06.07-01/27/97-01778

QUARTERLY MONITORING REPORT
OPERABLE UNIT NO. 1 – SITES 24 AND 78

FOURTH QUARTER 1996 (OCT – DEC 96)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0367

JANUARY 27, 1997

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

LANTDIV CLEAN program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

FOURTH QUARTER 1996 GROUNDWATER MONITORING REPORT

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

DQOs	Data Quality Objectives
gpm	gallons per minute
IR	Installation Restoration
MCB	Marine Corps Base
MCLs	maximum contaminant levels
NCWQSs	North Carolina Water Quality Standards
NFESC	Naval Facilities Engineering Service Center
NTU	Neophelmetic Turbidity Units
OU	Operable Unit
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
ROD	Record of Decision
SWMU	solid waste management unit
TAL	target analyte list
TCL	target compound list
TDS	total dissolved solids
TOC	top-of-casing
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds
mg/L	milligrams per liter
µg/L	micrograms per liter

1.0 INTRODUCTION

The following quarterly monitoring report presents the sampling procedures and analytical findings of the monitoring program at Operable Unit (OU) No. 1 (Sites 24 and 78), Marine Corps Base (MCB) Camp Lejeune, North Carolina. Operational data and an evaluation of the groundwater treatment system at Site 78 are also provided within this quarterly monitoring report. The report describes the activities completed at Sites 24 and 78 during the fourth quarter of 1996 and presents recommendations concerning the monitoring program.

1.1 Report Organization

This quarterly monitoring report is comprised of five sections. Section 1.0 describes the sampling program procedures and methodology. Section 1.0 also provides groundwater elevation data, groundwater flow direction, and various field observations. Analytical results and findings are presented in Section 2.0. A comparison of previous analytical findings versus the most recent results is also included within Section 2.0. An evaluation of the northern and southern groundwater treatment systems at Site 78 is presented in Section 3.0. Section 4.0 provides recommendations to improve the groundwater treatment system at Site 78 and the quarterly sampling program at both Sites 24 and 78. Finally, references used in the preparation of this report are included in Section 5.0. All tables, figures, and attachments are provided after the text portion of the report.

1.2 Quarterly Sampling Program

The fourth quarter sampling event commenced on October 1, 1996 and continued through October 11, 1996. Sampling at Site 24 involved the collection of groundwater samples from the three shallow monitoring wells depicted in Figure 1-1. Groundwater samples from Site 78 were collected from 18 shallow monitoring wells, 2 intermediate wells, 3 deep wells, and 5 recovery wells. Figure 1-2 depicts the groundwater sampling locations at Site 78.

During the quarterly sampling event a low flow purge and sampling technique was employed. The sampling methodology was developed in response to conversations with the United States Environmental Protection Agency (USEPA) Region IV personnel in Athens, Georgia. Prior to groundwater purging, water level and total depth measurements from each monitoring well were obtained. Water level and well depth measurements were used to calculate the volume of water necessary to purge each well. Table 1-1 provides a summary of both monitoring and recovery well construction details.

A peristaltic pump, with the intake set two to four feet above the bottom of the well was used to purge each of the monitoring wells. While purging groundwater, a flow rate of less than 0.25 gallons per minute (gpm) was maintained. Groundwater samples were obtained directly from the pump discharge. Dedicated sections of polyethylene and silicon pump-head tubing were used during purge and sampling activities at each monitoring well. A minimum of three well volumes were purged from each monitoring well prior to sampling. Measurements of pH, specific conductance, dissolved oxygen, temperature, and turbidity were recorded to ensure that groundwater characteristics had stabilized before sampling. These measurements were recorded in a field logbook and are provided in Table 1-2.

Groundwater samples were collected to assess whether contamination, detected during previous investigative activities, was present in the shallow aquifer or had migrated to the deeper Castle

Hayne Aquifer. Based upon previous sampling results and decision documents, the contaminants of concern were volatile organic compounds (VOCs) and selected metals. Groundwater samples were analyzed for full target compound list (TCL) organics, oil and grease, selected target analyte list (TAL) total metals, total suspended solids (TSS), and total dissolved solids (TDS). Samples were preserved at the time of collection with hydrochloric acid for volatile analyses, nitric acid for metal analyses, and sodium hydroxide for suspended and dissolved solids analyses. Table 1-3 provides a summary of requested analyses and groundwater samples submitted during the quarterly monitoring event. Groundwater samples were analyzed using various analytical methods, as provided in Table 1-3, and Level III Data Quality Objectives (DQOs). DQO Level III is equivalent to the Naval Facilities Engineering Service Center (NFESC) Level C, as specified in the "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Programs" document. Table 1-4 provides the various analytical method detection limits and comparative state and federal groundwater quality standards.

Trip blanks were prepared by the laboratory prior to the sampling event, placed in sample storage containers, and kept with the investigative samples throughout the sampling event. The trip blanks were then packaged for shipment with the environmental samples and sent for analysis. Trip blanks were used to determine if samples were cross-contaminated during storage and transportation to the laboratory.

Sample information, such as well number, sample identification, time and date of sample collection, samplers, analytical parameters, and required laboratory turnaround time was recorded in a field logbook and on sample labels. Chain-of-custody documentation, provided in Attachment A, accompanied the groundwater samples to the laboratory. Chain-of-custody forms were then compared to the monitoring plan; this comparison was used to verify that appropriate laboratory analyses had been requested. Upon receipt of the laboratory analytical results, a further comparison was performed to verify that each sample was analyzed for the requested analyses. Sample tracking documentation is provided as Attachment B. The sample designation format used during the monitoring program at Sites 24 and 78 is provided in Attachment C.

1.3 Groundwater Elevation and Flow Direction

The following sections provide information concerning groundwater flow patterns at Sites 24 and 78. Static water level measurements were collected after all well sampling activities had been completed. Measurements were recorded from top-of-casing (TOC) reference points marked on each monitoring well. Groundwater measurements were recorded to the nearest 0.01-foot using an electric measuring tape. The elevation data were obtained by subtracting the measured depth to groundwater from the surveyed reference elevation. For ease of discussion, groundwater elevation and flow direction for the two sites are presented separately.

1.3.1 Site 24

Water level measurements were collected at Site 24 on November 7, 1996. Table 1-5 provides a summary of the water level measurements and Figure 1-3 depicts the static elevations and approximate flow direction of groundwater. The general groundwater flow direction at Site 24 is south, in the direction of a series of tributaries which lead to Cogdels Creek. As shown on Figure 1-3, the flow direction near monitoring wells 24-GW07 and 24-GW08 is toward the south and southeast. Groundwater flow near wells 24-GW03 and 24-GW10 is generally toward the south

and southwest. The slight difference in groundwater flow directions across Site 24 is most likely a result of the local topography and the influence of the surface water features.

1.3.2 Site 78

Water level measurements at Site 78 were collected on November 7, 1996. Table 1- 6 provides a summary of the water level measurements and Figure 1-4 depicts the static elevations and approximate flow direction of groundwater. The groundwater flow regime at Site 78 is relatively consistent. Groundwater flow is generally toward the southwest, in the direction of an unnamed tributary to Cogdels Creek.

1.4 Field Observations

Field observations have been recorded during each groundwater sampling event at Sites 24 and 78. The following observations were noted during the third quarter monitoring event and are again noted during the fourth quarter monitoring event. A detailed description of the observations is contained in the third quarter monitoring report. Recommendations regarding the field observations which follow are presented in Section 3.0.

- Monitoring wells installed during the 1986 Confirmation Study are in need of above-ground maintenance. Paint on the bollards and protective casings on the majority of these wells has begun to peel and rust is present. Many of these wells are lacking protective caps and the required locking well caps. As a result, many wells are open and exposed to the environment. The usability and security of the wells at these sites should be addressed if they are going to remain groundwater sampling points.

- Groundwater samples from several of the monitoring wells at Site 78 exhibited sediment after having been purged for a reasonable amount of time. This suggests that the monitoring wells have either begun to deteriorate or were poorly constructed. Turbidity readings collected during groundwater sampling activities have been consistently high in some monitoring wells. In some cases turbidity readings have ranged between 100 nephlometric turbidity units (NTUs) and 200 NTUs. In general, it is preferred that groundwater samples be collected after turbidity readings stabilize at less than 10 to 20 NTUs. In many cases, the older monitoring wells do not reach this turbidity level, resulting in less than ideal sampling conditions.

- Recovery wells RW-1 through RW-4 and RW-9 are being sampled as part of the groundwater monitoring program at Site 78. Samples collected from the recovery wells may not reflect true contaminant concentrations present in the aquifer. The volume of water that must be purged from the recovery wells is significantly greater than the volume of water removed from typical monitoring wells. The low flow sampling procedure does not remove a sufficient volume of groundwater from these larger diameter recovery wells.

- A number of wells included in the groundwater monitoring program at Site 78 are located in or adjacent to areas which have exhibited petroleum contamination. These areas are actively being addressed as part of the Underground Storage Tank

(UST) Program at MCB Camp Lejeune. In addition to the UST sites there are also a number of solid waste management units (SWMUs) within Site 78. Figure 1-5 depicts the locations of Installation Restoration (IR), SWMU and UST sites that are within the boundary of Site 78. Organic compounds have been detected in wells located adjacent to the IR and UST sites identified within Site 78. The presence of VOCs in some of the monitoring wells suggest that previous activities "unrelated" to Site 78 have contributed to the observed results.

2.0 ANALYTICAL RESULTS AND FINDINGS

The section which follows presents analytical results and findings from groundwater monitoring performed at Sites 24 and 78 during the fourth quarter of 1996. Groundwater samples from Site 24 were obtained from three shallow monitoring wells. The quarterly sampling event at Site 78 entailed the collection of groundwater samples from 18 shallow monitoring wells, 2 intermediate monitoring wells, 3 deep monitoring wells, and 5 inactive groundwater recovery wells. A summary of groundwater analytical results is provided in Table 2-1. A positive detection summary of organic compounds, selected TAL metals, total dissolved solids, and total suspended solids is provided in Table 2-2.

Trip blanks accompanied the groundwater samples during field collection, shipment, and laboratory analysis. Two organic compounds were detected among the three trip blanks submitted during the quarterly sampling event. Acetone was detected at a concentration of 9 micrograms per liter (µg/L) and methylene chloride was detected in two of the samples at concentrations of 1.0 and 0.7 µg/L. Methylene chloride is a common laboratory contaminant often detected among laboratory quality assurance and quality control (QA/QC) samples. Acetone was not detected among any of the environmental samples; therefore, it is considered to be a laboratory artifact. Analytical results from the three trip blanks are presented in Table 2-3.

2.1 Site 24

The following sections present analytical results and findings from the monitoring event conducted at Site 24 during the fourth quarter of 1996.

2.1.1 Volatile Organic Compounds

As provided in Table 2-2, methylene chloride was detected in two of the three groundwater samples extracted from the shallow aquifer. The detected concentration of methylene chloride was 0.9 µg/L in samples obtained from monitoring wells 24-GW08 and 24-GW09. Methylene chloride is a common laboratory contaminant that is frequently detected in both environmental and laboratory QA/QC samples. As mentioned above, methylene chloride was detected in two of the three trip blank samples at similar concentrations (1.0 and 0.7 µg/L) during the fourth quarter sampling event. As a result, the presence of methylene chloride in the groundwater samples is not considered to be representative of actual groundwater conditions, but rather common laboratory contamination introduced during sample preparation and analysis. There were no other VOCs detected at Site 24 during the fourth quarter sampling event.

The three groundwater samples collected at Site 24 also were analyzed for oil and grease according to USEPA Solid Waste Method 9071. None of the samples collected from the three monitoring wells at Site 24 had positive detections of either petroleum product.

2.1.2 Selected Total Metals

As presented in Table 2-2, iron, lead, and manganese were the only total metals detected among the three groundwater samples submitted for analyses from Site 24. Iron was detected in each of the three samples, manganese was detected twice, and lead was detected in only one of the three samples. The sample obtained from monitoring well 24-GW09 exhibited the only positive metal detection that exceeded the applicable North Carolina Water Quality Standards (NCWQSs). Iron

was detected at a concentration of 776 µg/L, which exceeds the NCWQS of 300 µg/L, in the sample obtained from well 24-GW09. The detections of lead and manganese in monitoring wells 24-GW08 and 24-GW09 did not exceed the NCWQSs.

The observed concentration of iron in monitoring well 24-GW09 is typical of previous sampling events and analytical results obtained during numerous other groundwater investigations conducted throughout MCB Camp Lejeune. Although the concentration of metals in groundwater samples (particularly iron and manganese) often exceed established water quality standards, the levels are generally characteristic of natural site conditions. Soils found within the coastal plain of North Carolina are naturally rich in metals. The observed total metal concentrations in groundwater are due more to geologic conditions (i.e., naturally occurring metals bound to unconsolidated soil particles) and sample acquisition methods than to mobile metal concentrations in the surficial aquifer. The presence of certain metals such as iron and manganese in groundwater is often a reflection of solids or colloids in samples. In order to limit the amount of solids and obtain a more representative groundwater sample, a low-flow purge method was employed during sampling. However, the low-flow purge method can only reduce not eliminate the amount of solids that are frequently present in groundwater samples. Well deterioration and improper well construction procedures or materials may also contribute to the presence of solids, and therefore, metals in groundwater samples.

2.1.3 Suspended and Dissolved Solids

No suspended solids were detected among the three groundwater samples obtained at Site 24. All three of the shallow groundwater samples had detectable concentrations of dissolved solids, however. As provided in Table 2-2, monitoring wells 24-GW08, 24-GW09, and 24-GW10 had dissolved solid concentrations of 120, 88, and 46 milligrams per liter (mg/L), respectively. These concentrations of dissolved solids are below the NCWQS of 500 mg/L.

2.2 Site 78

The following sections present analytical results and findings from the monitoring event conducted at Site 78 during the fourth quarter of 1996. The majority of positive VOC detections were limited to samples obtained from the surficial aquifer. However, samples obtained from intermediate well 78-GW09IW and deep well 78-GW24DW also exhibited low concentrations of VOCs. The limited number of positive VOC detections among samples obtained from the deeper portion of the surficial aquifer and the Castle Hayne Aquifer suggests that vertical migration of VOCs may be limited to select areas; however, only three deep and two intermediate groundwater samples were collected throughout Site 78. The sections which follow discuss the findings of groundwater monitoring at Site 78 in further detail.

2.2.1 Shallow and Intermediate Groundwater

Groundwater conditions within the upper portion of the surficial aquifer were evaluated at Site 78 through collection and analysis of samples from 18 shallow monitoring wells and 5 inactive recovery wells (refer to Table 1-2 for well construction details and Figure 1-2 for well locations). Two additional groundwater samples were obtained from intermediate wells set in the lower portion of the surficial aquifer. The subsections which follow provide not only an evaluation of the most recent analytical data, but a comparison of those findings versus previous results.

2.2.1.1 Volatile Organic Compounds

A summary of groundwater analytical results is provided in Table 2-1; a graphic depiction of VOC results and their locations throughout the study area is presented in Figure 2-1. In general, the analytical data suggest two primary areas of chlorinated solvent contamination and one area of petroleum-related contamination within Site 78. The main area of petroleum-related groundwater contamination is situated within the former fuel farm area (refer to Figures 1-5 and 2-1). Benzene, toluene, ethylbenzene, and total xylenes were detected in the sample obtained from shallow monitoring well 78-GW22-1 at concentrations considerably in excess of applicable water quality standards. As provided in Table 2-2, the petroleum-related contaminants benzene, toluene, ethylbenzene, and total xylenes were detected at concentrations of 8,500, 2,000, 18,000, and 10,000 µg/L, respectively. Previous sampling results confirm the presence of petroleum-related contaminants within the former fuel farm area. In fact, monitoring well 78-GW22-1 is located within 250 feet of an active fuel product recovery system and within 150 feet of a fuel product recovery well. These same petroleum-related contaminants have not, however, been detected in the downgradient monitoring well 78-GW17-1.

There are two chlorinated solvent contaminant plumes within shallow groundwater at Site 78. One area of contamination is located within the northern portion of the site and the other is located within the southern portion of the site. The northern plume area is located southwest of Buildings 902 and 903 toward monitoring well 78-GW23. The southern plume area is situated near the intersection of Fir and East Streets adjacent to monitoring well 78-GW09, extending south and west.

A total of six VOCs were detected among samples associated with the southern contaminant plume. As depicted in Figure 2-1, positive VOC detections in the southern portion of Site 78 were limited to shallow monitoring wells 78-GW01, 78-GW04-1, and 78-GW09-1, and intermediate well 78-GW09-2. Among these wells, the sample obtained from well 78-GW09-1 exhibited the highest concentrations of each chlorinated solvent identified. As presented in Table 2-2, the solvents chloroform, 1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene (total), and trichloroethene were detected in the sample obtained from well 78-GW09-1 at concentrations of 2, 360, 45, 36, 170, and 490 µg/L, respectively. Figure 2-2 depicts total chlorinated solvent concentrations in samples obtained from well 78-GW09-1 during the past six quarterly monitoring events. The median concentration of total chlorinated solvents detected in well 78-GW09-1 is 1,378 µg/L. Figures 2-3, 2-4, and 2-5 depict the concentrations of 1,1-dichloroethene, 1,1,1-trichloroethane, and trichloroethene detected among samples obtained from well 78-GW09-1 during previous sampling events. Each of these compounds have been consistently detected at concentrations exceeding the NCWQS. Indicators of central tendency, including mean and median, have been calculated for each of the various compounds and are provided in Figures 2-2 through 2-5. As depicted in the figures, chlorinated solvent concentrations have decreased since the previous sampling event, but have remained above the applicable water quality standards.

As presented in Figure 2-1, 1,2-dichloroethene (total) was detected at 2 µg/L in the sample obtained from intermediate well 78-GW09-2; the NCWQS for 1,2-dichloroethene (total) is 70 µg/L. Intermediate well 78-GW09-2 is located approximately 150 feet southeast of shallow well 78-GW09-1. The same concentration of 1,2-dichloroethene (total) was exhibited in the sample obtained from intermediate well 78-GW09-2 during the third quarter 1996. The detections of 1,2-dichloroethene (total) during the most recent sampling events suggests that VOCs may have migrated to the deeper portion of the surficial aquifer. As shown in Figure 2-1, the detected

concentrations are significantly lower than the NCWQS, however, the presence of this compound in the deeper portion of the shallow aquifer is notable. Additional quarterly sampling will be required to monitor the presence of VOCs in the intermediate zone. Further data will confirm or deny the vertical migration of contaminants within the plume area. As mentioned, the detected concentrations of the last two sampling quarters do not exceed applicable water quality standards. In addition, there have been no detections of VOCs in samples obtained from deep monitoring well 78-GW09-3, located nearly 200 feet east of 78-GW09-1. These analytical results suggest that the identified chlorinated solvents are primarily located in the uppermost portion of the surficial aquifer in the southern plume area of Site 78, with limited vertical migration.

A total of four chlorinated solvents and four petroleum-related compounds were detected among samples associated with the northern contaminant plume. As depicted in Figure 2-1, positive VOC detections in the northern portion of Site 78 were limited to shallow monitoring wells 78-GW23 and 78-GW24-1. Groundwater samples obtained during previous monitoring events from nearby recovery wells RW-10 and RW-11, provide further confirmation of both petroleum-related contaminants and chlorinated solvents in the shallow aquifer. As presented in Table 2-2, the solvents 1,1-dichloroethene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride were detected in samples obtained from wells 78-GW23 and 78-GW24-1. The sample obtained from 78-GW23 had the highest concentrations of each identified contaminant. The maximum concentrations of 1,1-dichloroethene, 1,2-dichloroethene (total), trichloroethene, and vinyl chloride were 2, 6,200, 40, and 200 µg/L, respectively. Figure 2-6 depicts total chlorinated solvent concentrations in samples obtained from well 78-GW23 during the past six quarterly monitoring events. The increased concentration of total chlorinated solvents detected in well 78-GW23 during the last two quarters may be the result of differing laboratory analyses; not until the third quarter of 1996 were groundwater samples submitted for 1,2-dichloroethene (total) analyses. Figures 2-7 and 2-8 depict the concentrations of specific compounds detected in prior samples obtained from well 78-GW23.

Within the northern contaminant plume, benzene, toluene, ethylbenzene, and xylene (total) have also been detected among shallow groundwater samples obtained from 78-GW23. Of these petroleum-related contaminants, only benzene was detected at a concentration which exceeded the NCWQS of 1.0 µg/L and the MCL of 5.0 µg/L. The concentrations of benzene, toluene, ethylbenzene, and total xylenes associated with the northern contaminant plume were 16, 3, 7, and 51 µg/L, respectively. Results from samples collected during previous quarterly events confirm the presence of petroleum-related compounds in the northern portion of Site 78. Previous sampling results from intermediate monitoring well 78-GW24-2, located adjacent to shallow well 78GW24-1, have exhibited benzene, ethylbenzene, and toluene at concentrations of 4.8, 3.5, and 15 µg/L, respectively. These data suggest that petroleum-related compounds may have begun to migrate vertically from the surficial aquifer. Additional sampling data will be required before the migration of VOCs from the surficial aquifer to deeper zones can be confirmed.

Shallow monitoring wells 78-GW15, 78-GW19 and 78-GW39 are situated in areas removed from the main contaminant plumes at Site 78, however VOCs have been detected in these wells during previous sampling events. For example, tetrachloroethene was detected at concentrations of 0.9 and 0.8 µg/L in samples obtained from wells 78-GW15 and 78-GW19. In addition, samples obtained from monitoring well 78-GW39 exhibited low concentrations of toluene, xylene (total) and tetrachloroethene during the third quarter of 1996. Only methylene chloride was detected, at a concentration of at 1.0 µg/L, in the most recent sample obtained from monitoring well 78-GW39. The presence of methylene chloride is typically the result of laboratory contamination and not site

conditions. The detections of contaminants in samples obtained from monitoring wells 78-GW15, 78-GW19 and 78-GW39 demonstrate that VOCs are present at low concentrations in areas of the site removed from the main contaminant plumes.

