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SEMIANNUAL MONITORING REPORT
OPERABLE UNIT NO. 4 – SITES 41 AND 74

FIRST HALF 1997 (JAN – JUN 97)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0367

JUNE 20, 1997

Prepared for:

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PREFACE

The semiannual monitoring reports that are presented herein describe the procedures, analytical findings, and subsequent recommendations of the monitoring program at Operable Unit (OU) No. 4 (Sites 41 and 74), Marine Corps Base (MCB) Camp Lejeune, North Carolina. Figure P-1 depicts the location of OU No 4. The monitoring reports have been prepared by Baker Environmental, Inc. and submitted to the Naval Facilities Engineering Command, Atlantic Division; MCB Camp Lejeune, Environmental Management Department; the United States Environmental Protection Agency - Region IV; and the North Carolina Department of Environment, Health and Natural Resources.

Monitoring program activities at OU No. 4 were implemented in response to the Record of Decision (ROD) document signed by MCB Camp Lejeune on December 5, 1995. The ROD for OU No. 4 stipulates that environmental samples from Sites 41 and 74 be collected semiannually and submitted for specified laboratory analyses. The ROD also indicates that documentation in support of the selected remedy, institutional controls with monitoring, be maintained for periodic regulatory review.

The principal objective of the monitoring program at OU No. 4 is to monitor the potential for human or ecological exposure due to off-site migration of contaminants. The semiannual monitoring reports document the findings and provide interested parties with information required to authorize future decisions regarding OU No. 4. Information presented in the monitoring reports will be used to either extend, modify, or discontinue the monitoring program as necessary.

