROBENZENE	NA	NA
NAPHTHALENE	NA	NA
4-CHLOROANILINE	NA	NA
HEXACHLOROBUTADIENE	NA	NA
4-CHLORO-3-METHYLPHENOL	NA	NA
2-METHYLNAPHTHALENE	NA	NA
HEXACHLOROCYCLOPENTADIENE	NA	NA
2,4,6-TRICHLOROPHENOL	NA	NA
2,4,5-TRICHLOROPHENOL	NA	NA
2-CHLORONAPHTHALENE	NA	NA
2-NITROANILINE	NA	NA
DIMETHYLPHTHALATE	NA	NA
ACENAPHTHYLENE	NA	NA
2,6-DINITROTOLUENE	NA	NA
3-NITROANILINE	NA	NA
ACENAPHTHENE	NA	NA
2,4-DINITROPHENOL	NA	NA

FIXED BASE QA/QC SUMMARY
RINSATE AND TRIP BLANKS
OPERABLE UNIT NO. 15
SITES 88
MCB, CAMP LEJEUNE, NORTH CAROLINA
CTO-0356

SAMPLE NO	88-TB03	88-TB04
LAB ID	9608G686-008	9608G930-001
DATE SAMPLED	08/06/96	08/16/96
UNITS	UG/L	UG/L
SEMIVOLATILES (cont)		
4-NITROPHENOL	NA	NA
DIBENZOFURAN	NA	NA
2,4-DINITROTOLUENE	NA	NA
DIETHYLPHTHALATE	NA	NA
4-CHLOROPHENYL-PHENYLETHER	NA	NA
FLUORENE	NA	NA
4-NITROANILINE	NA	NA
4,6-DINITRO-2-METHYLPHENOL	NA	NA
N-NITROSODIPHENYLAMINE (1)	NA	NA
4-BROMOPHENYL-PHENYLETHER	NA	NA
HEXACHLOROBENZENE	NA	NA
PENTACHLOROPHENOL	NA	NA
PHENANTHRENE	NA	NA
ANTHRACENE	NA	NA
CARBAZOLE	NA	NA
DI-N-BUTYLPHTHALATE	NA	NA
FLUORANTHENE	NA	NA
PYRENE	NA	NA
BUTYLBENZYLPHTHALATE	NA	NA
3,3'-DICHLOROBENZIDINE	NA	NA
BENZO(A)ANTHRACENE	NA	NA
CHRYSENE	NA	NA
DI-N-OCTYLPHTHALATE	NA	NA
BENZO(B)FLUORANTHENE	NA	NA
BENZO(K)FLUORANTHENE	NA	NA
BENZO(A)PYRENE	NA	NA
INDENO(1,2,3-CD)PYRENE	NA	NA
DIBENZO(A,H)ANTHRACENE	NA	NA
BENZO(G,H,I)PERYLENE	NA	NA
BIS(2-ETHYLHEXYL)PHTHALATE	NA	NA