2.2.1.2 Selected Total Metals

As indicated in Table 2-2, total metals were detected in each of the 25 groundwater samples submitted for analyses from the surficial aquifer at Site 78. Iron and manganese were the most frequently detected total metals among samples obtained from the 18 shallow and 2 intermediate monitoring wells and the 5 recovery wells. Iron was detected among 16 of the 25 samples at concentrations which exceeded the NCWQS of 300 µg/L. Only 5 of the 25 groundwater samples had concentrations of manganese which exceeded the NCWQS of 50 µg/L. Positive detections of both iron and manganese were distributed evenly throughout the site, indicative of natural site conditions rather than disposal activities. Table 2-1 provides a summary of analytical results from Site 78 and a comparison of those results versus groundwater screening standards.

Arsenic and lead were detected at their respective maximum concentrations in a sample obtained from shallow monitoring well 78-GW22-1, located within the former fuel farm area. Detected concentrations of arsenic and lead were 20.8 and 53.5 µg/L, respectively. The lead detection exceeded applicable NCWQS and MCL of 15 µg/L. Positive detections of petroleum-related compounds in the sample obtained from 78-GW22-1 may account for the presence of these metals at higher concentrations, relative to the entire sample set.

2.2.1.3 Suspended and Dissolved Solids

Both TSS and TDS analyses were performed for each of the 23 shallow and 2 intermediate groundwater samples obtained at Site 78. As provided in Table 2-1, suspended solids were reported at concentrations ranging from 6 to 120 mg/L among 11 of the 25 samples obtained from the surficial aquifer. The TSS analyses from shallow monitoring wells confirm field turbidity measurements observed during both redevelopment and purge activities. The analytical results suggest that some shallow monitoring wells have either begun to deteriorate or were poorly constructed during installation.

Dissolved solids were reported in each of the shallow and intermediate groundwater samples at concentrations ranging from 62 and 560 mg/L. The detection of 560 µg/L at recovery well RW-3 exceeded the NCWQS of 500 mg/L.

2.2.2 Deep Groundwater

The following sections present the analytical results and findings from three deep groundwater samples obtained at Site 78 during the third quarter of 1996.

3.0 TREATMENT SYSTEM EVALUATION

Two independent groundwater extraction and treatment systems have been operating within the Hadnot Point Industrial Area since December 1994. The systems were designed to collect and treat VOC-contaminated shallow groundwater from both the northern and southern portions of Site 78. The systems were also designed to mitigate the potential for off-site contaminant migration.

As depicted in Figure 3-1, the northern treatment system currently includes two active recovery wells (RW-10 and RW-11) and four inactive recovery wells (RW-1, RW-2, RW-3, and RW-4). The southern treatment system includes four active recovery wells (RW-5, RW-6, RW-7, and RW-8) and one inactive recovery well (RW-9). Shallow groundwater extracted via the six active recovery wells is treated at either the northern or southern treatment plants, then discharged to the Hadnot Point Sewage Treatment Plant. The five currently inactive recovery wells were taken off-line during 1996 due to the low concentrations of contaminants being extracted. These inactive recovery wells are being sampled quarterly as part of the Site 78 monitoring program, however.

The following treatment system evaluation is divided into two sections. The first section focuses upon system components located within each treatment plant. These in-plant components include oil and water separators, metals removal systems, low-profile air strippers, and liquid-phase carbon adsorption units. The second section focuses upon the groundwater recovery components that are located outside of each treatment plant. These recovery components include recovery wells, piping, and pumps.

3.1 In-Plant Components

Both the northern and southern treatment plants contain oil and water separators; metals removal systems including flocculation tanks, settling tanks, and sand filters; low profile air strippers; and liquid-phase carbon adsorption units. Monitoring activities at both treatment plants include sampling of plant influent, plant effluent, oil and water separator effluent, sand filter effluent, and air stripper effluent. Tables 3-1 and 3-2 present monthly sampling results from October through December 1996 for the northern and southern treatment plants, respectively. No sampling was performed at the northern treatment plant during December 1996; the treatment systems were being cleaned and maintained. Attachment E contains the Monthly Progress Report for December 1996 prepared by OHM Remediation Services Corporation. The following assessment of the treatment components is based on monthly sampling results from October through December 1996 and the Monthly Progress Report presented in Attachment E.

Analytical results indicate that in-plant treatment components of both the northern and southern systems are functioning effectively. The treatment components are either treating contamination to the remediation levels or eliminating contamination altogether. Influent to both the northern and southern treatment plants has historically contained the VOCs trans-1,2-dichloroethene, trichloroethylene, vinyl chloride, benzene, and cis-1,2-dichloroethylene at concentrations exceeding remediation levels. Based on VOC concentrations in the air stripper effluent samples, the air stripper has successfully treated these contaminants to concentrations that are below the remediation levels, and in most cases, below the detection levels. Similarly, VOC concentrations in the plant effluent have been below the remediation levels and, frequently, below the detection levels. This indicates that VOC treatment is functioning effectively.

In addition to VOCs, plant influent has consistently contained metals, dissolved solids, and suspended solids. Based on sampling results from the sand filter effluent, the majority of metals have been reduced to below the remediation levels and suspended solids have been reduced to below the discharge limits. Calcium and dissolved solid concentrations, however, are not adequately being reduced during treatment and have resulted in the need for continued cleaning and maintenance. In addition, the Monthly Progress Report (refer to Attachment E) suggests that suspended solids are clogging many of the treatment subsystems and have, in at least one case, resulted in a loss of pressure. In fact, many of the maintenance items cited in the Monthly Progress Report relate to the presence of either calcium build-up or sludge.

Finally, oil and grease influent concentrations have typically been below the discharge limit of 1.00 parts per million (ppm). As a result, the effectiveness of the oil and water separators cannot be adequately determined at this time.

3.2 Groundwater Recovery Components

Recovery wells RW-10 and RW-11 are situated within a portion of the northern contaminant plume which has exhibited relatively high concentrations of VOCs. As a result, the two recovery wells have historically extracted groundwater with concentrations of VOCs at nearly the same rate and efficiency. However, from October 9, 1996 through November 31, 1996 recovery well RW-11 was inoperable and the northern treatment plant did not operate during December 1996. In addition, both RW-10 and RW-11 are located approximately 100 feet and 500 feet upgradient of monitoring well 78-GW23 where VOCs have been detected at levels well above water quality standards.

The southern recovery wells are situated in a line as a downgradient contaminant barrier. The recovery wells are positioned to limit contaminant migration and intercept the contaminated plume as it travels in the direction of groundwater flow. Because the southern recovery wells are located at the downgradient edge of the contaminant plume, these recovery wells have been extracting groundwater with lower VOC concentrations when compared to the northern recovery wells. Recovery wells RW-5 and RW-6 have typically removed VOCs at relatively higher concentrations than recovery wells RW-7 and RW-8 because they are positioned closer to the most highly contaminated portion of the suspected contaminant plume.

Compared to the southern recovery system, the northern recovery system has been extracting higher concentrations of VOCs. The northern recovery system is positioned in the portion of the suspected contaminant plume that contains relatively higher VOC concentrations. The southern recovery system, however, is positioned at the downgradient edge of the suspected contaminant plume rather than within the most highly contaminated area. Groundwater samples collected from of the inactive northern recovery wells did not exhibit VOCs.

During the period of October 1, 1996 through November 31, 1996, the one operational recovery well in the northern portion of Site 78 pumped at a rate of 2.9 gpm. The southern recovery wells RW-5, RW-6, RW-7, and RW-8 were pumping at a combined rate of 14 gpm. Both the northern and the southern treatment systems were designed to handle a maximum influent of 80 gpm. Because the actual pumping rates are lower than 80 gpm, the treatment systems are currently operating well below their maximum capacity. Based on past experience at MCB Camp Lejeune, a 100-foot radius of influence can be expected for a recovery well that is pumping at 5 gpm (Baker, April 1996). For the recovery wells at Site 78, the most recently observed pumping rates were between 2.9 and 3.5 gpm. Thus, a radius of influence closer to 75 feet may be expected for each recovery well at Site 78.

4.0 RECOMMENDATIONS

The ROD for OU No. 1 stipulates that groundwater samples both Site 24 and Site 78 be collected quarterly (Baker, 1994a). Possible off-site migration of known contaminants is monitored through quarterly groundwater sample collection and analysis. Groundwater sampling was implemented to ensure that potential human and ecological receptors would not be exposed to known site contaminants.

Based upon the observations and findings presented in Sections 1.0, 2.0, and 3.0 of this quarterly monitoring report, the following recommendations for the OU No. 1 monitoring program are provided. If non-significant changes are made to a component of the selected remedy described in the ROD (Baker, 1994a), the changes must be recorded in a post-decision document file. If significant changes are made to a component of the selected remedy, the changes will need to be presented in an Explanation of Significant Differences document.

Some of the recommendations discussed below were initially presented in the third quarter groundwater monitoring report. They are repeated here because they remain applicable and it is the intent of this report to provide a thorough listing of recommendations for the sampling program.

4.1 Modify Sample Analyses

The sections which follow detail recommended modifications to the analytical requirements of the monitoring program at OU No.1.

4.1.1 Modify Site 24 Sample Analyses

The ROD for OU No. 1 stipulates that groundwater samples from both monitoring and supply wells be collected quarterly and analyzed for VOCs, total metals, dissolved solids, and suspended solids. The contaminant of concern in groundwater at Site 24, however, was identified during the Remedial Investigation (RI) as heptachlor epoxide. The pesticide heptachlor epoxide was detected in groundwater samples collected from shallow monitoring wells 24-GW08, 24-GW09, and 24-GW10. These same wells are identified in the ROD for inclusion in the monitoring program at OU No. 1. Heptachlor epoxide was detected in each of the three wells at concentrations exceeding the NCWQS of 0.004 µg/L, but less than the Federal Maximum Contaminant Level (MCL) of 0.2 µg/L. Based upon this information, it is recommended that future samples obtained from shallow monitoring wells 24-GW08, 24-GW09, and 24-GW10 be submitted for pesticide analyses. Because VOCs have not been detected, it is also recommended that volatile organic analyses be eliminated from the monitoring program at Site 24.

Analytical results from soil samples collected throughout Site 24 during the RI confirm the presence of pesticides. In general, pesticides have a tendency to adhere to soil material. Suspended soil particles, or colloids, in the groundwater samples from Site 24 were likely to have been the cause of the detected pesticide contaminant. A low-flow purge method is now used during sample collection to reduce the amount of suspended material in samples and more accurately reflect true aquifer conditions. Because of the low-flow purge method, it is unlikely that any pesticides will be detected in future groundwater samples. If the lack of groundwater pesticide contamination is confirmed, possibly after three sampling events, pesticide samples from Site 24 should no longer be necessary.

4.1.2 Modify Site 78 Sample Analyses

Groundwater samples collected throughout Site 78 are currently submitted for oil and grease analyses. As indicated above, the ROD for OU No.1 stipulates only that samples be collected quarterly and analyzed for VOCs, total metals, dissolved solids, and suspended solids. Oil and grease analyses were added to the monitoring program in response to engineering requirements of the groundwater treatment system. However, only the treatment plant influent and effluent need be submitted for oil and grease analyses as an indicator of oil and water separator efficiency. In addition, concentrations of oil and grease compounds were not detected among any of the most recent sampling results. Analytical results from previous monitoring events at Site 78 suggest that oil and grease compounds have been detected infrequently and at concentrations less than 15 mg/L. Based upon this information, it is recommended that groundwater samples no longer be submitted for oil and grease analyses.

It is also recommended that total metal, dissolved solid and suspended solid analyses be eliminated from the sampling program. Although positive detections of metals and dissolved solids have been greater than applicable North Carolina standards, these analyses are not required to determine or monitor VOC contaminant migration. In addition, there is no history or evidence to suggest that metal disposal activities may have occurred at Site 78. The sediments of North Carolina's coastal plain are naturally rich in metals, particularly iron and manganese. It is not uncommon to detect total metal concentrations in groundwater at MCB Camp Lejeune that are greater than the applicable water quality standards. Turbidity readings, recorded prior to sampling, may be used to verify the presence of suspended solids; an indication of whether a monitoring well has begun to deteriorate.

4.2 Adjust Groundwater Sampling Scheme

The sections which follow describe a number of recommended adjustments to the monitoring program at Site 78. These adjustments pertain to the number and locations of groundwater sampling points utilized during the monitoring program. Two primary areas of groundwater contamination have been identified and are actively undergoing treatment at Site 78. The recommended adjustments are intended to improve the effectiveness of treatment systems already in place and provide necessary analytical data in support of the selected remedy.

4.2.1 Discontinue Sampling Inactive Recovery Wells

As presented in Section 1.0, recovery wells RW-1 through RW-4 and RW-9 are being sampled as part of the monitoring program at Site 78. These five recovery wells, however, are not actively extracting groundwater for treatment. Recovery wells RW-1 through RW-4 and RW-9 were deactivated as a result of low influent contaminant concentrations. In fact, sampling results obtained since the inception of monitoring program activities at Site 78 suggest that little to no contamination has been present within the identified recovery wells. Based upon this information, it is recommended that the identified recovery wells not be sampled as part of the monitoring program at Site 78.

Additionally, samples collected from the recovery wells via the low-flow sampling method may not accurately reflect true contaminant concentrations in groundwater. The low-flow sampling method, employed throughout MCB Camp Lejeune, does not remove a sufficient volume of groundwater at the minimum required rate from the larger diameter recovery wells.

4.2.2 Discontinue Sampling Selected Monitoring Wells

As presented in Section 1.0, monitoring well 78-GW22-1 is located within the former fuel farm area. Petroleum-related contaminants have consistently been detected at concentrations exceeding applicable water quality standards within groundwater samples obtained from well 78-GW22-1 during the monitoring program. The former fuel farm is being addressed as part of the UST Program at MCB Camp Lejeune and an active product recovery system is in operation within 250 feet of monitoring well 78-GW22-1. It is therefore recommended that groundwater samples not be retained for analysis in the future from 78-GW22-1.

At least two additional monitoring wells, included in the quarterly monitoring program, are situated adjacent to other unrelated areas of concern. Monitoring well 78-GW05 is located within 200 feet of IR Site 94 and well 78-GW19 is situated near a UST site associated with Building 1115. Samples collected from both monitoring wells 78-GW05 and 78-GW19 have exhibited concentrations of organic compounds below 2 µg/L. Site 94 and the former UST at Building 1115, however, are being or are planned to be addressed as part of other investigations. Based upon this information, it is recommended that groundwater samples not be collected from wells 78-GW05 and 78-GW19 as part of the monitoring program at Site 78.

Samples obtained from deep monitoring well 78-GW31-3 have exhibited little to no contamination during the previous five monitoring events. Toluene was the only organic compound detected among the samples obtained from 78-GW31-3. During the second quarter of 1996 toluene was detected at a concentration of 1.1 µg/L. The NCWQS for toluene is 1,000 µg/L. It is therefore recommended that no additional samples be obtained from deep monitoring well 78-GW31-3 during the monitoring program.

4.2.3 Locate and Commence Sampling Additional Monitoring Wells

Additional monitoring wells within the northern and southern contaminant plume areas should be identified for future sampling. Monitoring wells installed as part of any number of unrelated investigations should be employed to better define the extent of the two suspected groundwater contaminant plumes. Any additional sampling data acquired from supplemental investigations would also aid in the placement of future recovery wells. A Groundwater Monitoring Well Coverage Plan is currently being prepared for MCB Camp Lejeune. Information presented in the Groundwater Monitoring Well Coverage Plan document will be used to identify other existing monitoring wells within Site 78. Additional monitoring wells, however, may need to be installed in the future if an adequate amount of supplemental data can not be acquired.

4.3 Abandon Shallow Monitoring Well

Recorded field observations suggest that shallow monitoring well 78-GW22-1 has begun to deteriorate or was poorly constructed during the 1986 Confirmation Study. Soil particles from the surrounding undifferentiated formation have entered the well, most likely bypassing the screen and sandpack. Sediments, as a result, have been introduced into groundwater samples obtained from 78-GW22-1. The presence of soil particles in groundwater samples obtained from well 78-GW22-1 may have biased total metal analytical results. As cited, a number of total metals have been detected at concentrations exceeding both state and federal screening standards in samples obtained during the monitoring program from 78-GW22-1. Monitoring well 78-GW22-1 is located within the former fuel farm area and has also exhibited concentrations of petroleum contaminants far in excess of

applicable water quality standards. In addition, the former fuel farm is actively being addressed as part of the UST Program at MCB Camp Lejeune and several monitoring wells are located within close proximity of 78-GW22-1. Section 4.2 recommends that groundwater samples not be collected from well 78-GW22-1 during the monitoring program. Based upon this information, it is recommended that well 78-GW22-1 be abandoned according to accepted procedures.

Additional wells located throughout OU No.1 and associated with Sites 21, 24, and 78 may also be abandoned, once the need for future supplemental analytical data is determined.

4.4 Install Additional Recovery Wells

As indicated in Section 3.0, a majority of treatment system capacity for both the northern and southern treatment plants is currently underutilized. In addition, the recovery well systems are not extracting groundwater from the most contaminated portions of the two suspected chlorinated solvent plumes. Three additional recovery wells, supplementing the nine existing recovery wells (RW-1 through RW-9), were proposed as part of the selected remedy for OU No. 1. Two of the three additional wells (RW-10 and RW-11) were installed within the northern contaminant plume at Site 78. The third recovery well, proposed for the most contaminated portion of the southern plume, was never installed. It is therefore recommended that at least one recovery well be added to the southern treatment system. The additional recovery well should be installed adjacent to or immediately downgradient of monitoring well 78-GW09. Groundwater samples obtained from 78-GW09 have consistently exhibited the highest concentrations of chlorinated solvents within the southern portion of Site 78. Continued groundwater monitoring activities and treatment system analyses may, in the future, require that additional recovery wells be installed within the southern contaminant plume.

The northern treatment system is actively eliminating groundwater contaminants extracted from two recovery wells (RW-10 and RW11) within the northern chlorinated solvent plume. Although both active recovery wells are extracting contamination from the surficial aquifer, they are situated upgradient of monitoring well 78-GW23. Groundwater samples obtained from 78-GW23 have consistently exhibited concentrations of chlorinated solvents in excess of applicable water quality standards. Vinyl chloride has been detected at concentrations ranging from 54 to 360 µg/L in each of the previous five samples obtained from well 78-GW23 during the monitoring program. The radii of influence of RW-10 and RW-11, however, do not intercept 78-GW23. Based upon this information, it is recommended that at least one additional recovery well be installed near 78-GW23 to extract contaminated groundwater from the northern chlorinated solvent plume. Continued groundwater monitoring activities and treatment system analyses may, in the future, require that additional recovery wells be installed within the northern contaminant plume.

The depth, design, and general construction of any additional recovery wells should be similar to the existing recovery wells currently operating as part of the northern and southern treatment systems. The additional recovery wells could be incorporated with existing systems after a minimal number of upgrades. As presented in Section 3.0, both treatment systems are capable of accepting additional untreated influent. If additional recovery wells are to be added to the treatment system, details concerning their placement and design can be provided at that time.

4.5 Maintain Well Security and Aesthetics

A majority of the monitoring wells at Site 78 that were installed during the 1986 Confirmation Study have begun to show signs of deterioration. The bollards and protective casings of several wells have developed peeling paint and rust. In addition, a number of the padlocks used to secure the protective covers are either missing or no longer function properly. Both the usability and security of each monitoring well should be maintained if they are going to remain reliable groundwater sample collection points in the future. As suggested, the bollards and well casings should be painted with a weather and rust resistant paint. New protective locking covers should be installed on the wells currently without means of limiting access. New padlocks that operate with a universal key should be installed on each of the monitoring wells at Sites 24 and 78.

5.0 REFERENCES

Baker Environmental, Inc. (Baker). October 1996. Corrective Action Plan for Operable Unit No. 1 (Sites 21, 24, and 78). Revised Final. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

Baker Environmental, Inc. (Baker). April 1996. Basewide Groundwater Remediation Study (BRAGS). Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

Baker Environmental, Inc. (Baker). September 1994a. Record of Decision. Final. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

Baker Environmental, Inc. (Baker). June 1994b. Remedial Investigation Report. Operable Unit No. 1 (Sites 21, 24, and 78). Final. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

Baker Environmental, Inc. (Baker). June 1993. Design Package for the Hadnot Point Industrial Area Shallow Aquifer Groundwater Treatment System. Final. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

Environmental Science & Engineering (ES&E). 1990. Site Summary Report. Final. Prepared for the Department of the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia. ESE Project No. 49-02036.