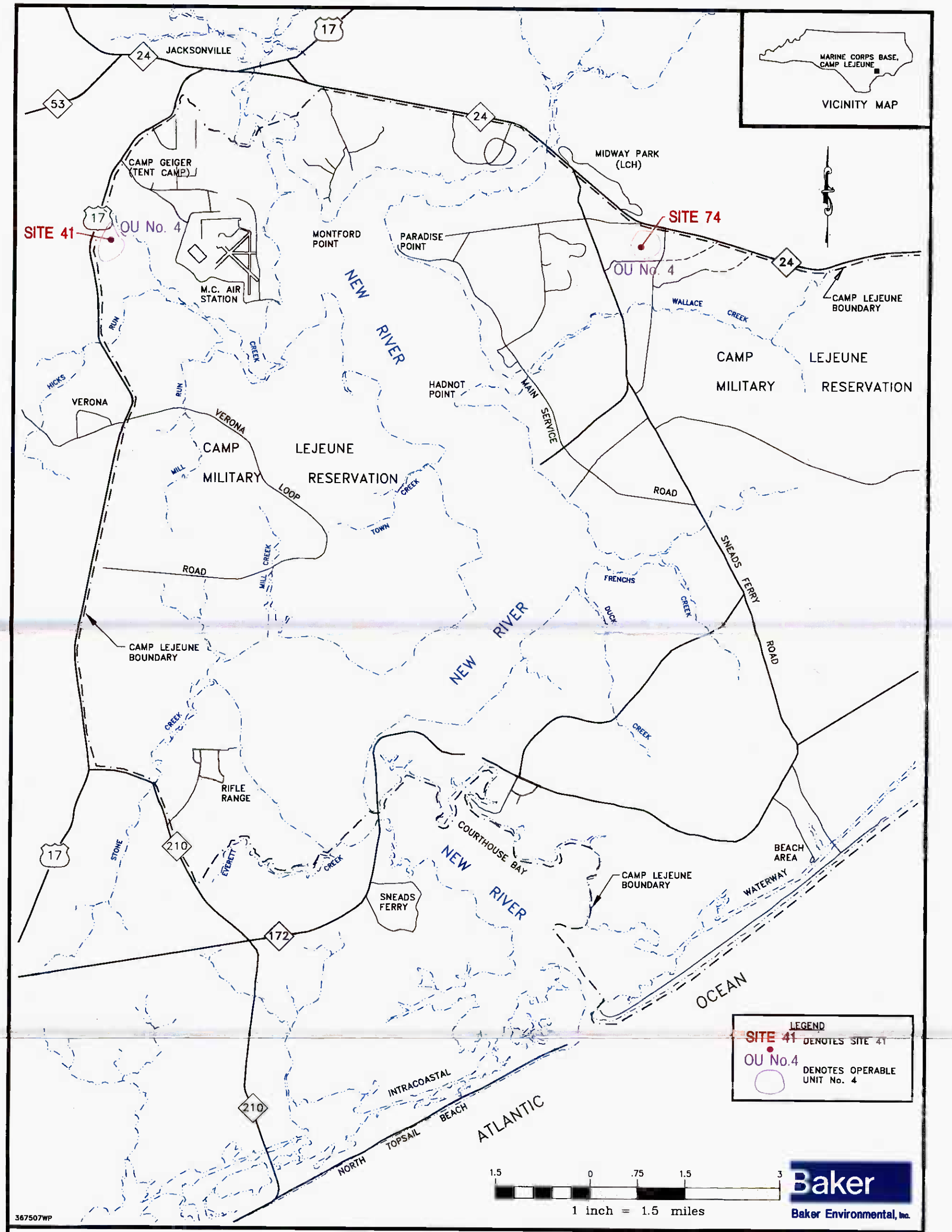

FIGURE P-1
LOCATION MAP
OPERABLE UNIT No. 4 - SITES 41 AND 74
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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LIST OF ACRONYMS

CLP	Contract Laboratory Program
CRDLs	Contract Required Detection Limits
CRQLs	Contract Required Quantitation Limits
DQOs	Data Quality Objectives
MCB	Marine Corps Base
NFESC	Naval Facilities Engineering Service Center
NTUs	Neophelometric Turbidity Units
OU	Operable Unit
ROD	Record of Decision

LIST OF ACRONYMS (Continued)

SOPs	Standard Operating Procedures
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
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

The following semiannual monitoring report presents the sampling procedures and analytical results of monitoring program activities conducted at Operable Unit (OU) No. 4 (Sites 41 and 74), Marine Corps Base (MCB) Camp Lejeune, North Carolina. The report describes sampling activities completed at Sites 41 and 74 during the first quarter of 1997 and provides the findings of that effort. In addition, recommendations concerning the monitoring program are also presented within this report.

1.1 Report Organization

This semiannual monitoring report is comprised of four text sections. Section 1.0 describes the sampling program procedures and methodology. Section 1.0 also provides groundwater elevation data, groundwater flow direction, and field observations. Analytical results and findings are presented in Section 2.0. A brief comparison of previous analytical findings versus the most recent findings is also included within Section 2.0. Section 3.0 presents recommendations of the semiannual monitoring program at Sites 41 and 74. Finally, the references used during preparation of this report are included in Section 4.0. All tables, figures, and attachments are provided after the text portion of this report.

1.2 Semiannual Sampling Program

The semiannual sampling event at OU No. 4 commenced on February 7, 1997 and concluded February 28, 1997. The sampling program at Site 41 consisted of groundwater sample collection and analysis from four shallow monitoring wells and one deep monitoring well. In addition to groundwater samples, surface water and sediment samples were obtained from eight sampling stations located throughout Site 41. Figure 1-1 depicts groundwater, surface water, and sediment sampling locations at Site 41. Groundwater samples from Site 74 were collected from four shallow monitoring wells. Figure 1-2 depicts the sampling locations at Site 74.

Prior to sampling, each existing well included in the monitoring program was redeveloped to remove fine-grained material from the well screens and to reestablish interconnection with the surrounding geologic formation. The monitoring wells were redeveloped using a Waterra™ pump. The pump operates by rapidly raising and lowering dedicated 1/2-inch polyethylene tubing upon which a check valve and surge block were secured. The combined action of pumping and surging groundwater served to dislodge and remove fine particles from the well screen and sand pack. Three to five well volumes were removed during redevelopment, until the extracted groundwater was essentially sediment-free. Measurements of pH, specific conductance, and temperature were recorded periodically to confirm groundwater parameter stabilization. Groundwater measurements compiled during redevelopment are provided in Attachment A.