OHM Remediation Services Corporation. November 1996. Work Plan for Systems Cleaning for North and South Groundwater Treatment Plants, Operable Unit 1, Site 78. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

TABLES

TABLE 1-1

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO - 0367
MCB CAMP LEJEUNE, NORTH CAROLINA

Monitoring Well Number	Date Installed	Top of Casing Elevation (feet, msl)	Ground Surface Elevation (feet, msl)	Boring Depth (feet, bgs)	Well Depth (feet, bgs)	Screen Interval Depth (feet, bgs)	Depth to Sand Pack (feet, bgs)	Depth to Bentonite (feet, bgs)	Stick-Up (feet, ags)
24-GW08	1993	26.20	23.60	19.0	19.0	9.1-18.2	7.0	5.0	NA
24-GW09	1993	16.55	13.80	12.5	12.5	2.6-11.7	1.5	0.5	NA
24-GW10	1993	19.33	17.30	18.0	18.0	8.0-17.2	6.0	4.0	NA
78-GW01	1986	NA	NA	27.0	25.0	5.0-25.0	3.0	2.0	1.8
78-GW04-1	1986	31.63	28.90	27.0	24.5	4.5-24.5	3.0	2.0	2.6
78-GW05	1986	28.63	26.10	27.0	25.0	5.0-25.0	3.0	2.0	1.97
78-GW08	1986	28.72	26.30	27.0	25.0	5.0-25.0	3.0	2.0	3.12
78-GW09-1	1987	NA	NA	27.0	25.0	5.0-25.0	3.0	2.0	2.35
78-GW09-2	1987	27.60	25.40	152.0	150.0	130.0-150.0	105.0	100.0	1.92
78-GW09-3	1986	26.97	24.70	152.0	150.0	130.0-150.0	105.0	10.0	2.25
78-GW10	1986	28.13	25.70	27.0	25.0	5.0-25.0	3.0	2.0	2.22
78-GW11	1986	28.22	25.50	25.5	25.0	5.0-25.0	3.0	2.0	2.49
78-GW14	1986	27.32	25.00	25.5	25.0	5.0-25.0	3.0	2.0	1.92
78-GW15	1986	27.03	26.80	25.5	25.0	5.0-25.0	3.0	2.0	0.08
78-GW17-1	1986	30.00	27.50	25.5	25.0	5.0-25.0	3.0	2.0	2.16
78-GW19	1986	29.07	26.50	25.5	25.0	5.0-25.0	3.0	3.0	2.19
78-GW21	1986	33.51	31.20	25.0	25.0	5.0-25.0	3.0	2.0	NA
78-GW22	1986	32.36	30.40	25.0	25.0	5.0-25.0	3.0	2.0	NA
78-GW22-1	1986	31.49	29.50	25.0	25.0	5.0-25.0	3.0	2.0	NA
78-GW23	1986	32.08	30.00	25.5	25.0	5.0-25.0	3.0	2.0	1.82
78-GW24-1	1986	32.84	30.50	25.5	25.0	5.0-25.0	3.0	2.0	1.55
78-GW24-2	1987	33.73	30.40	80.0	76.6	56.6-76.6	51.6	48.6	2.88
78-GW24-3	1987	32.32	30.50	155.0	148.2	128.2-148.2	90.0	84.0	2.24

TABLE 1-1 (Continued)

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO - 0367
MCB CAMP LEJEUNE, NORTH CAROLINA

Monitoring Well Number	Date Installed	Top of Casing Elevation (feet, msl)	Ground Surface Elevation (feet, msl)	Boring Depth (feet, bgs)	Well Depth (feet, bgs)	Screen Interval Depth (feet, bgs)	Depth to Sand Pack (feet, bgs)	Depth to Bentonite (feet, bgs)	Stick-Up (feet, ags)
78-GW25	1986	32.58	30.10	25.5	25.0	5.0-25.0	5.0	3.0	2.17
78-GW31-3	1993	25.99	26.30	148.0	153.0	140.0-153.0	1365.0	133.0	-0.46
78-GW39	1993	19.44	16.80	20.0	20.0	10.0-20.0	8.0	6.0	19.44
RW-1[1]	1994	NA	NA	25.0	25.0	10.0-25.0	8.0	2.0	0
RW-2[1]	1994	NA	NA	25.0	25.0	10.0-25.0	8.0	2.0	0
RW-3[1]	1994	NA	NA	25.0	25.0	10.0-25.0	8.0	2.0	0
RW-4[1]	1994	NA	NA	25.0	25.0	10.0-25.0	8.0	2.0	0
RW-9[1]	1994	NA	NA	25.0	25.0	10.0-25.0	8.0	2.0	0

Notes:

[1] Recovery well construction details are approximate.

ags = Above ground surface
bgs = Below ground surface
msl = Mean Sea Level
NA = Information not available

TABLE 1-2

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Well Volumes	Field Parameters				
		Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
24-GW08 10/9/96	0	1.85	270.2	19.9	6.38	4.7
	1.0	1.65	207.4	20.1	6.06	1.7
	2.0	2.4	213.4	20.2	6.22	1.3
	3.0	2.0	217.2	20.4	6.18	1.0
24-GW09 10/9/96	0	5.45	184.0	21.7	4.82	25.7
	1.0	5.4	188.8	21.6	4.92	20.1
	2.0	4.85	174.5	20.4	4.76	21.0
	3.0	4.8	170.1	20.6	4.72	13.0
24-GW10 10/9/96	0	4.4	74.4	21.2	5.33	1.9
	1.0	4.45	64.0	20.8	5.04	1.4
	2.0	4.2	62.3	20.8	5.01	1.0
	3.0	4.4	62.8	20.2	4.99	1.0
78-GW01 10/8/96	0	2.2	512.0	22.5	5.88	116.3
	1.0	1.8	476.7	21.7	5.87	20.5
	1.5	2.0	470.0	21.3	5.9	19.5
	2.0	2.2	468.5	20.8	5.94	57.0
	2.5	2.25	473.0	20.7	5.97	34.0
	3.0	2.25	477.1	20.8	5.99	76.5
78-GW04-1 10/6/96	0	1.65	210.8	25.0	6.25	>200
	1.0	1.4	263.9	25.3	6.48	158.5
	2.0	1.65	306.4	24.8	6.28	125.0
	3.0	1.8	315.2	24.6	6.41	121.0
	4.0	1.6	312.1	24.3	6.29	129.5
	5.0	1.8	301.1	25.1	6.29	140.0
78-GW05 10/6/96	0	2.6	522.0	23.4	6.14	9.0
	1.0	2.25	506.0	23.2	6.11	2.0
	2.0	2.45	502.0	23.2	6.13	0.9
	3.0	2.65	502.0	23.1	6.18	0.7
78-GW08 10/8/96	0	2.6	153.9	23.7	5.45	4.0
	0.5	2.0	178.5	23.2	5.48	6.2
	1.0	2.4	182.5	23.1	5.62	13.2
	2.0	2.25	197.7	23.0	5.67	25.3
	3.0	3.0	200.3	22.6	5.75	9.9

TABLE 1-2 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Well Volumes	Field Parameters				
		Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
78-GW09-1 10/4/96	0	3.4	527.0	21.3	6.58	7.6
	1.0	1.8	512.0	21.4	6.55	33.0
	2.0	3.2	506.0	21.1	6.55	14.0
	3.0	3.0	507.0	21.0	6.59	8.8
78-GW09-2 10/4/96	0	1.1	559.0	21.1	7.3	5.5
	1.0	1.6	570.0	20.1	7.44	1.9
	2.0	1.4	579.0	20.7	7.36	1.9
	3.0	1.05	569.0	21.3	7.31	1.1
78-GW09-3 10/4/96	0	2.0	469.8	21.3	10.9	17.0
	0.5	--	481.5	20.8	--	--
78-GW10 10/5/96	0	3.8	273.3	22.9	6.66	90.0
	1.0	3.2	259.5	22.7	6.64	76.0
	2.0	3.0	263.1	22.3	6.58	31.0
	3.0	3.2	264.3	22.4	6.52	7.9
78-GW-11 10/8/96	0	3.25	111.9	23.8	4.72	4.3
	1.0	3.0	110.8	23.3	4.85	4.3
	2.0	3.2	109.0	23.4	4.75	0
	3.0	3.25	109.2	22.9	4.76	0
78-GW14 10/5/96	0	3.0	274.4	23.6	5.05	17.9
	1.0	2.2	249.2	22.2	4.89	68.0
	2.0	1.75	239.3	22.0	4.86	11.4
	3.0	2.0	231.8	22.4	4.79	8.0
78-GW15 10/7/96	0	3.8	246.7	23.0	5.64	8.5
	1.0	4.0	223.0	23.5	5.57	3.0
	2.0	4.0	220.6	23.9	5.62	3.6
	3.0	4.4	220.7	24.2	5.72	4.0
78-GW17-1 10/7/96	0	4.6	840	21.6	7.08	12.0
	1.0	4.2	726	22.0	6.93	19.7
	2.0	4.4	675	21.9	6.97	4.0
	3.0	4.2	672	21.9	6.91	2.3
78-GW19 10/5/96	0	2.0	263.3	21.5	4.7	6.7
	1.0	1.8	253.5	20.8	4.8	1.2
	2.0	1.8	251.3	20.5	4.66	1.1
	3.0	2.0	256.3	20.5	4.75	0.9

TABLE 1-2 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Well Volumes	Field Parameters				
		Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
78-GW21 10/3/96	0	3.2	129.9	24.4	5.81	28.4
	1.0	3.2	235.3	24.4	7.36	40.5
	2.0	3.0	245.8	23.9	7.3	4.7
	3.0	2.8	233.8	24.3	7.53	1.7
78-GW22-1 10/4/96	0	1.2	631.0	21.7	6.44	28.5
	1.0	1.4	665.0	21.7	6.43	6.5
	2.0	1.6	671.0	21.4	6.41	1.8
	3.0	1.4	644.0	21.1	6.41	1.5
78-GW23 10/4/96	0	1.6	205.3	20.3	4.8	105.0
	1.0	1.4	229.8	21.3	4.99	8.0
	2.0	1.65	235.5	20.4	4.83	6.1
	3.0	2.0	226.4	20.5	4.77	7.6
78-GW24-1 10/3/96	0	2.2	460.0	23.8	6.72	2.2
	1.0	2.8	368.0	23.0	6.18	2.8
	2.0	2.2	358.8	23.3	5.91	2.2
	3.0	2.4	294	23.0	5.87	2.4
	1.0	--	274	22.9	--	--
	4.5	--	282	22.9	--	--
78-GW24-2 10/3/96	0	1.8	508.0	21.3	7.53	19.5
	1.0	1.6	713.0	21.4	7.53	19.4
	2.0	1.8	663.0	21.5	7.67	10.2
	3.0	1.6	644.0	21.3	7.69	24.5
78-GW24-3 10/3/96	0	2.2	487.0	22.1	7.52	4.5
	1.0	1.6	403.5	20.7	7.5	>200
	2.0	1.6	422.8	20.8	7.5	186
	3.0	1.6	447.9	21.4	7.5	19.5
78-GW25 10/3/96	0	3.4	397.9	23.3	5.24	4.5
	1.0	3.2	332.3	22.5	5.62	2.0
	2.0	3.2	339.9	22.3	5.69	2.4
	3.0	3.1	330.8	22.1	5.58	3.1

TABLE 1-2 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Well Volumes	Field Parameters				
		Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
78-GW31-3 10/7/96	0	1.6	491.0	21.7	10.9	28.0
	0.5	1.65	406.8	21.2	10.7	7.0
	1.0	1.6	288.5	20.8	10.6	35.0
	1.5	1.4	164.0	20.9	9.64	36.0
	2.0	1.4	182.2	20.5	9.49	29.0
	2.5	--	292.5	21.6	10.3	80.0
	3.0	--	291.0	21.6	10.2	65.0
	3.5	--	280.3	21.3	10.2	56.0
78-GW39 10/9/96	0	4.2	257.9	20.1	4.53	1.9
	1.0	4.2	255.0	20.4	3.81	0.2
	2.0	4.2	254.2	20.8	3.9	1.0
	3.0	4.4	258.3	20.9	4.12	0.7
RW-1 10/5/96	0	1.2	309.7	21.4	5.93	200
	0.5	1.25	310.2	21.3	5.69	>200
	1.0	1.45	326.4	20.6	5.98	>200
	1.5	1.5	368.3	21.7	6.07	>200
	2.0	1.4	402.2	21.3	6.17	>200
RW-1 10/6/96	2.5	1.8	299.2	22.2	5.62	34.0
	3.0	2.4	298.2	22.6	5.65	26.0
	3.5	1.6	296.9	22.3	5.58	15.0
	4.0	2.0	296.2	22.8	5.67	14.3
RW-2 10/4/96	0	2.0	295.6	21.6	5.95	160.0
	1.0	1.25	387.9	21.8	5.99	105.0
	2.0	1.4	433.1	21.3	6.08	74.0
	2.5	1.6	474.8	21.1	6.18	45.0
	3.0	1.8	496.8	20.9	6.31	35.0
	3.5	1.8	490.9	21.0	6.27	20.5
RW-3 10/6/96	0	1.2	832.0	19.4	6.23	>200
	0.5	0.8	770.0	19.8	6.55	>200
	1.0	1.0	779.0	20.1	6.81	>200
RW-3 10/7/96	2.0	1.45	870.0	21.0	6.56	28.0
	2.5	1.2	863.0	20.9	6.45	37.0
	3.0	1.45	870.0	20.7	6.41	16.0

TABLE 1-2 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Well Volumes	Field Parameters				
		Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
RW-4 10/7/96	0	--	438.2	20.2	16.0	1.2
	1.0	1.8	431.2	18.3	4.67	15.9
	1.5	1.1	428.9	20.5	4.33	38.0
	2.0	2.2	555.0	20.9	4.5	43.0
	2.5	2.2	600.0	20.6	4.58	41.3
	3.0	2.2	552.0	20.5	4.64	36.0
RW-9 10/6/96	0	38.0	402.3	23.1	6.29	>200
	1.0	2.65	516.0	22.0	6.82	>200
	1.5	2.4	602.0	22.7	7.03	>200
	2.0	1.8	641.0	22.5	7.23	>200
RW-9 10/7/96	2.5	2.8	387.7	20.8	6.18	>200
	3.0	3.6	418.5	20.8	6.24	>200
	3.5	4.0	369.9	20.5	6.15	182.0

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
°C = Degrees Centigrade
mg/L = milligrams per liter
-- = Not recorded

TABLE 1-3

GROUNDWATER SAMPLING SUMMARY
OPERABLE UNIT NO.1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Sample Location	Media	TCL Volatiles[1]	TAL Metals[2]	Oil & Grease[3]	Total Dissolved Solids[4]	Total Suspended Solids[4]	Sample Identification
24-GW08	GW	X	X	X	X	X	24-GW08-96D
24-GW09	GW	X	X	X	X	X	24-GW09-96D
24-GW10	GW	X	X	X	X	X	24-GW10-96D
78-GW01	GW	X	X	X	X	X	78-GW01-96D
78-GW04-1	GW	X	X	X	X	X	78-GW04-96D
78-GW05	GW	X	X	X	X	X	78-GW05-96D
78-GW08	GW	X	X	X	X	X	78-GW08-96D
78-GW09-1	GW	X	X	X	X	X	78-GW09-96D
78-GW09-2	GW	X	X	X	X	X	78-GW09IW-96D
78-GW09-3	GW	X	X	X	X	X	78-GW09DW-96D
78-GW10	GW	X	X	X	X	X	78-GW10-96D
78-GW11	GW	X	X	X	X	X	78-GW11-96D
78-GW14	GW	X	X	X	X	X	78-GW14-96D
78-GW15	GW	X	X	X	X	X	78-GW15-96D
78-GW17-1	GW	X	X	X	X	X	78-GW17-96D
78-GW19	GW	X	X	X	X	X	78-GW19-96D
78-GW21	GW	X	X	X	X	X	78-GW21-96D
78-GW22	GW	X	X	X	X	X	78-GW22A-96D
78-GW22-1	GW	X	X	X	X	X	78-GW22B-96D
78-GW23	GW	X	X	X	X	X	78-GW23-96D
78-GW24-1	GW	X	X	X	X	X	78-GW24-96D
78-GW24-2	GW	X	X	X	X	X	78-GW24IW-96D
78-GW24-3	GW	X	X	X	X	X	78-GW24DW-96D
78-GW25	GW	X	X	X	X	X	78-GW25-96D
78-GW31-3	GW	X	X	X	X	X	78-GW31DW-96D
78-GW39	GW	X	X	X	X	X	78-GW39-96D
RW-1	GW	X	X	X	X	X	78-EXW01-96D
RW-2	GW	X	X	X	X	X	78-EXW02-96D
RW-3	GW	X	X	X	X	X	78-EXW03-96D
RW-4	GW	X	X	X	X	X	78-EXW04-96D
RW-9	GW	X	X	X	X	X	78-EXW09-96D

Notes:

[1] Target Compound List Organics by U.S. Environmental Protection Agency (EPA) Method 8260.
[2] Selected Target Analyte List Metals (Antimony, Arsenic, Beryllium, Chromium, Iron, Lead, Manganese, Mercury, Nickel) by Solid Waste Method 6010.
[3] Oil and Grease by Solid Waste Method 9070.
[4] Total Suspended and Dissolved Solids by Solid Waste Method 160.1 and 160.2.

GW = Groundwater
X = Requested Analyses

TABLE 1-4

ANALYTICAL METHOD DETECTION LIMITS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	MDL	NCWQS	MCL
Volatile Organics µg/L:				
Chloromethane	8260	0.5	NA	NA
Vinyl Chloride	8260	0.5[1]	0.015	2
Bromomethane	8260	0.5	NA	NA
Chloroethane	8260	0.5	NA	NA
1,1-dichloroethene	8260	0.5	7	7
Acetone	8260	2	700	NA
Carbon Disulfide	8260	2	700	NA
Methylene Chloride	8260	0.5	5	5
1,2-dichloroethene (Total)	8260	0.5	70	70
1,1-dichloroethane	8260	0.5	700	NA
2-butanone	8260	2	NA	NA
Chloroform	8260	0.5[1]	0.19	100
1,1,1-trichloroethane	8260	0.5	200	200
Carbon Tetrachloride	8260	0.5[1]	0.3	5
Benzene	8260	0.5	1	5
1,2-dichloroethane	8260	0.5[1]	0.38	5
Trichloroethene	8260	0.5	NA	5
1,2-dichloropropane	8260	0.5	0.56	5
Bromodichloromethane	8260	0.5	0.6	100
Cis-1,3-dichloropropene	8260	0.5	NA	NA
4-methyl-2-pentanone	8260	2	NA	NA
Toluene	8260	0.5	1000	1000
Trans-1,3-dichloropropene	8260	0.5[1]	0.2	NA
1,1,2-trichloroethane	8260	0.5	NA	5
Tetrachloroethene	8260	0.5	0.7	5
2-hexanone	8260	2	NA	NA
Dibromochloromethane	8260	0.5	NA	NA
Chlorobenzene	8260	0.5	50	100
Ethylbenzene	8260	0.5	29	700
Xylene, Total	8260	0.5	530	10000
Styrene	8260	0.5	100	100
Bromoform	8260	0.5[1]	0.19	100
1,1,2,2-tetrachloroethane	8260	0.5	NA	NA

TABLE 1-4 (Continued)

ANALYTICAL METHOD DETECTION LIMITS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	MDL	NCWQS	MCL
Metals (µg/L):				
Barium, Total	6010A	1.4	2000	2000
Beryllium, Total	6010A	0.7	NA	4
Cadmium, Total	6010A	2.6	5	5
Chromium, Total	6010A	3.3	50	100
Lead, Total	7421	1.2	15	15
Manganese, Total	6010A	1.6	NA	50
Wet Chemistry (mg/L):				
Total Dissolved Solids	160.1	10	500	500
Total Suspended Solids	160.2	5	NA	NA

Notes:

(1) Method Detection Limit greater than North Carolina Water Quality Standard

MCL = Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system. (U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories.)
MDL = Method Detection Limit
NA = Standard not available
NCWQS = North Carolina Water Quality Standards. Values Applicable to Groundwater (North Carolina Administrative Code, Title 15A, Subchapter 2L).
mg/L = Milligrams per liter or parts per million
µg/L = Micrograms per liter or parts per billion

TABLE 1-5

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 1 - SITE 24
INDUSTRIAL AREA FLY ASH DUMP
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	Third Quarter SWL (Date 7-30-96)	Third Quarter SWE (Date 7-30-96)	Fourth Quarter SWL (Date 11-7-96)	Fourth Quarter SWE (Date 11-7-96)
24-GW03	15.88	5.14	10.74	4.64	11.24
24-GW04	19.17	8.89	10.28	8.38	10.79
24-GW06	12.70	4.95	7.75	NA [2]	NA [2]
24-GW07	29.82	15.43	14.39	13.94	15.88
24-GW08	26.20	15.76	10.44	14.48	11.72
24-GW09	16.55	5.66	10.89	5.93	10.62
24-GW10	19.93	11.06	8.87	11.07	8.86

Notes:

[1] Top of PVC well casing (in feet above mean sea level [MSL])
[2] Monitoring well has been eliminated due to paving of parking lot.

SWL = Static water level taken from top of PVC well casing
SWE = Static water elevation (in feet above MSL)
NA = Data not available

TABLE 1-6

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 1 - SITE 78
HADNOT POINT INDUSTRIAL AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	Third Quarter SWL (Date 8-9-96)	Third Quarter SWE (Date 8-9-96)	Fourth Quarter SWL (Date 11-7-96)	Fourth Quarter SWE (Date 11-7-96)
78-GW01	NA	NA	NA	NA	NA
78-GW04-1	31.63	19.31	12.32	18.51	13.12
78-GW05	28.63	8.91	19.72	9.01	19.62
78-GW08	28.72	12.30	16.42	11.61	17.11
78-GW09-2	27.60	13.55	14.05	12.96	14.64
78-GW09-3	26.97	12.76	14.21	12.17	14.80
78-GW10	28.13	10.79	17.34	10.69	17.44
78-GW11	28.22	11.65	16.57	11.70	16.52
78-GW14	27.32	9.71	17.61	9.41	17.91
78-GW15	27.03	8.70	18.33	7.50	19.53
78-GW17-1	30.00	10.94	19.06	9.65	20.35
78-GW19	29.07	6.64	22.43	7.70	21.37
78-GW21	33.51	9.85	23.66	9.40	24.11
78-GW22	32.36	5.71	26.65	6.62	25.74
78-GW22-1	31.46	10.55	20.94	8.51	22.98
78-GW23	32.08	8.63	23.45	8.46	23.62
78-GW24-1	32.84	5.85	26.99	6.82	26.02

TABLE 1-6 (continued)

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 1 - SITE 78
HADNOT POINT INDUSTRIAL AREA
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	Third Quarter SWL (Date 8-9-96)	Third Quarter SWE (Date 8-9-96)	Fourth Quarter SWL (Date 11-7-96)	Fourth Quarter SWE (Date 11-7-96)
78-GW24-2	33.73	11.33	22.40	11.46	22.27
78-GW24-3	32.32	10.34	21.98	10.13	22.19
78-GW25	32.58	6.31	26.27	7.07	25.51
78-GW31-3	25.99	9.21	16.78	8.77	17.22
78-GW39	19.44	14.81	4.63	NA	NA

Notes:

[1] Top of PVC well casing (in Feet above mean sea level [MSL])

SWL = Static water level taken from top of PVC well caasing
SWE = Static water elevation (in feet above MSL)
NA = Data not available

TABLE 2-1

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT No. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction (units)	Detected Contaminants or Analytes	Comparison Criteria		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above		Qualitative Assessment of Positive Detections
		NCWQS	MCL					NCWQS	MCL	
Organics (µg/L)	Vinyl Chloride	0.015	2.0	6	200	78-GW23	2/31	2/31	2/31	2 Exceed Both Standards
	1,1-Dichloroethene	7.0	7.0	2.0	36	78-GW09	2/31	1/31	1/31	1 Exceeds Both Standards, South
	Methylene Chloride	5.0	NE	0.9	1.0	78-GW39	3/31	0/31	NA	None Exceed NCWQS
	1,1-Dichloroethane	700	NE	45	45	78-GW09	1/31	0/31	NA	Did Not Exceed NCWQS, South
	1,2-Dichloroethene (Total)	70	70	0.6	6,200	78-GW23	6/31	3/31	3/31	3 Exceed Both Standards
	Chloroform	0.19	100	2.0	2.0	78-GW09	1/31	1/31	0/31	1 Exceeds NCWQS, South
	1,1,1-Trichloroethane	200	200	360	360	78-GW09	1/31	1/31	1/31	1 Exceeds Both Standards, South
	Trichloroethene	2.8	5	0.9	490	78-GW09	6/31	5/31	4/31	5 Exceed NCWQS, 4 Exceed MCL
	Benzene	1.0	5	16	8,500	78-GW22-1	2/31	2/31	2/31	2 Exceed Both Standards
	Toluene	1,000	1,000	0.8	18,000	78-GW22-1	4/31	1/31	1/31	1 Exceeds Both Standards, Former Fuel Farm
	Tetrachloroethene	0.7	5	0.8	0.8	78-GW19	1/31	1/31	0/31	1 Exceeds NCWQS, North
	Ethylbenzene	29	700	7.0	2,000	78-GW22-1	2/31	1/31	1/31	1 Exceeds Both Standards, Former Fuel Farm
	Xylene (Total)	530	10,000	51	10,000	78-GW22-1	2/31	1/31	0/31	1 Exceeds NCWQS, Former Fuel Farm
	Oil and Grease	NE	NE	5.7	5.7	RW-1	1/31	NA	NA	Recovery Well
Total Metals (µg/L)	Antimony, Total	NE	6.0	4.1	4.1	78-GW04	1/31	NA	0/31	Did Not Exceed MCL, South
	Arsenic, Total	50	50	2.0	20.8	78-GW22-1	6/31	0/31	0/31	None Exceed Standards
	Beryllium, Total	NE	4.0	0.45	2.30	RW-4	5/31	NA	0/31	None Exceed MCL, Max. Recovery Well
	Chromium, Total	50	100	2.1	4.7	78-GW04	6/31	0/31	0/31	None Exceed Standards
	Iron, Total	300	NE	15.9	26,100	RW-3	31/31	19/31	NA	19 Exceed NCWQS, Widely Scattered
	Lead, Total	15	15	1.3	53.5	78-GW22-1	16/31	2/31	2/31	2 Exceed Both Standards
	Manganese, Total	50	NE	1.2	240	RW-4	30/31	5/31	NA	5 Exceed NCWQS, Scattered
	Nickel, Total	100	100	6.8	22.6	RW-4	2/31	0/31	0/31	Niether Exceed Standards

TABLE 2-1 (Continued)

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT No. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction (units)	Detected Contaminants or Analytes	Comparison Criteria		Min.	Max.	Location of Maximum Detection	Detection Frequency	Detections Above		Qualitative Assessment of Positive Detections
		NCWQS	MCL					NCWQS	MCL	
Wet Chemistry (mg/L)	Total Dissolved Solids	500	NE	46	560	RW-3	31/31	1/31	NA	1 Exceeds NCWQS, Recovery Well
	Total Suspended Solids	NE	NE	6.0	120	78-GW22-1	11/31	NA	NA	Maximum Detection Former Fuel Farm

Notes:

- Concentrations presented in micrograms per liter (µg/L) or parts per billion for organic and metal results, wet chemistry results presented in milligrams per liter (mg/L) or parts per million.

NA - Not applicable

NCWQS - North Carolina Water Quality Standards (North Carolina Administrative Code, Title 15A, Subchapter 2L).

ND - Not Detected

NE - Not Established

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

TABLE 2-2
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	24-GW08-96D	24-GW09-96D	24-GW10-96D	78-EXW01-96D	78-EXW02-96D	78-EXW03-96D	78-EXW04-96D
DATE SAMPLED	10/09/96	10/09/96	10/09/96	10/06/96	10/04/96	10/07/96	10/07/96
VOLATILES (ug/l)							
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.9	0.9	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.6 U	1.6 U	1.6 U	14.5	3.2	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.54	0.4 U	0.4 U	2.3
CHROMIUM, TOTAL	1.7 U	1.7 U	1.7 U	2.3	1.7 U	1.7 U	4.1
IRON, TOTAL	128	776	61	8410	3170	26100	19000
LEAD, TOTAL	2.4	1.3 U	1.3 U	2.8	4.2	9.9	1.3 U
MANGANESE, TOTAL	2.8	17.8	0.8 U	73.4	29.4	237	240
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	22.6
OIL & GREASE (mg/L)							
OIL & GREASE, GRAV.	5.4 U	5.5 U	5.6 U	5.7	5.4 U	5.6 U	5.9 U
WET CHEMISTRY (mg/l)							
TOTAL DISSOLVED SOLIDS	120	88	46	200	270	560	370
TOTAL SUSPENDED SOLIDS	5 U	7	5 U	8	6	34	14

NOTES
ug/L = micrograms per liter
mg/L = milligrams per liter
U = not detected

TABLE 2-2
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	78-EXW09-96D	78-GW01-96D	78-GW04-96D	78-GW05-96D	78-GW08-96D	78-GW09-96D	78-GW09DW-96D
DATE SAMPLED	10/07/96	10/09/96	10/06/96	10/06/96	10/08/96	10/04/96	10/04/96
VOLATILES (ug/l)							
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	36	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	45	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	5	0.6	0.5 U	0.5 U	170	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	360	0.5 U
TRICHLOROETHENE	0.5 U	21	4	0.5 U	0.5 U	490	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	4.1	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	2	2.6	3.3	1.6 U	1.6 U	1.3 U	1.3 U
BERYLLIUM, TOTAL	0.45	0.4 U	0.55	0.4 U	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	2.4	1.7 U	4.7	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	6260	20400	12300	54.2	63.7	16.4	148
LEAD, TOTAL	1.3 U	1.3 U	3.3	1.7	1.3 U	1.3 U	1.3 U
MANGANESE, TOTAL	47.7	18.9	83.7	59.7	5.7	2.2	1.2
NICKEL, TOTAL	6.8	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U
OIL & GREASE (mg/L)							
OIL & GREASE, GRAV.	5.2 U	5.2 U	5.6 U	5.3 U	5.4 U	5.2 U	5.2 U
WET CHEMISTRY (mg/l)							
TOTAL DISSOLVED SOLIDS	260	360	210	340	120	290	120
TOTAL SUSPENDED SOLIDS	23	10	46	5 U	5 U	5 U	5 U

NOTES
ug/L = micrograms per liter
mg/L = milligrams per liter
U = not detected

TABLE 2-2
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	78-GW09IW-96D	78-GW10-96D	78-GW11-96D	78-GW14-96D	78-GW15-96D	78-GW17-96D	78-GW19-96D
DATE SAMPLED	10/04/96	10/05/96	10/08/96	10/05/96	10/07/96	10/07/96	10/05/96
VOLATILES (ug/l)							
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.9	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.8
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.49
CHROMIUM, TOTAL	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	563	124	417	3230	43	30.4	4200
LEAD, TOTAL	2.5	4.1	1.3 U	1.3	1.3 U	1.3 U	2.4
MANGANESE, TOTAL	25.2	3.1	2.7	22.3	4.4	1.6	18.3
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U
OIL & GREASE (mg/L)							
OIL & GREASE, GRAV.	5.6 U	5.3 U	5.3 U	5.3 U	5.6 U	5.5 U	5.2 U
WET CHEMISTRY (mg/l)							
TOTAL DISSOLVED SOLIDS	330	150	62	120	120	470	130
TOTAL SUSPENDED SOLIDS	5 U	5 U	5 U	5 U	5 U	5 U	5 U

NOTES
ug/L = micrograms per liter
mg/L = milligrams per liter
U = not detected

TABLE 2-2
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	78-GW21-96D	78-GW22-96D	78-GW22A-96D	78-GW23-96D	78-GW24-96D	78-GW24DW-96D	78-GW24IW-96D
DATE SAMPLED	10/03/96	10/09/96	10/04/96	10/04/96	10/03/96	10/04/96	10/03/96
VOLATILES (ug/l)							
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	200	6	0.5 U	0.5 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	2	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	6200	120	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	40	20	0.5 U	0.5 U
BENZENE	0.5 U	8500	0.5 U	16	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	18000	0.5 U	3	0.5 U	0.8	0.5 U
ETHYLBENZENE	0.5 U	2000	0.5 U	7	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	10000	0.5 U	51	0.5 U	0.5 U	0.5 U
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	20.8	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	1.7 U	3.5	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	60.1	10800	429	3710	14600	415	1120
LEAD, TOTAL	1.3 U	53.5	2.2	2.4	1.3 U	1.3 U	1.3 U
MANGANESE, TOTAL	20.5	22.4	24.9	15.7	25.8	34.3	14.1
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U
OIL & GREASE (mg/L)							
OIL & GREASE, GRAV.	5.3 U	5.6 U	5.4 U	5.4 U	5.3 U	5.3 U	5.8 U
WET CHEMISTRY (mg/l)							
TOTAL DISSOLVED SOLIDS	130	78	390	140	150	200	300
TOTAL SUSPENDED SOLIDS	5 U	120	5 U	9	5 U	5 U	20

NOTES
ug/L = micrograms per liter
mg/L = milligrams per liter
U = not detected

TABLE 2-2
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	78-GW25-96D	78-GW31DW-96D	78-GW39-96D
DATE SAMPLED	10/03/96	10/08/96	10/09/96
VOLATILES (ug/l)			
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	0.5 U	0.5 U	1
ACETONE	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U
TOTAL METALS (ug/L)			
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	1.7 U	2.1	1.7 U
IRON, TOTAL	204	416	15.9
LEAD, TOTAL	3.5	20.8	1.3
MANGANESE, TOTAL	1.2	13.5	8.9
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U
OIL & GREASE (mg/L)			
OIL & GREASE, GRAV.	5.6 U	5.6 U	5.2 U
WET CHEMISTRY (mg/l)			
TOTAL DISSOLVED SOLIDS	170	72	170
TOTAL SUSPENDED SOLIDS	5 U	5 U	5 U

NOTES
ug/L = micrograms per liter
mg/L = milligrams per liter
U = not detected

TABLE 2-3
TRIP BLANK ANALYTICAL RESULTS
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	78-TB01-96D	78-TB03-96D	78-TB02-96D
DATE SAMPLED	10/03/96	10/10/96	10/08/96
VOLATILES (ug/L)			
CHLOROMETHANE	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U
METHYLENE CHLORIDE	1	0.7	0.5 U
ACETONE	9	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U
2-BUTANONE	2 U	2 U	2 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U
4-METHYL-2-PENTANONE	2 U	2 U	2 U
2-HEXANONE	2 U	2 U	2 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U

NOTES
ug/L = micrograms per liter
U = not detected

TABLE 3-1

SAMPLING RESULTS - NORTHERN TREATMENT PLANT
FOURTH QUARTER, 1996
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	October 1996					November 1996				
	Plant Influent	Oil/Water Separator Effluent	Air Stripper Effluent	Sand Filter Effluent	Final Effluent	Plant Influent	Oil/Water Separator Effluent	Air Stripper Effluent	Sand Filter Effluent	Final Effluent
Volatiles										
trans-1,2-Dichloroethene	0.0007	N/A	<0.0005	N/A	<0.0005	<0.0001	N/A	<0.001	N/A	<0.001
Trichloroethylene	0.016	N/A	<0.0005	N/A	<0.0005	0.0177	N/A	<0.0005	N/A	<0.0005
Vinyl Chloride	0.015	N/A	<0.0005	N/A	<0.0005	0.002	N/A	<0.0005	N/A	<0.0005
Benzene	0.0454	N/A	<0.0005	N/A	<0.0005	0.0488	N/A	<0.0005	N/A	<0.0005
1,2-cis-Dichloroethylene	0.0498	N/A	<0.0005	N/A	<0.0005	N/A	N/A	N/A	N/A	N/A
Total Metals										
Antimony	<0.001	N/A	N/A	<0.001	<0.001	<0.001	N/A	N/A	<0.001	<0.001
Arsenic	<0.002	N/A	N/A	<0.002	<0.002	<0.002	N/A	N/A	<0.002	<0.002
Beryllium	<0.001	N/A	N/A	<0.001	<0.001	<0.001	N/A	N/A	<0.001	<0.001
Calcium	55.6	N/A	N/A	69.1	69.1	74.2	N/A	N/A	72.4	75
Chromium	<0.004	N/A	N/A	<0.004	<0.004	<0.004	N/A	N/A	<0.004	<0.004
Iron	<0.013	N/A	N/A	0.244	0.244	9.87	N/A	N/A	<0.013	<0.013
Lead	0.004	N/A	N/A	<0.001	<0.001	<0.001	N/A	N/A	<0.001	0.008
Manganese	<0.001	N/A	N/A	<0.001	<0.001	0.059	N/A	N/A	<0.001	<0.001
Mercury	<0.0001	N/A	N/A	<0.0001	<0.0001	<0.0001	N/A	N/A	<0.0001	<0.0001
Nickel	<0.007	N/A	N/A	<0.007	<0.007	<0.007	N/A	N/A	<0.007	<0.007
Wet Chemistry										
Oil & Grease	<1.00	<1.00	N/A	N/A	N/A	<1.00	<1.00	N/A	N/A	2.66
Total Dissolved Solids (TDS)	208	N/A	N/A	198	198	215	N/A	N/A	208	217
Total Suspended Solids (TSS)	69	N/A	N/A	1.00	1.00	44	N/A	N/A	2.00	<1.00
pH	7.96	N/A	N/A	N/A	N/A	6.62	N/A	N/A	N/A	8.12

Note:

All concentrations are reported in milligrams per liter (mg/L) or parts per million.
Northern treatment plant off-line during December, 1996.

TABLE 3-2

SAMPLING RESULTS - SOUTHERN TREATMENT PLANT
FOURTH QUARTER 1996
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	October 1996					November 1996				
	Plant Influent	Oil/Water Separator Effluent	Air Stripper Effluent	Sand Filter Effluent	Final Effluent	Plant Influent	Oil/Water Separator Effluent	Air Stripper Effluent	Sand Filter Effluent	Final Effluent
Volatiles										
trans-1,2-Dichloroethene	0.00078	N/A	<0.0005	N/A	<0.0005	<0.001	N/A	<0.001	N/A	<0.001
Trichloroethylene	0.03	N/A	<0.0005	N/A	<0.0005	0.036	N/A	0.0005	N/A	<0.0005
Vinyl Chloride	0.0006	N/A	<0.0005	N/A	<0.0005	<0.001	N/A	<0.0005	N/A	<0.0005
Benzene	<0.0005	N/A	<0.0005	N/A	<0.0005	0.002	N/A	<0.0005	N/A	<0.0005
1,2-cis-Dichloroethylene	0.153	N/A	<0.0005	N/A	<0.0005	N/A	N/A	N/A	N/A	N/A
Total Metals										
Antimony	<0.001	N/A	N/A	<0.001	<0.001	<0.001	N/A	N/A	<0.001	<0.001
Arsenic	<0.002	N/A	N/A	<0.002	<0.002	<0.002	N/A	N/A	<0.002	<0.002
Beryllium	<0.001	N/A	N/A	<0.001	<0.001	<0.001	N/A	N/A	<0.001	<0.001
Calcium	163	N/A	N/A	69.1	69.4	135	N/A	N/A	134	144
Chromium	<0.004	N/A	N/A	<0.004	<0.004	<0.004	N/A	N/A	<0.004	<0.004
Iron	0.502	N/A	N/A	0.244	0.501	0.374	N/A	N/A	<0.013	<0.013
Lead	0.004	N/A	N/A	<0.001	<0.011	<0.001	N/A	N/A	<0.001	<0.001
Manganese	0.06	N/A	N/A	<0.001	<0.001	0.048	N/A	N/A	0.0178	<0.001
Mercury	<0.0001	N/A	N/A	<0.0001	<0.0001	<0.0001	N/A	N/A	<0.0001	<0.0001
Nickel	<0.007	N/A	N/A	<0.007	<0.007	<0.007	N/A	N/A	<0.007	<0.007
Wet Chemistry										
Oil & Grease	<1.00	<1.00	N/A	N/A	<1.00	3.47	2.42	N/A	N/A	<1.00
Total Dissolved Solids (TDS)	444	N/A	N/A	198	448	438	N/A	N/A	429	445
Total Suspended Solids (TSS)	2.00	N/A	N/A	1.00	1.00	1.00	N/A	N/A	2.00	<1.00
pH	7.17	N/A	N/A	N/A	8.27	7.18	N/A	N/A	N/A	8.26

Note:

All concentrations are reported in milligrams per liter (mg/L).

TABLE 3-2 (Continued)

SAMPLING RESULTS - SOUTHERN TREATMENT PLANT
FOURTH QUARTER 1996
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Contaminant	December 1996				
	Plant Influent	Oil/Water Separator Effluent	Air Stripper Effluent	Sand Filter Effluent	Final Effluent
Volatiles					
trans-1,2-Dichloroethene	<0.0005	N/A	<0.0005	N/A	<0.0005
Trichloroethylene	0.024	N/A	<0.0005	N/A	<0.0005
Vinyl Chloride	<0.0005	N/A	<0.0005	N/A	<0.0005
Benzene	0.002	N/A	<0.0005	N/A	<0.0005
1,2-cis-Dichloroethylene	0.152	N/A	<0.0005	N/A	<0.0005
Total Metals					
Antimony	<0.001	N/A	N/A	<0.001	<0.001
Arsenic	<0.002	N/A	N/A	<0.002	<0.002
Beryllium	<0.001	N/A	N/A	<0.001	<0.001
Calcium	158	N/A	N/A	142	137
Chromium	<0.004	N/A	N/A	<0.004	<0.004
Iron	0.257	N/A	N/A	<0.013	<0.013
Lead	0.015	N/A	N/A	<0.001	<0.001
Manganese	0.05	N/A	N/A	0.017	0.141
Mercury	<0.0001	N/A	N/A	<0.0001	<0.0001
Nickel	<0.007	N/A	N/A	<0.007	<0.007
Wet Chemistry					
Oil & Grease	<1.02	2.76	N/A	N/A	<1.00
Total Dissolved Solids (TDS)	484	N/A	N/A	450	445
Total Suspended Solids (TSS)	2.00	N/A	N/A	2.00	<1.00
pH	7.55	N/A	N/A	8.03	8.26

Note:

All concentrations are reported in milligrams per liter (mg/L).