During the semiannual sampling event, a low flow groundwater purge and sampling technique was employed. The sampling methodology was developed in response to standard operating procedures (SOPs) issued by the U.S. Environmental Protection Agency (USEPA - Region IV, 1996). Prior to groundwater purging, water level and well 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. Tables 1-1 and 1-2 provide summaries of monitoring well construction details for wells included in the monitoring program.

A peristaltic pump, with the intake set two to four feet from the bottom, was used to purge each monitoring well. While purging groundwater, a flow rate of less than 0.25 gallons per minute was maintained. Dedicated sections of polyethylene and silicon pump-head tubing were used during purge and sampling activities at each monitoring well. Groundwater samples were obtained directly from the pump discharge. 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 after each well volume was removed to ensure that groundwater characteristics had stabilized before sampling. These measurements were recorded in a field logbook. A summary of the groundwater field parameters at Sites 41 and 74 are provided in Tables 1-3 and 1-4, respectively.

Groundwater samples were collected to assess whether contamination detected during previous investigative activities has remained in the shallow aquifer and to determine if the contamination had migrated. Based upon previous monitoring results and decision documents, volatile organic compounds (VOCs) and metals were identified as contaminants of concern at Site 41. Metals were identified as the contaminants of concern at Site 74. As a result, groundwater, surface water, and sediment samples obtained at Site 41 were analyzed for target compound list (TCL) volatiles and target analyte list (TAL) metals. Groundwater samples obtained at Site 74 were analyzed for TAL metals. In addition, all groundwater samples obtained from Sites 41 and 74 were submitted to the laboratory for total dissolved solids (TDS) and total suspended solids (TSS). Aqueous samples were preserved at the time of collection with hydrochloric acid for volatile analyses and nitric acid for metal analyses. Tables 1-5 and 1-6 provide a summary of requested analyses and samples submitted during the semiannual monitoring program at Sites 41 and 74, respectively. As provided in Tables 1-5 and 1-6, environmental samples were analyzed using Contract Laboratory Program (CLP) methods and Level IV Data Quality Objectives (DQOs). DQO Level IV is equivalent to the Naval Facilities Engineering Service Center (NFESC) Level D, as specified in the "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Programs" document. Table 1-7 provides the various Contract Required Quantitation Limits (CRQLs) for organic compounds, Contract Required Detection Limits (CRDLs) for inorganics, and comparative water quality standards.

Surface water and sediment samples obtained at Site 41 were collected to assess whether known contaminants had migrated from the former dump. Samples were obtained from Tank Creek, a drainage ditch, and an unnamed tributary to Tank Creek at regularly spaced intervals. One surface water and one sediment sample were collected from each of the eight sampling locations. The eight surface water and sediment sampling locations are depicted in Figure 1-2. At each sampling station, surface water samples were collected by dipping laboratory prepared containers directly into the water. Sediment samples were collected below the water surface, from the creek bed. A sediment corer, equipped with a disposable acetate sleeve, was manually pushed approximately six inches into the creek bed. The sediment was then extruded from the disposable sampling tube and placed in appropriate laboratory containers. Each surface water and sediment sample was analyzed for TAL metals, as provided in Table 1-5.

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 environmental samples, obtained from Site 41, were cross-contaminated with volatile compounds during storage and transportation to the laboratory.

Sample information, including 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 B, accompanied the 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 in Attachment C. The sample designation format used during the monitoring program at Sites 41 and 74 is provided in Attachment D.

1.3 Groundwater Elevation and Flow Direction

The following provides information concerning groundwater flow patterns at Sites 41 and 74. 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 reference elevation. The groundwater elevation data are based upon water levels obtained during the sampling program. For ease of discussion, groundwater elevation and flow direction for the two sites are presented separately.