FIGURES

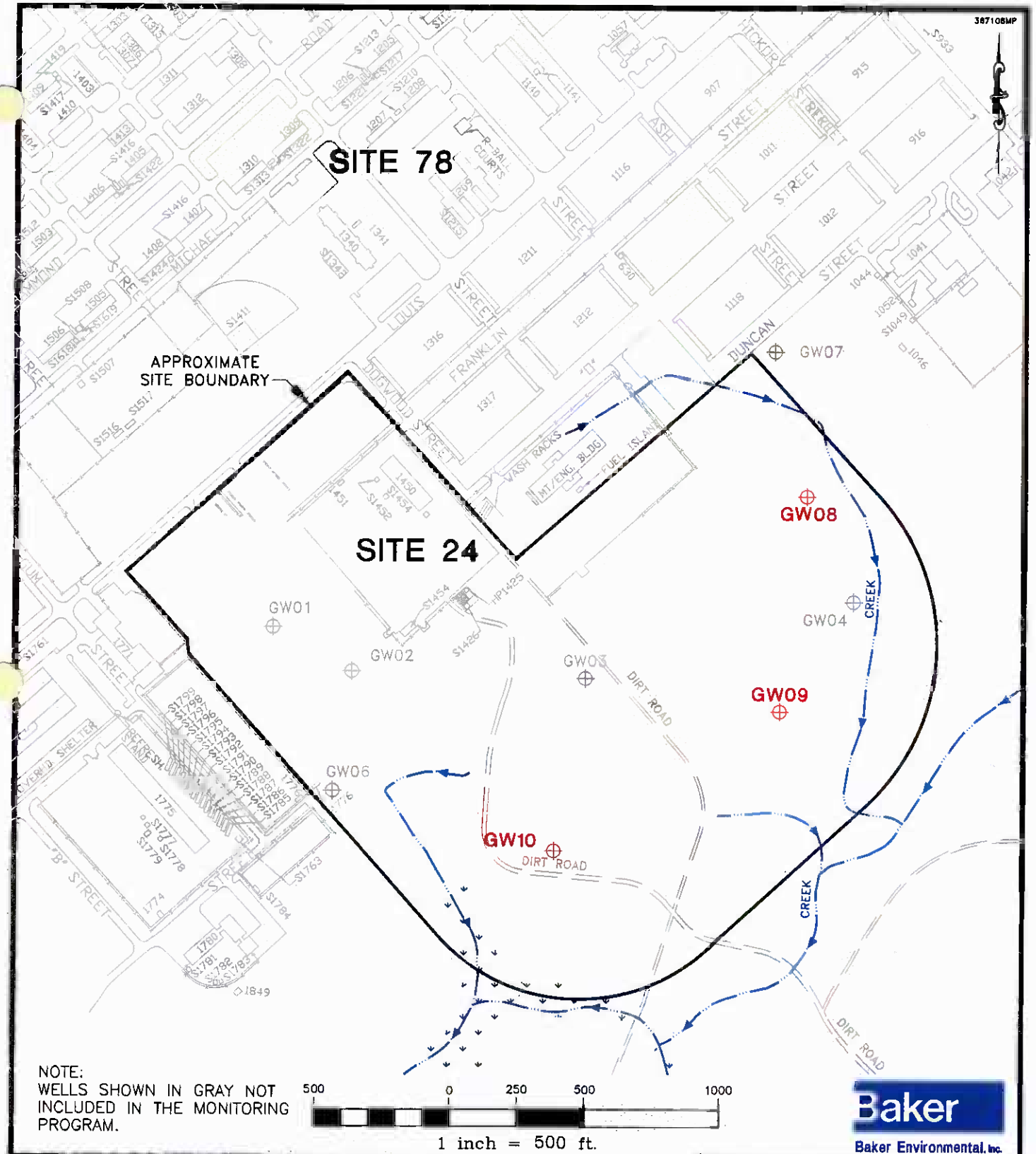


FIGURE 1-1
WELL LOCATION MAP
OPERABLE UNIT No. 1 – SITE 24
MONITORING AND O&M SUPPORT, CTO-0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01778JJBIY

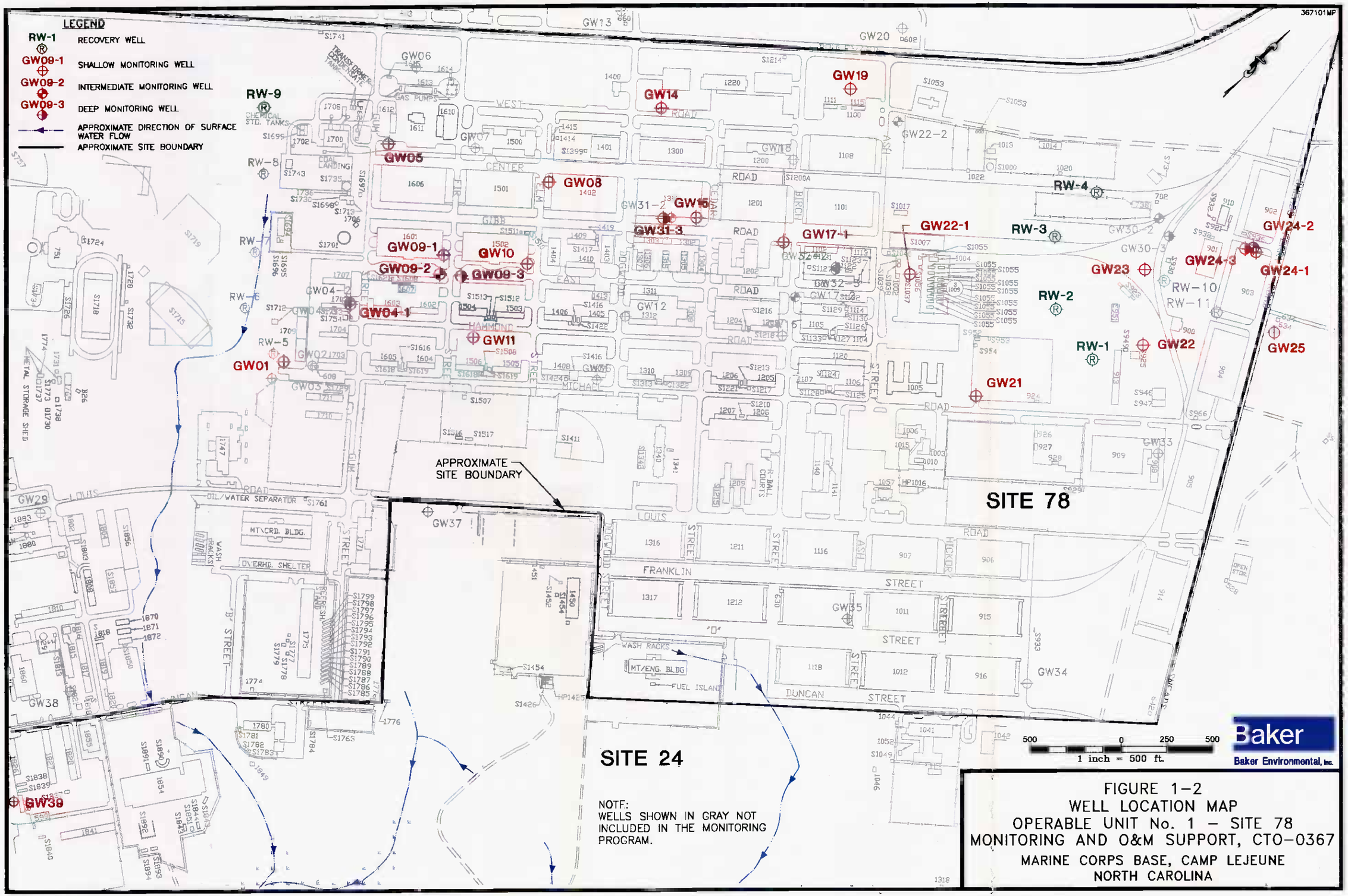
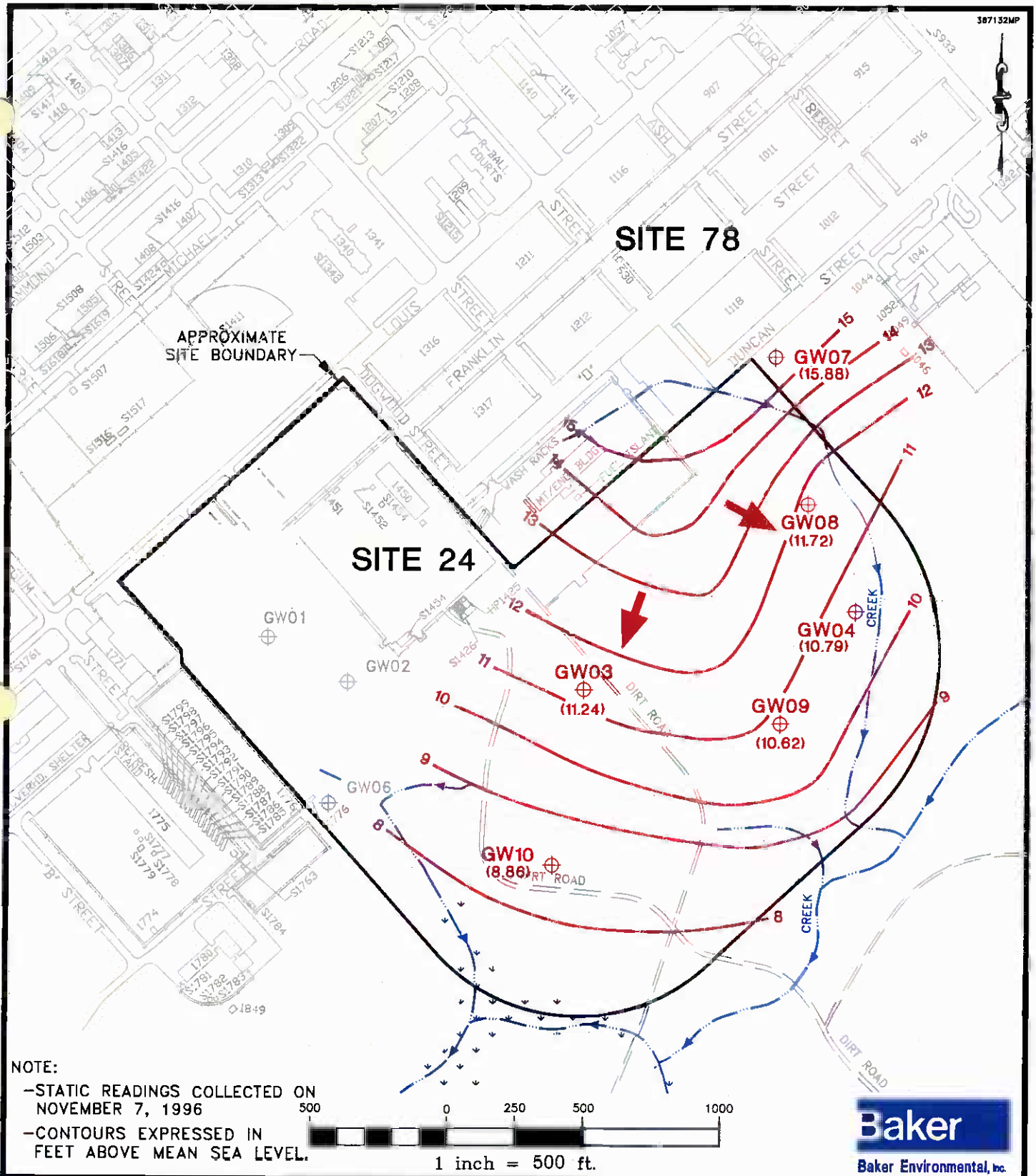


FIGURE 1-2
WELL LOCATION MAP
OPERABLE UNIT No. 1 – SITE 78
MONITORING AND O&M SUPPORT, CTO-0367
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

- GW03 ⊕ — SHALLOW MONITORING WELL
- (11.24) — STATIC GROUNDWATER ELEVATION
- 13 — GROUNDWATER ELEVATION CONTOUR
- → — APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- ← — APPROXIMATE DIRECTION OF SURFACE WATER FLOW
- — APPROXIMATE SITE BOUNDARY

SOURCE: LANTDIV, FEB. 1992

FIGURE 1-3
SHALLOW GROUNDWATER CONTOUR MAP NOVEMBER 7, 1996
OPERABLE UNIT No. 1 - SITE 24
MONITORING AND O&M SUPPORT, CTO-0367
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

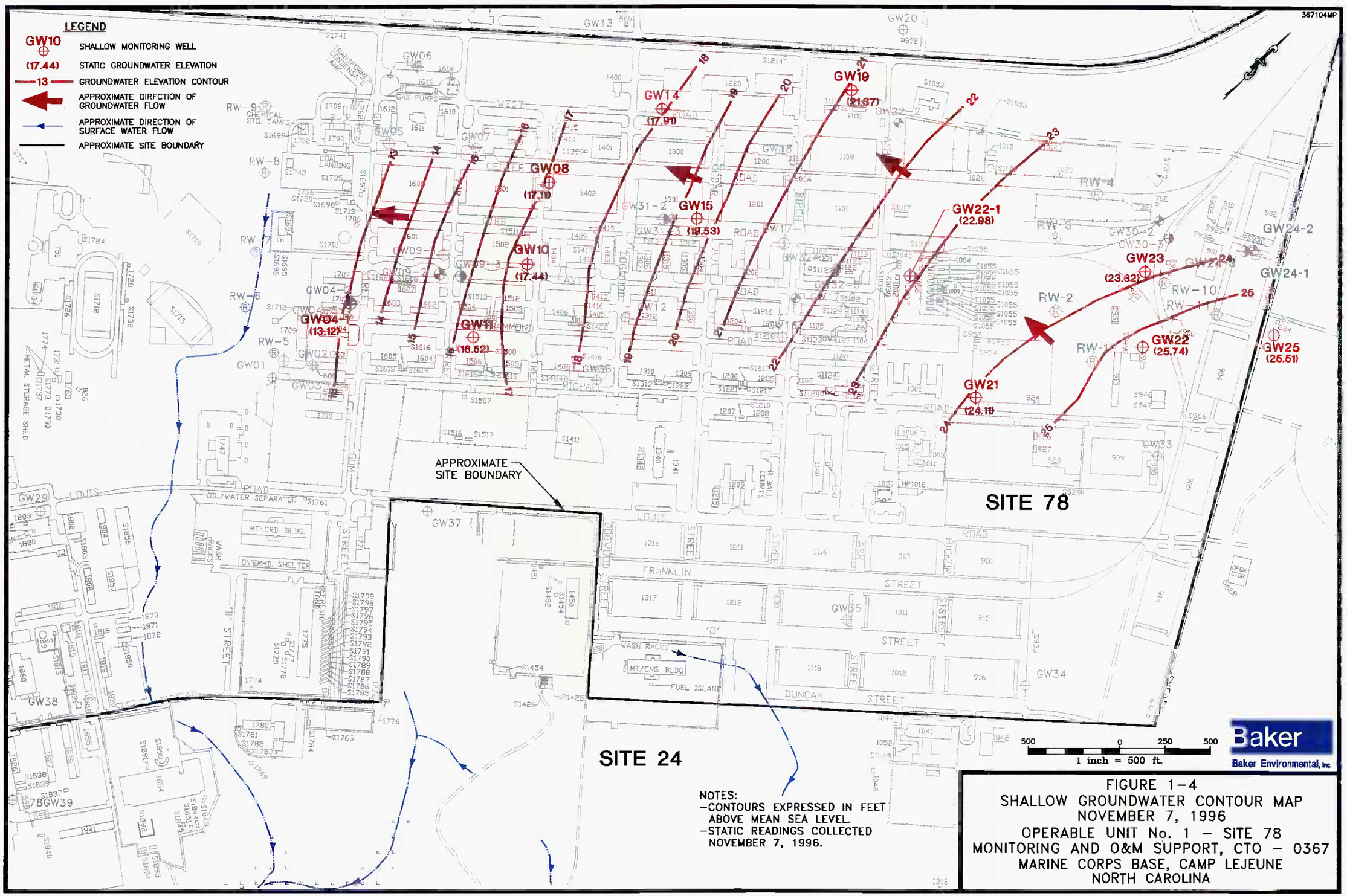


FIGURE 1-4
SHALLOW GROUNDWATER CONTOUR MAP
NOVEMBER 7, 1996
OPERABLE UNIT No. 1 – SITE 78
MONITORING AND O&M SUPPORT, CTO – 0367
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

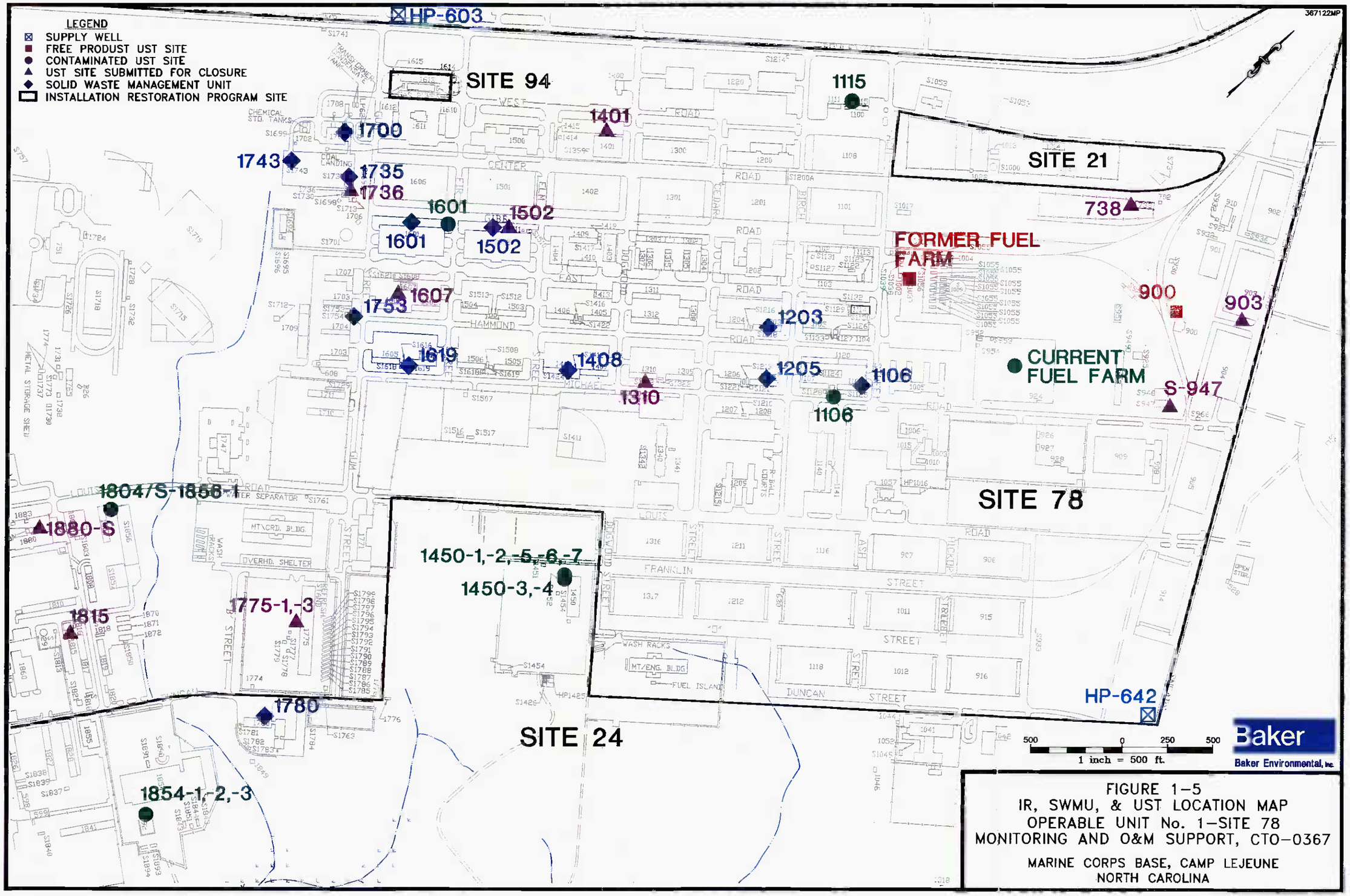


FIGURE 1–5
IR, SWMU, & UST LOCATION MAP
OPERABLE UNIT No. 1–SITE 78
MONITORING AND O&M SUPPORT, CTO–0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

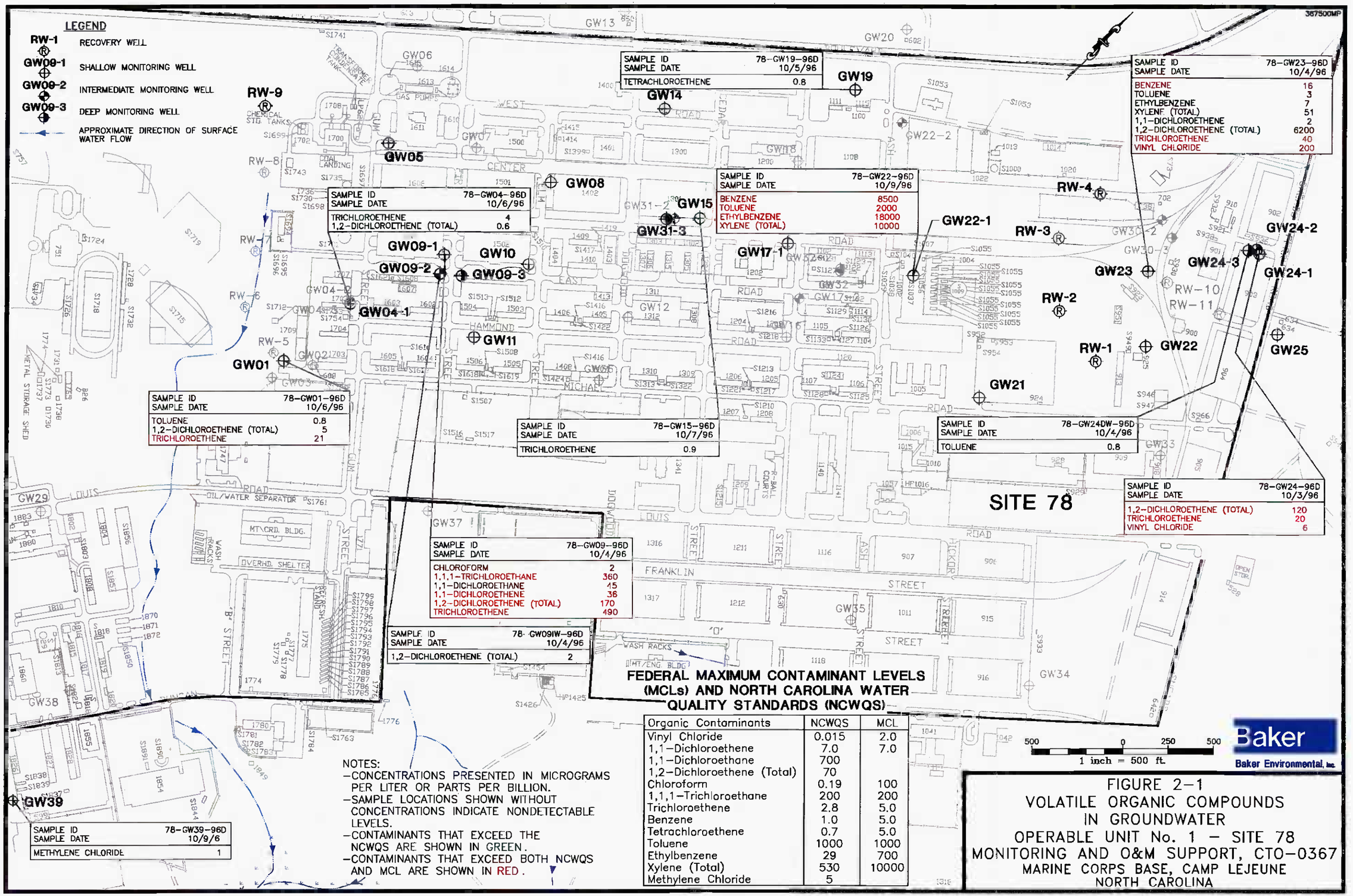
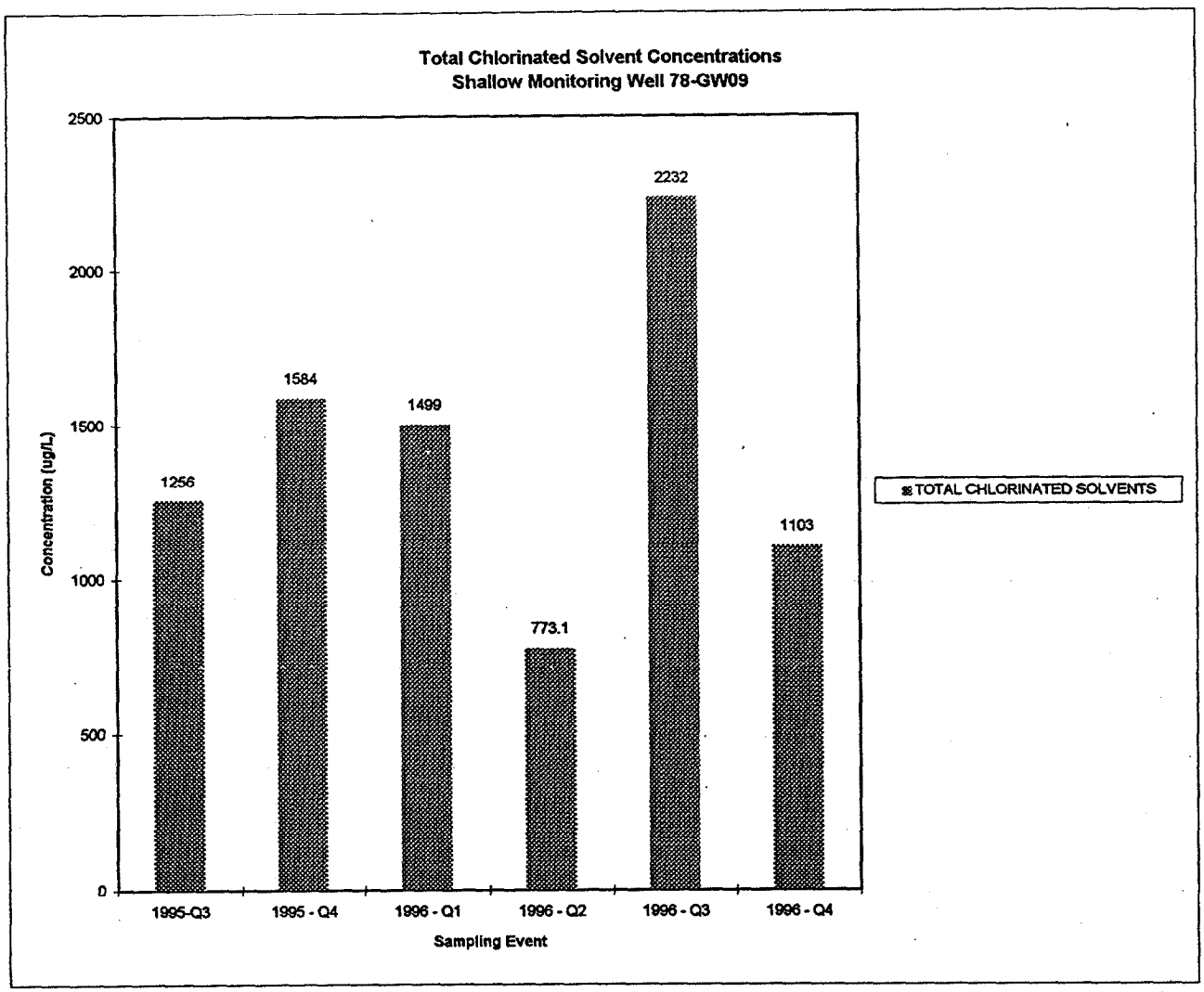

LEGEND
RW-1 RECOVERY WELL
GW09-1 SHALLOW MONITORING WELL
GW09-2 INTERMEDIATE MONITORING WELL
GW09-3 DEEP MONITORING WELL
APPROXIMATE DIRECTION OF SURFACE WATER FLOW
SAMPLE ID 78-GW19-96D
SAMPLE DATE 10/5/96
TETRACHLOROETHENE 0.8
SAMPLE ID 78-GW23-96D
SAMPLE DATE 10/4/96
BENZENE 16
TOLUENE 3
ETHYLBENZENE 7
XYLENE (TOTAL) 51
1,1-DICHLOROETHENE 2
1,2-DICHLOROETHENE (TOTAL) 6200
TRICHLOROETHENE 40
VINYL CHLORIDE 200
SAMPLE ID 78-GW04-96D
SAMPLE DATE 10/6/96
TRICHLOROETHENE 4
1,2-DICHLOROETHENE (TOTAL) 0.6
SAMPLE ID 78-GW22-96D
SAMPLE DATE 10/9/96
BENZENE 8500
TOLUENE 2000
ETHYLBENZENE 18000
XYLENE (TOTAL) 10000
SAMPLE ID 78-GW01-96D
SAMPLE DATE 10/6/96
TOLUENE 0.8
1,2-DICHLOROETHENE (TOTAL) 5
TRICHLOROETHENE 21
SAMPLE ID 78-GW15-96D
SAMPLE DATE 10/7/96
TRICHLOROETHENE 0.9
SAMPLE ID 78-GW24DW-96D
SAMPLE DATE 10/4/96
TOLUENE 0.8
SAMPLE ID 78-GW24-96D
SAMPLE DATE 10/3/96
1,2-DICHLOROETHENE (TOTAL) 120
TRICHLOROETHENE 20
VINYL CHLORIDE 6
SAMPLE ID 78-GW09-96D
SAMPLE DATE 10/4/96
CHLOROFORM 2
1,1,1-TRICHLOROETHANE 360
1,1-DICHLOROETHANE 45
1,1-DICHLOROETHENE 36
1,2-DICHLOROETHENE (TOTAL) 170
TRICHLOROETHENE 490
SAMPLE ID 78-GW09W-96D
SAMPLE DATE 10/4/96
1,2-DICHLOROETHENE (TOTAL) 2
SAMPLE ID 78-GW39-96D
SAMPLE DATE 10/9/6
METHYLENE CHLORIDE 1
SITE 78
FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLs) AND NORTH CAROLINA WATER QUALITY STANDARDS (NCWQS)
Organic Contaminants | NCWQS | MCL
Vinyl Chloride | 0.015 | 2.0
1,1-Dichloroethene | 7.0 | 7.0
1,1-Dichloroethane | 700 |
1,2-Dichloroethene (Total) | 70 |
Chloroform | 0.19 | 100
1,1,1-Trichloroethane | 200 | 200
Trichloroethene | 2.8 | 5.0
Benzene | 1.0 | 5.0
Tetrachloroethene | 0.7 | 5.0
Toluene | 1000 | 1000
Ethylbenzene | 29 | 700
Xylene (Total) | 530 | 10000
Methylene Chloride | 5 |
NOTES:
-CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.
-SAMPLE LOCATIONS SHOWN WITHOUT CONCENTRATIONS INDICATE NONDETECTABLE LEVELS.
-CONTAMINANTS THAT EXCEED THE NCWQS ARE SHOWN IN GREEN.
-CONTAMINANTS THAT EXCEED BOTH NCWQS AND MCL ARE SHOWN IN RED.
500 0 250 500
1 inch = 500 ft.
Baker
Baker Environmental, Inc.
FIGURE 2-1
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
OPERABLE UNIT No. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-0367
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

FIGURE 2-2

TOTAL CHLORINATED SOLVENT RESULTS FROM 78-GW09
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA

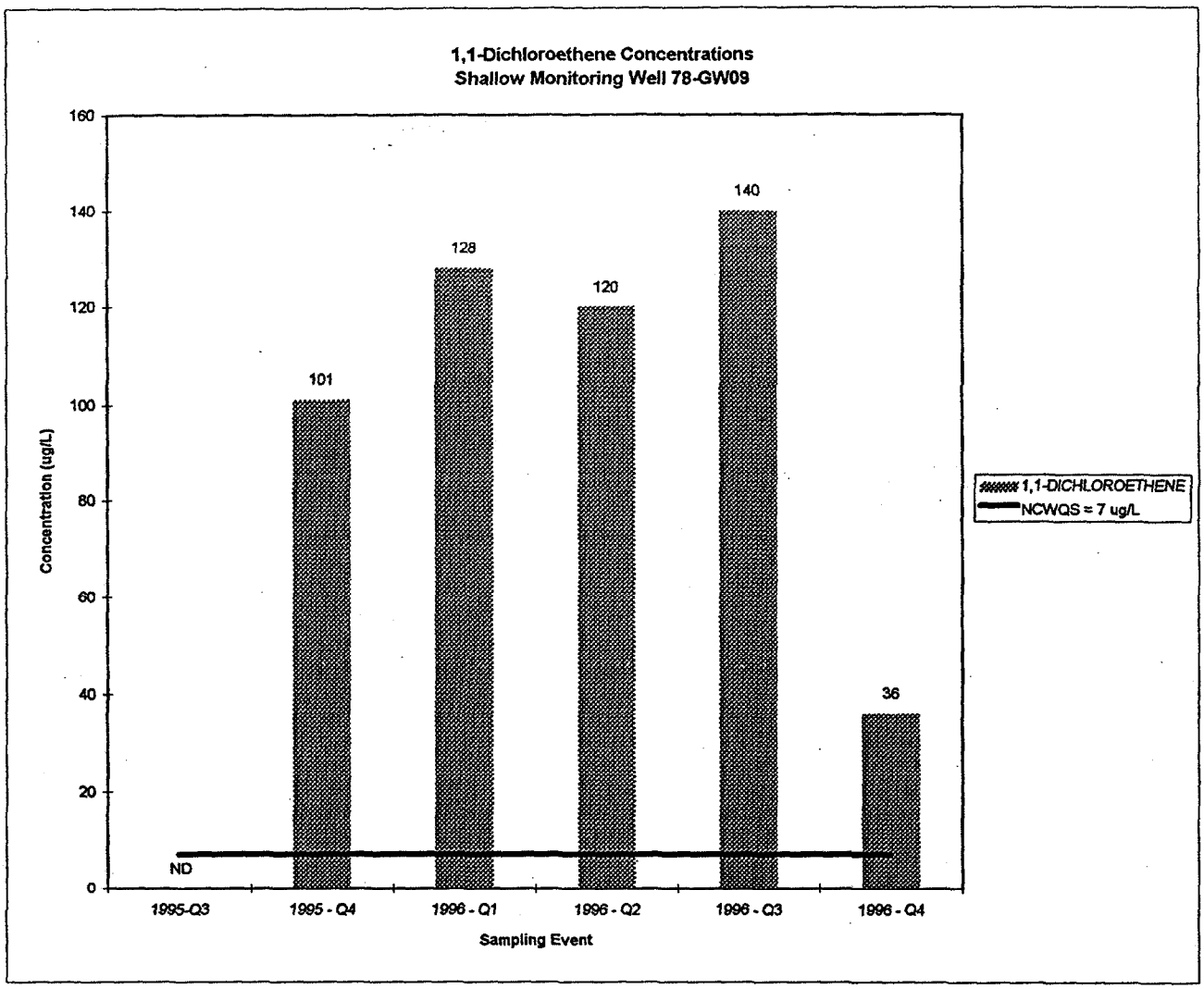


Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Contaminants	Mean Total (ug/L)	Median Total (ug/L)	Detection Frequency	Detections Above Standards
TOTAL CHLORINATED SOLVENTS	1408	1378	N/A	N/A

FIGURE 2-3

1,1-DICHLOROETHENE RESULTS FROM 78-GW09
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA



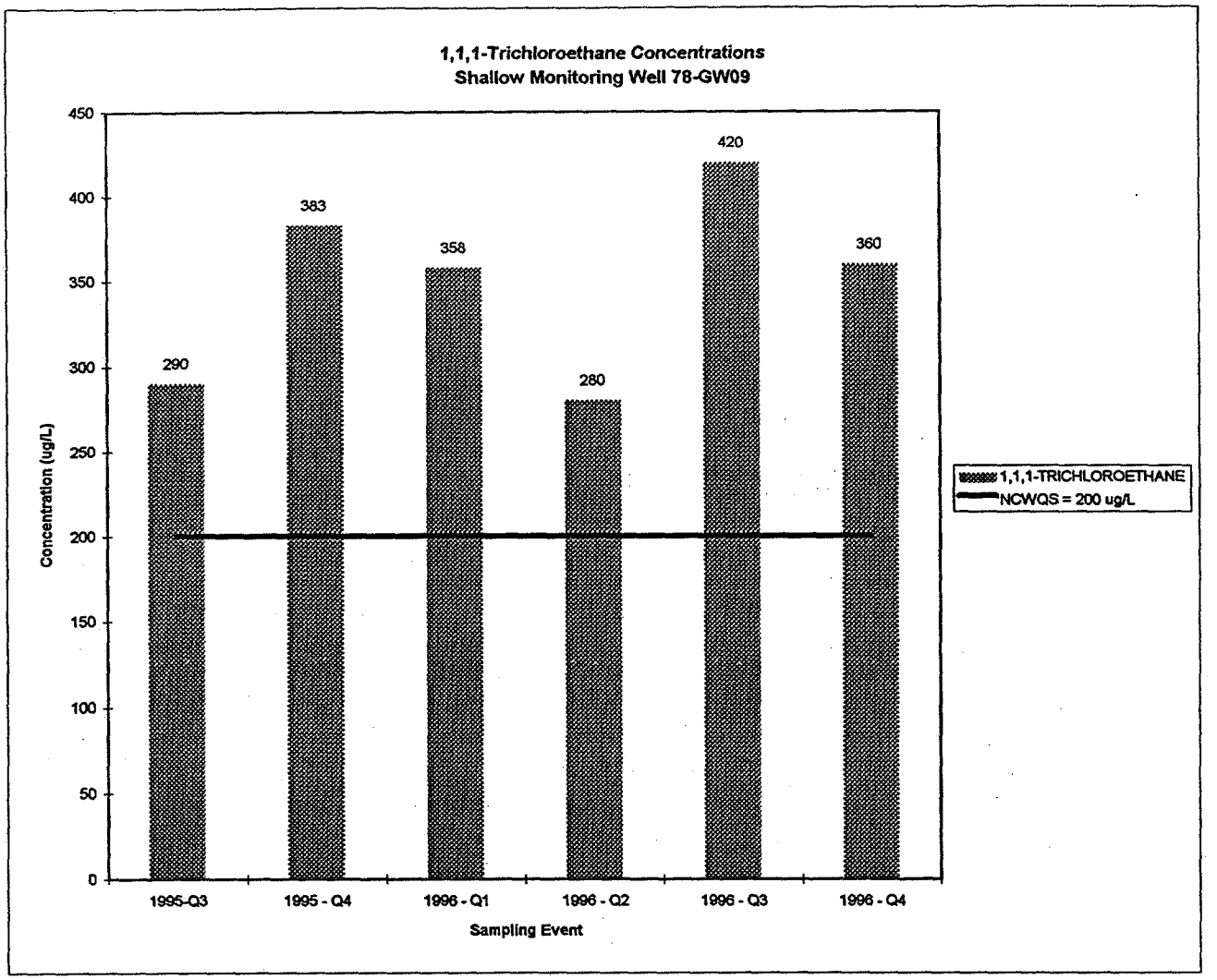
Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Notes:
Federal Maximum Contaminant Level (MCL) = 7 micrograms per liter (ug/L)
North Carolina Water Quality Standard (NCWQS) = 7 micrograms per liter (ug/L)
ND = Not Detected

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
1,1-DICHLOROETHENE	88	111	5/6	5/6

FIGURE 2-4

1,1,1-TRICHLOROETHANE RESULTS FROM 78-GW09
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA



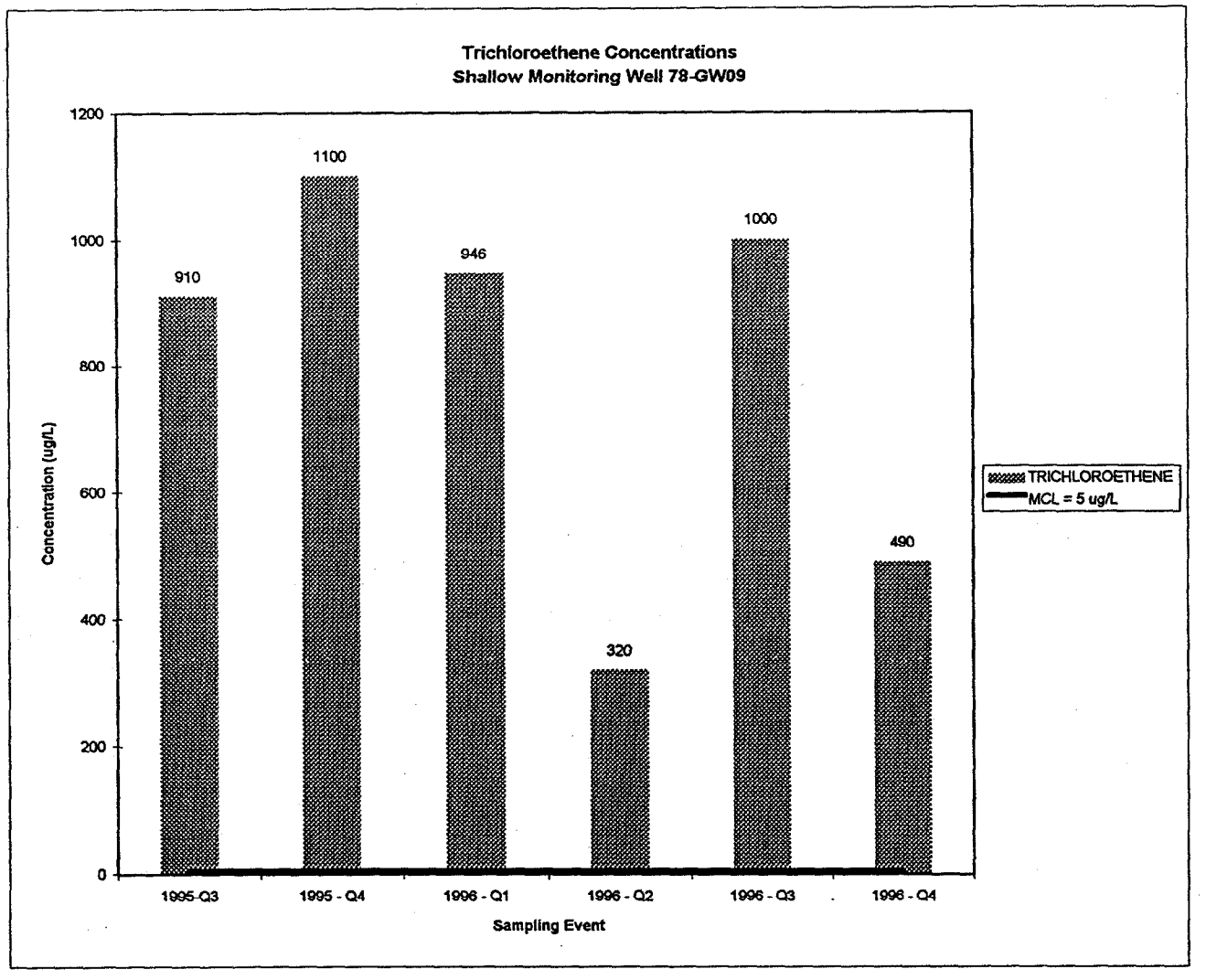
Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Notes:
Federal Maximum Contaminant Level (MCL) = 200 micrograms per liter (ug/L)
North Carolina Water Quality Standard (NCWQS) = 200 micrograms per liter (ug/L)

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
1,1,1-TRICHLOROETHANE	359	349	6/6	6/6

FIGURE 2-5

TRICHLOROETHENE RESULTS FROM 78-GW09
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA



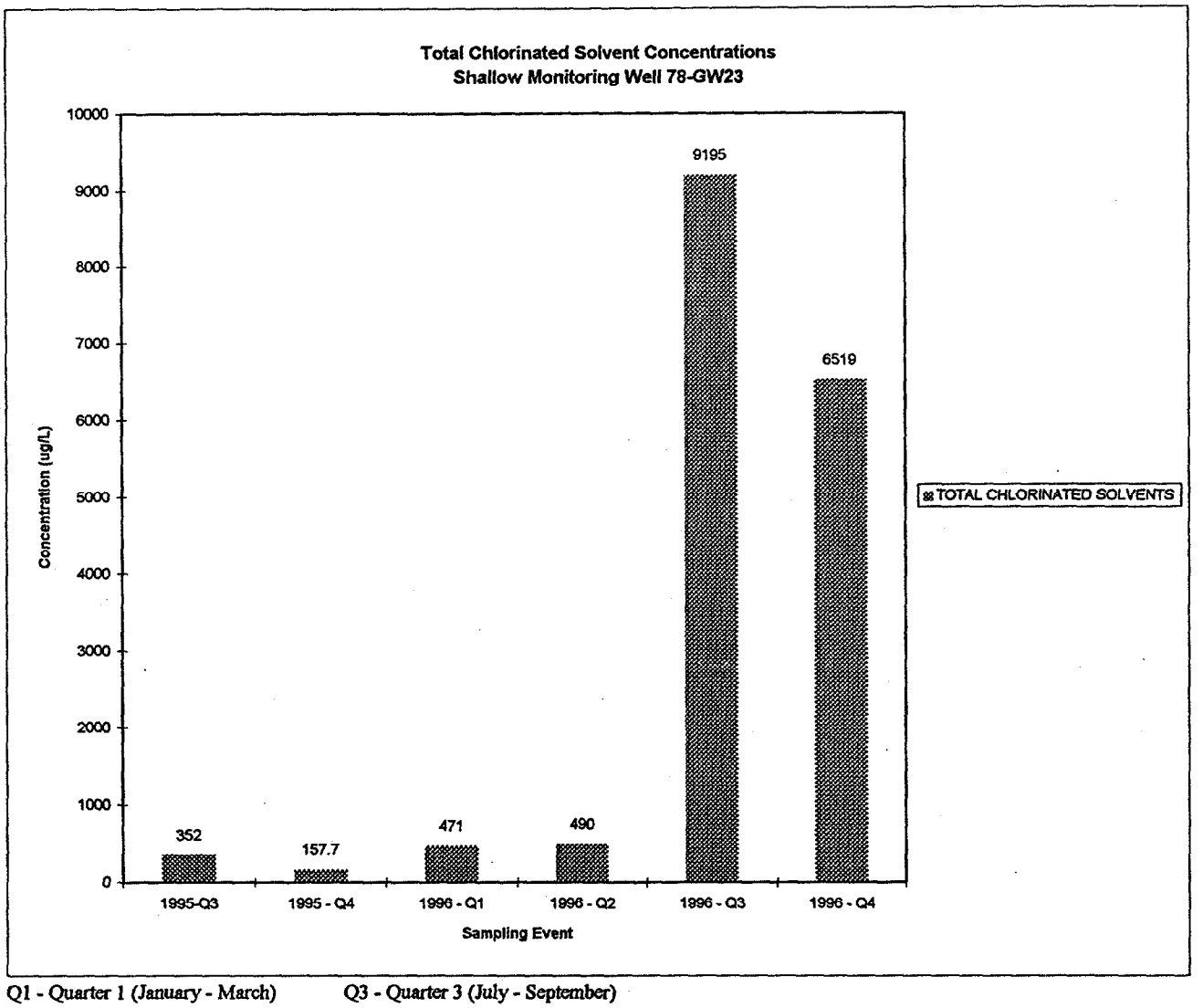
Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Notes:
Federal Maximum Contaminant Level (MCL) = 5 micrograms per liter (ug/L)
There is no North Carolina Water Quality Standard (NCWQS)