1.3.1 Site 41

Water level measurements were collected at Site 41 on February 28, 1997. Table 1-8 provides a summary of the measurements and Figure 1-3 depicts the static elevations and approximate flow direction of groundwater at Site 41. In general, shallow groundwater flows radially from the topographically higher area of the site toward the adjacent marsh and creeks. The flow direction appears to mimic surface topography being influenced by natural surface features including intermittent streams and marsh areas.

1.3.2 Site 74

Water level measurements at Site 74 were collected on February 7, 1997. Table 1-9 provides a summary of the measurements and Figure 1-4 depicts the static elevations and approximate flow direction of groundwater at Site 74. Groundwater flow within the surficial aquifer at Site 74 is influenced by the nearby drainages and, to a lesser extent, Wallace Creek to the south. As depicted in Figure 1-4, groundwater at Site 74 flows primarily in an easterly direction.

1.4 Field Observations

The following field observation was noted during the semiannual monitoring activities at Sites 41 and 74. Recommendations regarding the field observations which follow are presented in Section 3.0.

Monitoring wells installed at Sites 41 and 74 during the 1984 Confirmation Study have begun to exhibit signs of deterioration. Turbidity readings, obtained during sampling activities, suggest that soil material from the surrounding formation has begun to infiltrate the well screens and sand packs of older monitoring wells. Less than ideal sampling conditions may result when consistent readings of greater than 50 nephelometric turbidity units (NTUs) in groundwater are obtained. In general,

it is preferable that groundwater samples be collected after turbidity readings stabilize at less than 10 NTUs. The impact of elevated turbidity readings is particularly evident among groundwater samples submitted for metal analyses; naturally-occurring metals that adhere to soil particles are reflected in the groundwater results. Future sampling results will be used to determine if corrective measures will be required to obtain samples with lower levels of turbidity.

In addition to potential subsurface deterioration, many of the monitoring wells installed during the Confirmation Study are in need of above-ground maintenance. Paint on the bollards and protective casings of many wells has begun to peel and rust is present. In addition, many of the locks on a number of wells no longer function properly or do not function at all. The usability and security of the wells should be addressed if they are to remain groundwater sampling points in the future.

2.0 ANALYTICAL RESULTS AND FINDINGS

The section which follows presents analytical results and findings from sampling performed at Sites 41 and 74 during the first quarter of 1997. Groundwater samples from Site 41 were obtained from four shallow monitoring wells and one deep monitoring well. In addition, one surface water sample and one sediment sample were obtained from eight locations within and immediately adjacent to Site 41. The sampling program at Site 74 entailed the collection of groundwater samples from four shallow monitoring wells. All analytical results compiled during the first quarter of 1997 are presented in Attachment E.

As part of a continuing quality assurance and quality control (QA/QC) process, two trip blanks were prepared for volatile organic analyses. The trip blanks were prepared prior to the sampling event and kept with the environmental samples from Site 41 during field collection, shipment, and laboratory analysis. As provided in Table 2-1, there were no detections of any organic compounds among the trip blank samples.

2.1 Site 41

The following section presents analytical results and findings from the monitoring program conducted at Site 41 during the first quarter of 1997. Groundwater samples were obtained from five monitoring wells located throughout the study area. In addition to groundwater samples, eight surface water and eight sediment samples were also collected at Site 41. For ease of review, analytical results and findings from each media are presented separately within the subsections which follow.

2.1.1 Groundwater Analytical Results

Groundwater conditions within the surficial aquifer were evaluated at Site 41 through collection and analysis of samples from four shallow monitoring wells (refer to Figure 1-1). An additional sample was also obtained from the deeper Castle Hayne Aquifer. Each groundwater sample collected at Site 41 was analyzed for TCL volatile organic contaminants (VOCs), TAL total metals, TDS, and TSS (refer to Table 1-5). A summary of groundwater analytical results is provided in Table 2-2. A positive detection summary of all groundwater results is provided in Table 2-3.