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
TRICHLOROETHENE	794	928	6/6	6/6

FIGURE 2-6

TOTAL CHLORINATED SOLVENT RESULTS FROM 78-GW23
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA

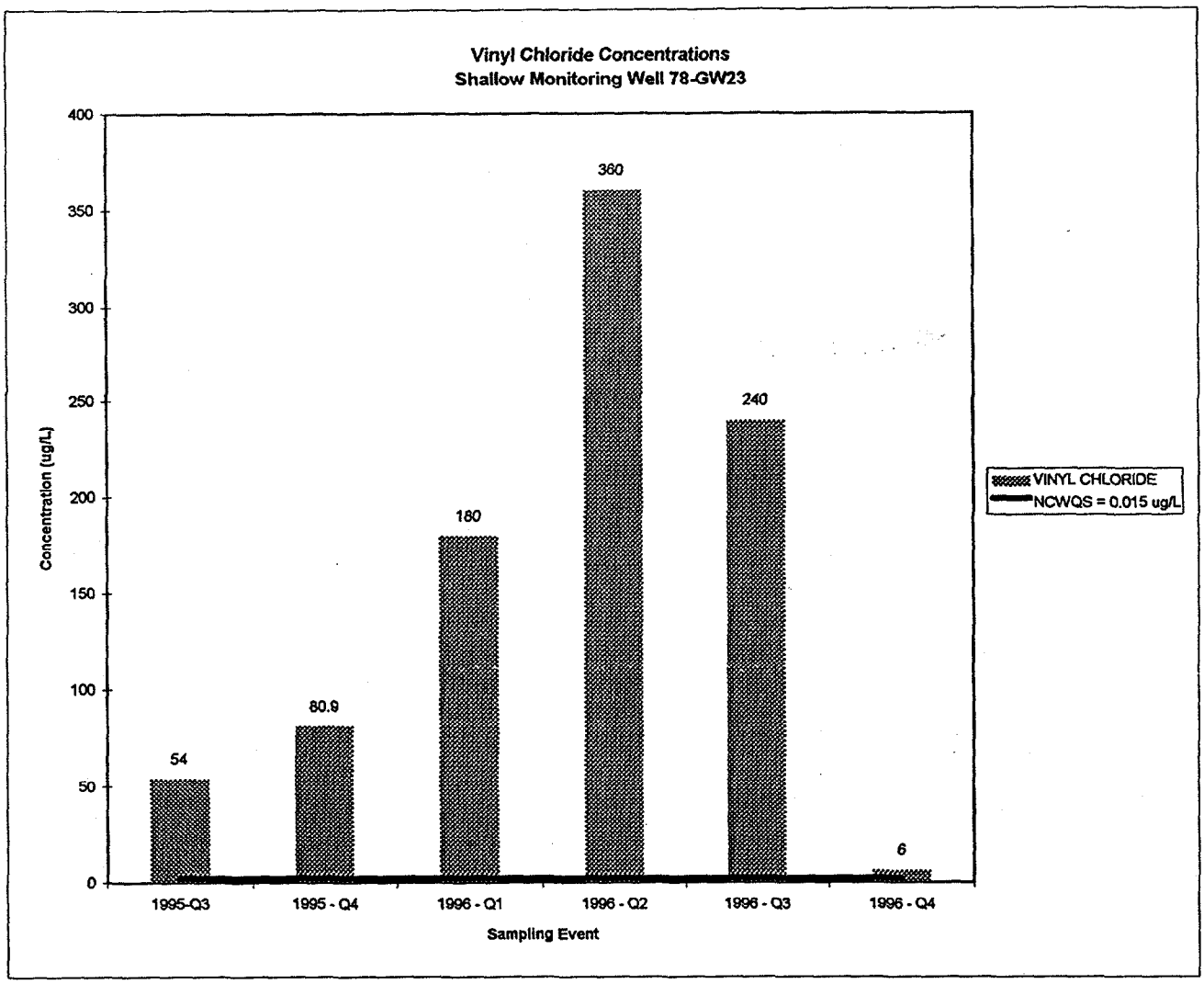


Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
TOTAL CHLORINATED SOLVENTS	2864	481	6/6	N/A

FIGURE 2-7

VINYL CHLORIDE RESULTS FROM 78-GW23
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA



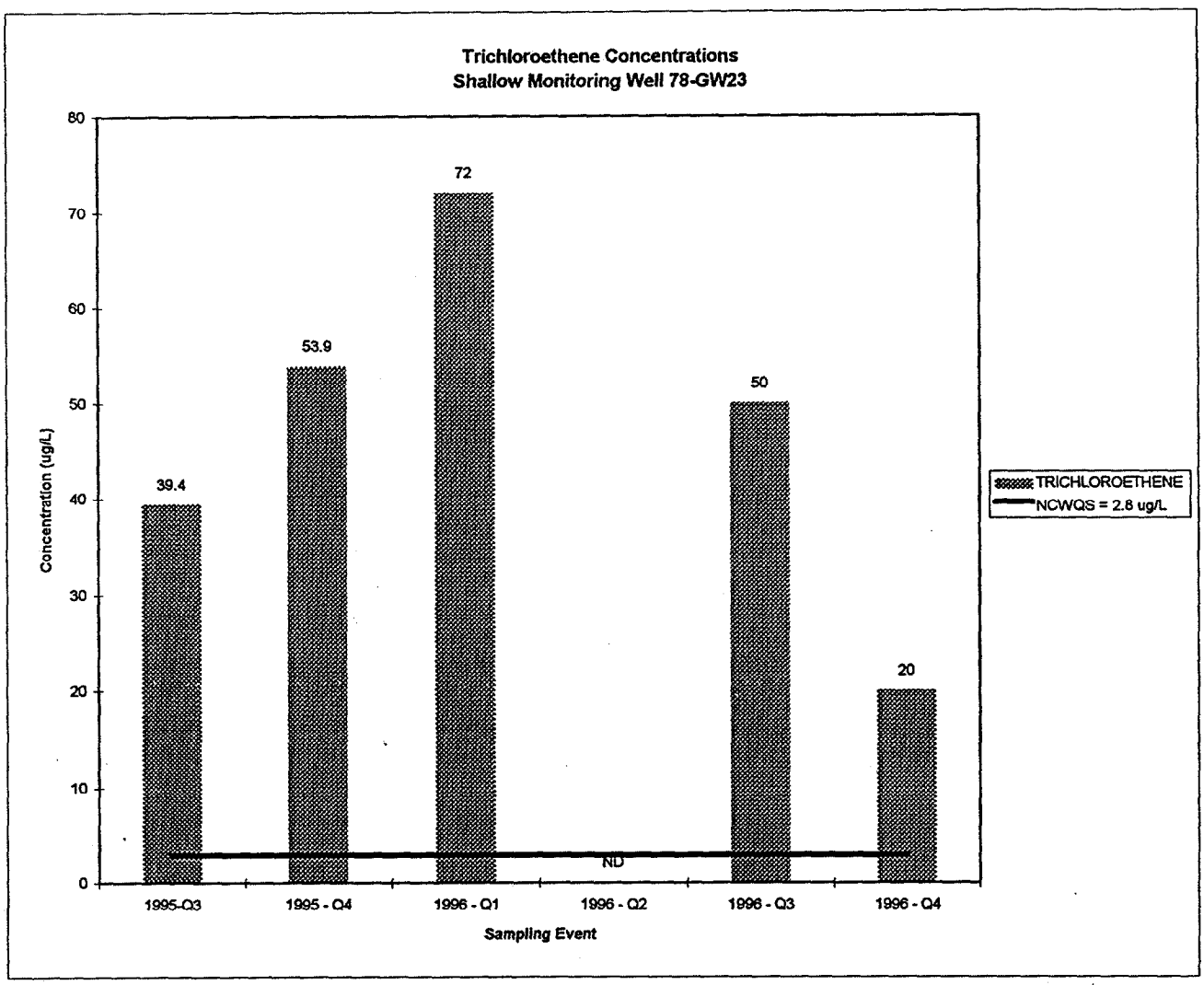
Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Notes:
Federal Maximum Contaminant Level (MCL) = 2 micrograms per liter (ug/L)
North Carolina Water Quality Standard (NCWQS) = 0.015 micrograms per liter (ug/L)

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
VINYL CHLORIDE	153	130	6/6	6/6

FIGURE 2-8

TRICHLOROETHENE RESULTS FROM 78-GW23
OPERABLE UNIT NO. 1 - SITE 78
MONITORING AND O&M SUPPORT, CTO-367
MCB, CAMP LEJEUNE, NORTH CAROLINA



Q1 - Quarter 1 (January - March)
Q2 - Quarter 2 (April - June)
Q3 - Quarter 3 (July - September)
Q4 - Quarter 4 (October - December)

Notes:
Federal Maximum Contaminant Level (MCL) = 5 micrograms per liter (ug/L)
North Carolina Water Quality Standard (NCWQS) = 2.8 micrograms per liter (ug/L)
ND = Not Detected

Contaminant	Mean Detection (ug/L)	Median Detection (ug/L)	Detection Frequency	Detections Above Standards
TRICHLOROETHENE	39	45	5/6	5/6

LEGEND

RW-1 ® OFF-LINE RECOVERY WELL

RW-5 ® ON-LINE RECOVERY WELL

APPROXIMATE DIRECTION OF SURFACE WATER FLOW

APPROXIMATE SITE BOUNDARY

RW-9 ® RW-8 ® RW-7 ® RW-6 ® RW-5 ®

RW-4 ® RW-3 ® RW-2 ® RW-1 ® RW-10 ® RW-11 ®

SOUTHERN TREATMENT PLANT

NORTHERN TREATMENT PLANT

APPROXIMATE SITE BOUNDARY

SITE 78

SITE 24

1 inch = 500 ft.

Baker Environmental, Inc.

FIGURE 3-1
NORTHERN AND SOUTHERN TREAMENT SYSTEMS
OPERABLE UNIT No. 1 – SITE 78
MONITORING AND O&M SUPPORT, CTO-0367
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01778.1701V

ATTACHMENTS

ATTACHMENT A
CHAIN-OF-CUSTODY DOCUMENTATION

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #
Project Number: 62470-367
Project Name: LTM
Field Team: Yankosky / Kovan
SEND RESULTS TO:

Analytical Methods

TCL VOA EPA 8260	TAL Metals SW 6010/7470	Oil & Grease SW9070	TSS/TDS								
Type of Container(s) (3)											
G	P	G	P								
Number of Container(s)											

General Comments

COC # 04101-96D

~~Notes Sample Number~~	1996 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Number of Container(s)												Sample Id ~~Remarks~~
Bottino	10/3	1235	SITE 78	GW		2	1	1	1									78-GW24-96D
Turn	10/3	1845	SITE 78	GW		2	1	1	1									78-GW21-96D
	10/3	1615	SITE 78	GW		2	1	1	1									78-GW24IW-96D
	10/3	1750	SITE 78	GW		2	1	1	1									78-GW25-96D
	10/4	1515	SITE 78	GW		2	1	1	1									78-GW09IW-96D
	10/4	1045	SITE 78	GW		2	1	1	1									78-GW23-96D
	10/4	0800	SITE 78	GW		2	1	1	1									78-GW24DW-96D
	10/4	1640	SITE 78	GW		2	1	1	1									78-GW22A-96D
	10/4	1030	SITE 78	GW		2	1	1	1									~~78-GW~~ 78-EXW02-96D
Blank	10/4	1715	~~SITE 78~~			2												78-TB01-96D

Relinquished By: [signature] Date: 10/4/96 Time: 1730
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: _____ No ☐
Analysis turnaround: Priority ☐ _____ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal Return to Baker ☐ Lab Disposal ☒
Archive until: _____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

data hard copy - 11/1/96

Courier Name: FedEx
Courier Pickup Number: 1369804391
File Name: _____

CHAIN-OF-CUSTODY RECORD

Pg. 1 of 1

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

Lab and BOA #:
Delivery Order #:
Project Number: 6470-367
Project Name: LTM
Field Team: Jackosky / Kirwan
SEND RESULTS TO:

Analytical Methods

TCL VOA EPA 8260	TAL Metals Sw6010/7470	Diss. Gases RSK 175	TSS/TDS

Type of Container(s) (3)

G	P	G	P

Number of Container(s)

2	1	1	1
2	1	1	1

General Comments

COC# OU101-96D

Sample Id. Remarks

~~Sample~~ Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Remarks
Routine	10/4	1700	Site 78	GW		78-GW09-96D
Trip	10/4	1710	Site 78	GW		~~78-GW09DW~~ 78-GW09DW-96D

Relinquished By: Ronald Kirwan Date: 10/4/96 Time: 1730
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: ____ No ☐
Analysis turnaround: Priority ☐ ____ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐
Sample Disposal Return to Baker ☐ Lab Disposal ☒
Archive until: ____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed Ex
Courier Pickup Number: 136930491
File Name:

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #
Project Number: 62470.367
Project Name: LTM
Field Team: Jarkosky / Kerwin
SEND RESULTS TO: Tom Tritsk

Analytical Methods

TAL VOA EPA 8260	TAL Metals SW6010/7470	Oil & Grease SW9070	TSS/TDS								
G	P	G	P								
2	1	1	1								

Type of Container(s) (3)

Number of Container(s)

~~Sample~~ Notes ~~Number~~	1996 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Remarks / Sample Id.
Routine	10/5	1410	Site 78	GW		78-GW19-96D
Trip	10/5	1520	Site 78	GW		78-GW14-96D
	10/5	1610	Site 78	GW		78-GW10-96D
(time)	10/6	~~0805~~ 0805	Site 78	GW		78-EXW01-96D
	10/6	1550	Site 78	GW		78-GW05-96D
	10/6	1745	Site 78	GW		78-GW04-96D
	10/7	0840	Site 78	GW		78-EXW03-96D
	10/7	1100	Site 78	GW		78-EXW09-96D
	10/7	1240	Site 78	GW		78-EXW04-96D
	10/7	1515	Site 78	GW		78-GW15-96D

General Comments

LLC # OW102-96D

Relinquished By: Donald Kerwin Date: 10/8/96 Time: 1700
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: No ☐
Analysis turnaround: Priority ☐ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal Return to Baker ☐ Lab Disposal ☒
Archive until: (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

data hard copy 11/5/96

Courier Name: Fed Ex
Courier Pickup Number: 136980436 5
File Name:

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #
Project Number: 62470.367
Project Name: LTM
Field Team: Yackosky / Krivan
SEND RESULTS TO: Tom Trebilcock

Notes ~~Sample Number~~	1996 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: TCL VOA EPA 8260	TAL Metals SW 6010/7470	Oil & Grease SW 9070	TSS/TDS	Type of Container(s) (3)	Number of Container(s)	~~Remarks~~ Sample Id.
Routine												
Turn	10/7	1700	Site 78	GW		2	1	1	1	A P A P		78-GW17-96D
Blank	10/8	1200		GW		2						78-TB02-96D
	10/8	1145	Site 78	GW		2	1	1	1			78-GW31DW-96D
	10/8	1335	Site 78	GW		2	1	1	1			78-GW08-96D
	10/8	1430	Site 78	GW		2	1	1	1			78-GW11-96D

General Comments
COC # 041102-96D

Relinquished By: [signature] Date: 10/8/96 Time: 1700
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: No ☐
Analysis turnaround: Priority ☐ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐
Sample Disposal Return to Baker ☐ Lab Disposal ☒
Archive until: (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed Ex
Courier Pickup Number: 136904365
File Name:

CHAIN-OF-CUSTODY RECORD

Pg. 1 of 1

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

Lab and BOA #:
Delivery Order #:
Project Number: 10470-367
Project Name: LTM
Field Team: Jackosky / Kirian
SEND RESULTS TO: Tom Trebilcock

Analytical Methods

TCL VOA EPA 8260	TAL Metals SW6010/7470	Oil & Grease SW 9070	TSS/TDS								
Type of Container(s) (3)											
G	P	G	P								
Number of Container(s)											

General Comments

DOC# 041103-96D

Notes ~~Sample~~ Number	1996 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Sample Id ~~Remarks~~
Routine	10/9	0800	Site 78	GW		78-GW101-96D
Turn	10/9	1200	Site 78	GW		78-GW122-96D
	10/9	1005	Site 78	GW		78-GW139-96D
	10/9	1400	Site 78	GW		24-AW108-96D
Time 1435	10/9	~~1435~~	Site 78	GW		24-GW109-96D
	10/9	1620	Site 78	GW		24-GW110-96D
Blank	10/10	1100		~~GW~~		78-TB03-96D

Relinquished By: [signature] Date: 10/10/96 Time: 1200
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: ____ No ☐
Analysis turnaround: Priority ☐ ____ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal Return to Baker ☐ Lab Disposal ☒
Archive until: ____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed Ex
Courier Pickup Number: 136980443 / 136980442
File Name:

data hard copy 11/7/96

ATTACHMENT B
SAMPLE TRACKING FORM

Sample Tracking and Chain-of-Custody Documentation - Sites 24 and 78
Monitoring and O&M Program Support, CTO-367
MCB, Camp Lejeune, North Carolina

MATRIX	DATE SHIPPED	SAMPLE ID	Analysis Requested					Analysis Received					DATE RECEIVED	TURNAROUND TIME	RFW #	COMMENTS
			TCL Volatiles (EPA 8260)	TAL Metals (SW 6010/7470)	Oil & Grease (SW 9070)	Total Dissolved Solids	Total Suspended Solids	TCL Volatiles (EPA 8260)	TAL Metals (SW 6010/7470)	Oil & Grease (SW 9070)	Total Dissolved Solids	Total Suspended Solids				
Groundwater		**COC# OU101-96D**												0		
	10/4/96	78-GW24-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW21-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW24IW-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW25-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW09IW-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW23-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW24DW-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW22A-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-EXW02-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-TB01-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW09-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
	10/4/96	78-GW09DW-96D	X	X	X	X	X	X	X	X	X	X	11/1/96	27	9610G697	
		COC# OU102-96D												0		
	10/8/96	78-GW19-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW14-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW10-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-EXW01-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW05-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW04-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	TCE
	10/8/96	78-EXW03-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-EXW09-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-EXW04-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW15-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	TCE
	10/8/96	78-GW17-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	

TAL Metals (SW 6010/7470) - Antimony, Arsenic, Beryllium, Chromium, Iron, Lead, Nickel, Mercury, Manganese

Sample Tracking and Chain-of-Custody Documentation - Sites 24 and 78
Monitoring and O&M Program Support, CTO-367
MCB, Camp Lejeune, North Carolina

MATRIX	DATE SHIPPED	SAMPLE ID	Analysis Requested					Analysis Received					DATE RECEIVED	TURNAROUND TIME	RFW #	COMMENTS
			TCL Volatiles (EPA 8260)	TAL Metals (SW 6010/7470)	Oil & Grease (SW 9070)	Total Dissolved Solids	Total Suspended Solids	TCL Volatiles (EPA 8260)	TAL Metals (SW 6010/7470)	Oil & Grease (SW 9070)	Total Dissolved Solids	Total Suspended Solids				
Groundwater	10/8/96	78-TB02-96D	X					X					11/5/96	27	9610G760	
	10/8/96	78-GW31DW-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW08-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
	10/8/96	78-GW11-96D	X	X	X	X	X	X	X	X	X	X	11/5/96	27	9610G760	
		COC# OU103-96D												0		
	10/9/96	78-GW01-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/9/96	78-GW22-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/9/96	78-GW39-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/9/96	24-GW08-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/9/96	24-GW09-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/9/96	24-GW10-96D	X	X	X	X	X	X	X	X	X	X	11/7/96	28	9610G814	
	10/10/96	78-TB03-96D	X					X					11/7/96	27	9610G814	
														0		
TOTAL ANALYSES			34	32	32	32	32	34	32	32	32	32				

TAL Metals (SW 6010/7470) - Antimony, Arsenic, Beryllium, Chromium, Iron, Lead, Nickel, Mercury, Manganese

ATTACHMENT C
SAMPLE DESIGNATIONS

SAMPLE DESIGNATIONS

In order to accurately identify and differentiate samples collected during the monitoring program, all samples were designated with a unique identification number. The unique sample number identifies the site, the sample media, the sampling station's number, and the quarter in which the sample was collected. The sample designation format is as follows:

Site Number - Sample Station Identifier - Year and Quarter

An explanation of each identifier is provided below:

Site Number	The investigation was conducted at Sites 24 and 78.
Sample Station Identifier	Each monitoring well has been assigned a unique identification number. The identification number may include the qualifiers "DW" which denotes a deep monitoring well, "IW" which denotes an intermediate monitoring well, "EXW" which denotes a contaminant recovery well, or "GW" which denotes groundwater.
Year	The investigation was conducted during 1996.
Quarter	The investigation was conducted during the fourth quarter. The four quarters of year are identified by the first four letters of the alphabet (i.e., A, B, C and D).