Two VOCs were detected among the five groundwater samples collected at Site 41. Benzene and chlorobenzene were detected in the sample obtained from shallow monitoring well 41-GW11 at estimated concentrations of 4 micrograms per liter (µg/L) and 3 µg/L, respectively. The benzene detection of 3 µg/L slightly exceeded the applicable North Carolina Water Quality Standard (NCWQS) of 1 µg/L, but did not exceed the federal maximum contaminant level (MCL) for drinking water of 5 µg/L. The chlorobenzene detection of 3 µg/L did not exceed either the NCWQS (50 µg/L) or the MCL (100 µg/L) screening standards. Figure 2-1 depicts the location and concentration of the benzene and chlorobenzene detections.

The positive detections of both benzene and chlorobenzene were limited to one shallow groundwater sample obtained from the central portion of the study area. As depicted in Figure 2-1, monitoring well 41-GW11 is located within 50 feet of deep monitoring well 41-GW11DW. The lack of positive VOC detections in the sample obtained from deep monitoring well 41-GW11DW suggests that volatile contaminants have not migrated from the surficial aquifer to the deeper Castle Hayne Aquifer. In addition, the lack of positive VOC detections in other samples obtained from the

shallow aquifer suggests that VOCs in groundwater may be limited to an area surrounding monitoring well 41-GW11.

Positive detections of VOCs among groundwater samples obtained at Site 41 have been documented in the past. Previous sampling results from shallow monitoring well 41-GW11 have also exhibited benzene and chlorobenzene at concentrations similar to those presented here (i.e., less than 5 µg/L). Future sampling will be employed to determine the nature and persistence of the observed VOCs at Site 41.

As presented in Table 2-2, aluminum, iron, lead, and manganese were the only total metals detected at concentrations exceeding either the applicable NCWQS or MCL among the five groundwater samples submitted for analyses from Site 41. Aluminum was detected in each of the five groundwater samples at concentrations ranging from 74 µg/L to 1390 µg/L; each of which exceed the 50 µg/L secondary MCL. Lead was detected among four of the five groundwater samples obtained from Site 41. Only the lead concentration of 20.9 µg/L in the sample obtained from monitoring well 41-GW11 exceeded the NCWQS of 15 µg/L. Iron and manganese were detected in each of the five groundwater samples obtained from Site 41. Iron concentrations ranged from 258 µg/L to 32700 µg/L; four of the five positive iron detections exceeded the 300 µg/L NCWQS. Four of the five manganese detections exceeded the NCWQS of 50 µg/L. Manganese concentrations among the groundwater samples obtained from Site 41 ranged from 6.3 µg/L to 376 µg/L.

Previous sampling events, completed prior to the initiation of the monitoring program, have documented similar findings. Metals have been detected consistently among groundwater samples obtained from Site 41. Specifically, iron and manganese have been detected above applicable standards among previous groundwater samples.

Soils found within the coastal plain of North Carolina are naturally rich in metals, particularly iron and manganese. The observed concentrations of iron and manganese, and to a lesser extent aluminum and lead, in groundwater may be 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 aquifer. The presence of metals in groundwater is often the result of solids or colloids in aqueous samples. The metals detected among groundwater samples obtained from Site 41 may also be indicative of naturally occurring metals in the presence of acidic soils. Additional sampling will be required to statistically confirm the presence and concentration of various metals in groundwater at Site 41.

2.1.2 Surface Water Analytical Results

Three surface water samples were collected from both Tank Creek and an unnamed tributary to Tank Creek at Site 41 (refer to Figure 1-1). Two additional surface water samples were obtained from two separate drainage ditches that flow into the unnamed tributary. All eight surface water samples were submitted for volatile organic and total metal analyses. No organic compounds were detected among the eight samples submitted for laboratory analysis. Metals, however, were detected in each of the eight surface water samples. Table 2-4 provides a summary of surface water analytical results. A positive detection summary of surface water analytical results is presented in Table 2-5.

Laboratory analyses of the eight surface water samples obtained from Site 41 indicate that 15 of 23 total metals were positively detected. As indicated in Table 2-4, iron, lead, and zinc were the

only metals identified at concentrations in excess of either state or federal comparison criteria. The surface water sample obtained at station 41-TC-SW12 had the only positive zinc detection that exceeded the state comparison criteria. Zinc was detected at a concentration of 99.4 µg/L; the state comparison criteria for zinc is 50 µg/L. Iron was detected in each of the samples obtained at Site 41, ranging in concentrations from 768 µg/L to 3510 µg/L. Four of the eight iron detections exceeded the state comparison level of 1000 µg/L. The two highest concentrations of iron were detected in samples obtained from the two drainage ditches. Locations and concentrations of the four iron detections which exceeded the state comparison criteria are presented in Figure 2-3.

Lead was detected among seven of the eight surface water samples obtained from Site 41. Each of the lead detections slightly exceeded the USEPA Region IV Freshwater Aquatic Life Criteria of 1.32 µg/L. Concentrations of lead in surface water samples obtained at Site 41 ranged from 1.4 µg/L to 2.6 µg/L. No other total metal concentrations among the eight surface water samples exceeded either state standards or federal criteria.

Surface water data has been collected from Site 41 during several events as part of previous investigations at Site 41. The results of the monitoring program are relatively consistent with what has been discovered at the site through these previous studies. However, the previous data includes two detections of chlorobenzene from samples collected from the drainage ditches at Site 41. The concentrations were 4.0 µg/L and 1.0 µg/L. In addition, pesticides were detected in one surface water sample at very low concentrations, lindane at a concentration of 0.02 µg/L and 4,4'-DDT at a concentration of 0.030 µg/L. The latest round of sampling completed during the monitoring program did not identify any organic compounds in the surface water samples.

Metals concentrations in surface water samples remains consistent with little variation between the concentrations detected during previous studies and the latest samples collected as part of the monitoring program. Historical data show that the metals arsenic, iron, and manganese were present at concentrations which exceeded state water quality standards. These metals are commonly detected at concentrations which exceed their related standards.

2.1.3 Sediment Analytical Results

Eight sediment samples were collected in conjunction with surface water samples also obtained from Site 41. Each of the eight sediment samples were submitted for volatile organic and metal analyses. As presented in Table 2-6, one organic compound was detected among the eight sediment samples. The VOC 2-butanone was detected at an estimated concentration of 8 µg/kg in the sample obtained from station 41-TC-SD10. As a common laboratory contaminant, the presence of 2-butanone at the observed concentration is most likely the result of sample preparation or handling. Laboratory analyses of the sediment samples obtained from Tank Creek, an unnamed tributary to Tank Creek, and two separate drainage ditches indicate that 20 of 23 metals were positively detected. As indicated in Table 2-6, none of the metals identified among sediment samples were detected at concentrations in excess of applicable screening values. Aluminum, barium, chromium, iron, lead, manganese, and zinc were detected in each of the eight samples. A positive detection summary of metals in the eight sediment samples is presented in Table 2-7.

Various organic compounds, including volatiles, semivolatiles, and pesticides, have been detected in the sediments during the previous sampling activities at Site 41. In general, the detected organic compounds have exhibited relatively low concentrations. The only organic compound detected during the monitoring program sampling event was 2-butanone, which is most likely related to

laboratory contamination. In general the historical data of the sediment samples show results similar to those identified as part of the monitoring program. The majority of both the historical data and the monitoring program data include detections involving metals. The historical data exhibits results similar to those identified as part of the monitoring program (i.e., common analytes detected at similar concentrations). Further, detected concentrations of metals in the sediment samples are consistent with other samples collected at various sites throughout MCB Camp Lejeune.

2.2 Site 74

The section which follows presents analytical results and findings from the monitoring program conducted during the first quarter of 1997 at Site 74. Groundwater quality was evaluated at Site 74 by sampling four shallow monitoring wells. Each of the four groundwater samples collected at Site 74 were analyzed for TAL total metals, total suspended solids, and total dissolved solids.