Under this sample designation format the sample number 78-GW09DW-96D refers to:

78-GW09DW-96D	Site 78
78-GW09DW-96D	Groundwater sample
78-GW09DW-96D	Monitoring well No.9
78-GW09DW-96D	Deep monitoring well
78-GW09DW-96D	Year 1996.
78-GW09DW-96D	The third quarter (i.e., July through September)

ATTACHMENT D
ANALYTICAL RESULTS - OCTOBER 1996

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
ORGANICS

SAMPLE ID	24-GW08-96D	24-GW09-96D	24-GW10-96D	78-EXW01-96D	78-EXW02-96D	78-EXW03-96D	78-EXW04-96D
DATE SAMPLED	10/09/96	10/09/96	10/09/96	10/06/96	10/04/96	10/07/96	10/07/96
VOLATILES (ug/L)							
CHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	0.9	0.9	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
2-BUTANONE	2 U	2 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	2 U	2 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U
2-HEXANONE	2 U	2 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
ORGANICS

SAMPLE ID	78-EXW09-96D	78-GW01-96D	78-GW04-96D	78-GW05-96D	78-GW08-96D	78-GW09-96D	78-GW09DW-96D
DATE SAMPLED	10/07/96	10/09/96	10/06/96	10/06/96	10/08/96	10/04/96	10/04/96
VOLATILES (ug/L)							
CHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	36	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	45	0.5 U
1,1-DICHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-BUTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	360	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	21	4	0.5 U	0.5 U	490	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	0.5 U	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	5	0.6	0.5 U	0.5 U	170	0.5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
ORGANICS

SAMPLE ID	78-GW09IW-96D	78-GW10-96D	78-GW11-96D	78-GW14-96D	78-GW15-96D	78-GW17-96D	78-GW19-96D
DATE SAMPLED	10/04/96	10/05/96	10/08/96	10/05/96	10/07/96	10/07/96	10/05/96
VOLATILES (ug/L)							
CHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-BUTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.9	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.8
TETRACHLOROETHENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
ORGANICS

SAMPLE ID	78-GW21-96D	78-GW22-96D	78-GW22A-96D	78-GW23-96D	78-GW24-96D	78-GW24DW-96D	78-GW24IW-96D
DATE SAMPLED	10/03/96	10/09/96	10/04/96	10/04/96	10/03/96	10/04/96	10/03/96
VOLATILES (ug/L)							
CHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U	200	6	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U	2	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
METHYLENE CHLORIDE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-BUTANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	8500	0.5 U	16	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U	40	20	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-METHYL-2-PENTANONE	0.5 U	18000	0.5 U	3	0.5 U	0.8	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	2 U	2 U	2 U	2 U	2 U	2 U	2 U
2-HEXANONE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	2000	0.5 U	7	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	10000	0.5 U	51	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U	6200	120	0.5 U	0.5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
ORGANICS

SAMPLE ID	78-GW25-96D	78-GW31DW-96D	78-GW39-96D
DATE SAMPLED	10/03/96	10/08/96	10/09/96
VOLATILES (ug/L)			
CHLOROMETHANE	0.5 U	0.5 U	0.5 U
VINYL CHLORIDE	0.5 U	0.5 U	0.5 U
BROMOMETHANE	0.5 U	0.5 U	0.5 U
CHLOROETHANE	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHENE	0.5 U	0.5 U	0.5 U
ACETONE	2 U	2 U	2 U
CARBON DISULFIDE	2 U	2 U	2 U
METHYLENE CHLORIDE	0.5 U	0.5 U	1
1,2-DICHLOROETHENE (TOTAL)	0.5 U	0.5 U	0.5 U
1,1-DICHLOROETHANE	2 U	2 U	2 U
2-BUTANONE	0.5 U	0.5 U	0.5 U
CHLOROFORM	0.5 U	0.5 U	0.5 U
1,1,1-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U
CARBON TETRACHLORIDE	0.5 U	0.5 U	0.5 U
BENZENE	0.5 U	0.5 U	0.5 U
1,2-DICHLOROETHANE	0.5 U	0.5 U	0.5 U
TRICHLOROETHENE	0.5 U	0.5 U	0.5 U
1,2-DICHLOROPROPANE	0.5 U	0.5 U	0.5 U
BROMODICHLOROMETHANE	0.5 U	0.5 U	0.5 U
CIS-1,3-DICHLOROPROPENE	2 U	2 U	2 U
4-METHYL-2-PENTANONE	0.5 U	0.5 U	0.5 U
TOLUENE	0.5 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.5 U	0.5 U	0.5 U
1,1,2-TRICHLOROETHANE	0.5 U	0.5 U	0.5 U
TETRACHLOROETHENE	2 U	2 U	2 U
2-HEXANONE	0.5 U	0.5 U	0.5 U
DIBROMOCHLOROMETHANE	0.5 U	0.5 U	0.5 U
CHLOROBENZENE	0.5 U	0.5 U	0.5 U
ETHYLBENZENE	0.5 U	0.5 U	0.5 U
XYLENE (TOTAL)	0.5 U	0.5 U	0.5 U
STYRENE	0.5 U	0.5 U	0.5 U
BROMOFORM	0.5 U	0.5 U	0.5 U
1,1,2,2-TETRACHLOROETHANE	0.5 U	0.5 U	0.5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
INORGANICS

SAMPLE ID	24-GW08-96D	24-GW09-96D	24-GW10-96D	78-EXW01-96D	78-EXW02-96D	78-EXW03-96D	78-EXW04-96D
DATE SAMPLED	10/09/96	10/09/96	10/09/96	10/06/96	10/04/96	10/07/96	10/07/96
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.6 U	1.6 U	1.6 U	14.5	3.2	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.54	0.4 U	0.4 U	2.3
CHROMIUM, TOTAL	1.7 U	1.7 U	1.7 U	2.3	1.7 U	1.7 U	4.1
IRON, TOTAL	128	776	61	8410	3170	26100	19000
LEAD, TOTAL	2.4	1.3 U	1.3 U	2.8	4.2	9.9	1.3 U
MANGANESE, TOTAL	2.8	17.8	0.8 U	73.4	29.4	237	240
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	22.6

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
INORGANICS

SAMPLE ID	78-EXW09-96D	78-GW01-96D	78-GW04-96D	78-GW05-96D	78-GW08-96D	78-GW09-96D	78-GW09DW-96D
DATE SAMPLED	10/07/96	10/09/96	10/06/96	10/06/96	10/08/96	10/04/96	10/04/96
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	4.1	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	2	2.6	3.3	1.6 U	1.6 U	1.3 U	1.3 U
BERYLLIUM, TOTAL	0.45	0.4 U	0.55	0.4 U	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	2.4	1.7 U	4.7	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	6260	20400	12300	54.2	63.7	16.4	148
LEAD, TOTAL	1.3 U	1.3 U	3.3	1.7	1.3 U	1.3 U	1.3 U
MANGANESE, TOTAL	47.7	18.9	83.7	59.7	5.7	2.2	1.2
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	6.8	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
INORGANICS

SAMPLE ID	78-GW09IW-96D	78-GW10-96D	78-GW11-96D	78-GW14-96D	78-GW15-96D	78-GW17-96D	78-GW19-96D
DATE SAMPLED	10/04/96	10/05/96	10/08/96	10/05/96	10/07/96	10/07/96	10/05/96
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.49
CHROMIUM, TOTAL	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	563	124	417	3230	43	30.4	4200
LEAD, TOTAL	2.5	4.1	1.3 U	1.3	1.3 U	1.3 U	2.4
MANGANESE, TOTAL	25.2	3.1	2.7	22.3	4.4	1.6	18.3
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
INORGANICS

SAMPLE ID	78-GW21-96D	78-GW22-96D	78-GW22A-96D	78-GW23-96D	78-GW24-96D	78-GW24DW-96D	78-GW24IW-96D
DATE SAMPLED	10/03/96	10/09/96	10/04/96	10/04/96	10/03/96	10/04/96	10/03/96
TOTAL METALS (ug/L)							
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	20.8	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	1.7 U	3.5	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	60.1	10800	429	3710	14600	415	1120
LEAD, TOTAL	1.3 U	53.5	2.2	2.4	1.3 U	1.3 U	1.3 U
MANGANESE, TOTAL	20.5	22.4	24.9	15.7	25.8	34.3	14.1
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U	6.7 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
INORGANICS

SAMPLE ID	78-GW25-96D	78-GW31DW-96D	78-GW39-96D
DATE SAMPLED	10/03/96	10/08/96	10/09/96
TOTAL METALS (ug/L)			
ANTIMONY, TOTAL	2.3 U	2.3 U	2.3 U
ARSENIC, TOTAL	1.3 U	1.6 U	1.6 U
BERYLLIUM, TOTAL	0.4 U	0.4 U	0.4 U
CHROMIUM, TOTAL	1.7 U	2.1	1.7 U
IRON, TOTAL	204	416	15.9
LEAD, TOTAL	3.5	20.8	1.3
MANGANESE, TOTAL	1.2	13.5	8.9
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	6.7 U	6.7 U	6.7 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
O&G AND WET CHEMISTRY

SAMPLE ID	24-GW08-96D	24-GW09-96D	24-GW10-96D	78-EXW01-96D	78-EXW02-96D	78-EXW03-96D	78-EXW04-96D
DATE SAMPLED	10/09/96	10/09/96	10/09/96	10/06/96	10/04/96	10/07/96	10/07/96
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
OIL & GREASE, GRAV.	5.4 U	5.5 U	5.6 U	5.7	5.4 U	5.6 U	5.9 U
WET CHEMISTRY							
TOTAL DISSOLVED SOLIDS	120	88	46	200	270	560	370
TOTAL SUSPENDED SOLIDS	5 U	7	5 U	8	6	34	14

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
O&G AND WET CHEMISTRY

SAMPLE ID	78-EXW09-96D	78-GW01-96D	78-GW04-96D	78-GW05-96D	78-GW08-96D	78-GW09-96D	78-GW09DW-96D
DATE SAMPLED	10/07/96	10/09/96	10/06/96	10/06/96	10/08/96	10/04/96	10/04/96
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
OIL & GREASE, GRAV.	5.2 U	5.2 U	5.6 U	5.3 U	5.4 U	5.2 U	5.2 U
WET CHEMISTRY							
TOTAL DISSOLVED SOLIDS	260	360	210	340	120	290	120
TOTAL SUSPENDED SOLIDS	23	10	46	5 U	5 U	5 U	5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
O&G AND WET CHEMISTRY

SAMPLE ID	78-GW09IW-96D	78-GW10-96D	78-GW11-96D	78-GW14-96D	78-GW15-96D	78-GW17-96D	78-GW19-96D
DATE SAMPLED	10/04/96	10/05/96	10/08/96	10/05/96	10/07/96	10/07/96	10/05/96
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
OIL & GREASE, GRAV.	5.6 U	5.3 U	5.3 U	5.3 U	5.6 U	5.5 U	5.2 U
WET CHEMISTRY							
TOTAL DISSOLVED SOLIDS	330	150	62	120	120	470	130
TOTAL SUSPENDED SOLIDS	5 U	5 U	5 U	5 U	5 U	5 U	5 U

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
O&G AND WET CHEMISTRY

SAMPLE ID	78-GW21-96D	78-GW22-96D	78-GW22A-96D	78-GW23-96D	78-GW24-96D	78-GW24DW-96D	78-GW24IW-96D
DATE SAMPLED	10/03/96	10/09/96	10/04/96	10/04/96	10/03/96	10/04/96	10/03/96
UNITS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
OIL & GREASE, GRAV.	5.3 U	5.6 U	5.4 U	5.4 U	5.3 U	5.3 U	5.8 U
WET CHEMISTRY							
TOTAL DISSOLVED SOLIDS	130	78	390	140	150	200	300
TOTAL SUSPENDED SOLIDS	5 U	120	5 U	9	5 U	5 U	20

GROUNDWATER ANALYTICAL RESULTS
OCTOBER 1996
OPERABLE UNIT NO. 1 - SITES 24 AND 78
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA
O&G AND WET CHEMISTRY

SAMPLE ID	78-GW25-96D	78-GW31DW-96D	78-GW39-96D
DATE SAMPLED	10/03/96	10/08/96	10/09/96
UNITS	MG/L	MG/L	MG/L
OIL & GREASE, GRAV.	5.6 U	5.6 U	5.2 U
WET CHEMISTRY			
TOTAL DISSOLVED SOLIDS	170	72	170
TOTAL SUSPENDED SOLIDS	5 U	5 U	5 U

ATTACHMENT E
MONTHLY REMEDIAL SYSTEM PROGRESS REPORT

OHM Corporation

MONTHLY PROGRESS REPORT
CONTRACT N62470-93-D-3032
DELIVERY ORDER 0118

REMEDIAL SYSTEM OPERATION, REVIEW AND REPAIR
NORTH AND SOUTH TREATMENT PLANTS
OPERABLE UNIT (OU) NO. 1, SITE 78
HADNOT POINT INDUSTRIAL AREA
MCB CAMP LEJEUNE, NORTH CAROLINA

Prepared by:

OHM Remediation Services Corp.
Eastern Region
200 Horizon Center Boulevard
Trenton, New Jersey 08691-1904

James A. Dunn, Jr., P.E.
Project Manager

Approved by:

John P. Franz
Program Manager

December 31, 1996
Delivery Order 0118
OHM Project 18859

TABLE OF CONTENTS

1.0 INTRODUCTION

This Monthly Progress Report has been prepared to summarize the activities performed from December 1, 1996 to December 31, 1996, as well as a summary of the work planned for the month of January 1997 by OHM Remediation Services Corp., (OHM), on Delivery Order 0118 of the Navy-LANTDIV RAC Contract N62470-93-D-3032. This delivery order was signed on May 23, 1996 for a Design Review and Site Visit as the Scope of Work for the North and South Treatment Plants located in the Hadnot Point Industrial Area, Site 78, at Marine Corps Base Camp Lejeune, North Carolina. Subsequent modifications to this delivery order have been issued for the operation, review, maintenance and repair of the plants.

The remediation effort consists of:

1. Operation of the two treatment plants for a period of one year commencing 7/1/96
2. Preparation of plans for the major maintenance event and the engineering review of the treatment trains
3. Performance of a detailed systems evaluation in conjunction with the cleaning and repair of the components of the treatment systems
4. Presentation of findings at a meeting at the base

Such work is specified in the Statement of Work Design Package Section 01010 dated June 20, 1996 and NAVFAC General Paragraphs Section 01010 dated 02/95 and OHM's proposals dated July 1, 1996, July 17, 1996 and July 26, 1996. The total delivery order value to date, including approved modifications is $252,050.26 cost plus $21,554.71 fee. Modification No. 2 was issued during August 1996.

New problem areas and corrective actions taken are identified, and an analysis of project costs and schedule are provided.

2.0 WORK ACCOMPLISHED

During the month of December 1996, OHM has performed the following:

1. Continued the daily operation and maintenance of the south plant. Plant downtime during the month totaled 24 hours attributable primarily to a split in the air line to the wells.
2. Commenced cleaning, repair and review of the systems design of the north plant.
3. Discovered that the incoming power supply to the north plant was 502 volts. Base Maintenance reduced the incoming voltage to acceptable levels.
4. Found an excessive amount of mud in all of the treatment units starting with the oil/water separator and continuing through the plant to the carbon units. Added a piping connection from the building drainage sump to the sludge holding tank to permit initial solids removal via the filter press.
5. Installed a new paddle type flowmeter with a range of 24-416 gallons per minute in a horizontal portion of the effluent discharge line. The existing flowmeter was removed and will be salvaged/resold, if possible.
6. The oil/water separator was cleaned and the media replaced. The replacement media was reconfigured with larger holes while keeping the same 30 micron oil particle adhesion

value. A fixed ladder and platform assembly will be installed to provide safe access to the coalescing media for periodic cleaning.

7. The building drainage sump was thoroughly cleaned.
8. The sludge build-up in the flocculation tank was removed and the tank pressure washed.
9. The sludge holding tank was pressure washed.
10. A core blowdown line and a filtrate blowdown line were added to enhance filter cake quality. All sludges from the cleaning operations were filter pressed. The existing filter cloths were inspected and found to be in good condition.
11. The sludge settling tank was pressure washed.
12. The primary feed pumps were pressure washed to remove calcium build-up. Although successful, the pressure washing removed calcium deposits which had apparently been acting as auxiliary pump seals. The pumps, which demonstrated excessive leaking, were replaced with Gould pumps.
13. The multi-layer sand filters were completely plugged with mud which resulted in a 35-40 psig pressure loss within the units. The media was vacuum removed and the units pressure washed. New media was installed in the units. The automatic backwash control valving was disassembled and cleaned in accordance with the manufacturers recommendations. No local representative/distributor is available for these units.
14. The low profile air stripper was completely disassembled and the components pressure washed (10,000 psi) to remove calcium build-up. New gaskets were installed and the unit re-assembled.
15. The auto-drain system for the air compressor was replaced. The dryer was serviced by the manufacturers representative. A coalescent filter and a particulate filter were added to the air system immediately downstream of the air dryer.
16. The secondary feed pumps were replaced with Goulds pumps.
17. The air blower was raised to prevent intrusion of water from the air stripper sump.
18. The bag filter housings were pressure washed to remove all calcium build-up. The three inch PVC ball valves were replaced with two inch bronze valves for better service life.
19. The upper diffusers in the liquid phase carbon units were totally clogged with calcium and required replacement. The replacement diffusers were manufactured with larger openings. The second carbon unit had an approximate 4" mud deposit on top of the carbon which was vacuum removed. No carbon required replacement in either unit.
20. The backwash tank had accumulated solids and therefore was cleaned.
21. The sand filter backwash pump and the carbon backwash pumps were re-plumbed to permit use of either or both pumps for back washing either unit.
22. The remote notification system will be reprogrammed and reactivated to contact our onsite representative in the event of a plant malfunction.
23. All other PVC ball valves subject to handling raw water prior to the filter press were changed to bronze or steel valves for better service life.

3.0 WORK PLANNED

During the month of January 1997, OHM is scheduled to perform the following:

1. Complete cleaning, repairs and review of system designs of the North plant and commence cleaning, repairs and review of the systems design of the South plant, with only one plant

out of service at a time.

2. Commence preparation of review report for the plants.

4.0 PROBLEMS AND SOLUTIONS

To date, there have been no problem areas on this delivery order.

5.0 COST/SCHEDULE SUMMARY

Cost Summary:

The following is a summary of the costs associated with this delivery order. A detailed performance report is attached.

D.O. ceiling amount (without fee)	$ 252,050.00
Approximate cost through 12/22/96	$ 80,946.00
Approximate cost for December 1996	$ 50,687.00
Remaining funds	$ 171,104.00
Estimated cost to complete	$ 168,900.00
Estimated cost at completion	$ 249,846.00
Physical % complete	31.99%
Financial % complete	32.12%

The estimate at completion has not been decreased due to the uncertainty of the cost of the cleaning and replacement parts operation at the South plant.

Schedule Summary:

Original contract completion date	10/01/96
Current contract completion date	06/30/97
Prior period schedule completion date	07/01/97
Current period schedule completion date	07/01/97

The current schedule is attached.

6.0 NON-COMPLIANCE CHECKOFF LIST

No non-compliance issues have been associated with this delivery order.

7.0 WASTE MATERIALS TRACKING

To date, waste materials generated under this delivery order (filter cake) have been sampled and results of analyses are pending. If results indicate that the filter cake is non-hazardous, plans are to dispose of

this material in the base landfill.

8.0 GOVERNMENT MATERIALS TRACKING

No government owned materials have been utilized on this delivery order.

9.0 MODIFICATION LOG

The current Modification Log is attached.

10.0 WORK DIRECTIVE LOG

Work directives have been issued under this delivery order for parts replacement as they occur. Costs are being absorbed in Modification 2 at this time.

Quarterly Report – October to December 1996
Maintenance of Shallow Aquifer Remedial Systems
Site 78 Hadnot Point MCB Camp Lejeune, North Carolina
Contract N62420-93-D-3032, Delivery Order 0118

	North Plant	*South Plant*
Period of Performance	10/1/96 – 12/2/96	10/1/96 – 12/31/96
Duration	62 days	92 days
Product Recovery		
Previously reported	0	0
Current period	0	0
Total to date	0	0
Treated Groundwater (Note: Flow meters not working entire period.)		
Estimated rate	2.9 gpm	14 gpm
Duration	1,472 hours	2,195.5 hours
Estimated total treated this period	296,496 gallons	1,844,220 gallons

Treatment System Performance

1. Normal maintenance includes bag filter changes twice weekly both plants, oil changes for air compressors, backwashing sand filters and carbon units, solids management both plants and Calsperse changeout both plants.
2. pH of North Plant influent 7.29, South Plant influent 7.44.
3. North Plant was down during December for major maintenance and cleaning. Primary and secondary pumps were replaced. Sand filter media and oil/water separator media were replaced. New flow meter was installed on discharge line.
4. South Plant will be cleaned in January 1997.
5. One north recovery well (RW-11) was inoperable from 10/9/96 to 12/31/96.

Comments and Recommendations

1. The volumes of treated groundwater have been estimated based on previous measured influent flow rates from the wells for each plant.
2. Attached is tabular analytical data for the three sampling events which occurred during the reporting period.
3. Recommendations for design changes and/or system revisions will be made when South Plant cleaning is complete, anticipated in February 1997.

January 14, 1997

Prepared by: James E. Dunn, Jr., P.E. Date
Senior Project Manager

OHM Remediation Services Corp.