Metals were detected in each of the groundwater samples obtained at Site 74. Table 2-8 provides a summary of the groundwater analytical results. A positive detection summary of metals detected among groundwater samples obtained at Site 74 is presented in Table 2-9. Figure 2-4 depicts the locations and groundwater analytical results of total metals that were detected at concentrations in excess of either the NCWQS or MCL.

Aluminum and iron were the only metals detected among the seven groundwater samples at concentrations in excess of either the NCWQS or MCL. Aluminum exceeded the secondary MCL of 50 µg/L in each of the four samples obtained from Site 74 (refer to Figure 2-2). Aluminum concentrations ranged from 228 µg/L in sample 74-GW01 to 2430 µg/L in the sample obtained from 74-GW03A. Iron exceeded the NCWQS and MCL of 300 µg/L in samples obtained from monitoring wells 74-GW03A and 74-GW07. Iron was detected at concentrations of 504 µg/L in 74-GW03A and 1770 µg/L in 74-GW07 .

Concentrations of both aluminum and iron in groundwater samples often exceed established water quality standards; the levels are generally characteristic of natural site conditions at MCB Camp Lejeune. Aluminum and iron were the only total metals identified among groundwater samples at concentrations which exceeded applicable water quality standards. As depicted in Figure 2-4, aluminum was detected at concentrations above the secondary MCL throughout the study area. Several hundred or even several thousand milligrams per liter of aluminum is not unusual for natural groundwater obtained from areas with slightly acidic conditions (USGS, 1992). The observed concentrations of total metals in the groundwater at Site 74 are believed to be the result of natural site conditions and the presence of suspended solids within samples. Although it is possible that buried metal material at the site may contribute to the detection of metals in groundwater, the observed concentrations are believed to be the result of the slightly acidic soils, coupled with the natural presence of metals. These natural conditions are believed to be the primary reason for the observed concentrations of metals in groundwater at Site 74.

Previous sampling events at Site 74, completed prior to initiation of the monitoring program, have documented similar findings as those identified here. The same metals have been detected consistently among groundwater samples obtained at Site 74. Specifically, a review of the historical data indicate that iron, lead, manganese, and selenium have been detected at concentrations which have exceeded applicable standards among groundwater samples . The previous results and findings also indicated that natural site conditions have contributed to the majority of the detected metal concentrations.

3.0 RECOMMENDATIONS

Based upon the observations and findings presented in Sections 1.0 and 2.0 of this semiannual monitoring report, the following recommendations for the monitoring program at OU No. 4 are provided. If non-significant changes are made to a component of the selected remedy described in the Record of Decision [(ROD) (Baker, 1995)], 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.

3.1 Implemented Recommendations

Although no formal recommendations regarding the monitoring program at Sites 41 and 74 have been provided to date, the following action item was initiated with parallel activities being conducted at other sites. The disposition of each recommendation will, in the future, be presented here to update monitoring program information. It is also the intent of this report to provide a thorough listing of recommendations and implemented actions.

3.1.1 Well Security and Aesthetics

A number of monitoring wells at Sites 41 and 74 that were installed during the 1984 Confirmation Study had begun to show signs of deterioration. The bollards and protective casings of the wells had developed peeling paint and rust. In addition, a number of the padlocks used to secure the protective covers were either missing or no longer functioned properly. Both the usability and security of each monitoring well would need to be maintained if the wells were going to remain reliable groundwater sample collection points in the future. As a result, the bollards and protective casings of several wells were painted with a weather and rust resistant paint. In addition, new padlocks that operate with a universal key were installed on each of the monitoring wells at Sites 41 and 74. Figures 3-1 through 3-4 depict the typical monitoring well repairs performed.

3.2 Proposed Recommendations

Based upon the observations and findings presented in Sections 1.0 and 2.0 of this monitoring report, no significant changes to the monitoring program are currently recommended. The lack of metal contamination at Site 74 and the lack of significant VOC contamination at Site 41 suggests that future semiannual monitoring may not be required. The need for additional sampling, particularly at Site 74, may be more accurately and statistically determined after three semiannual events have been completed. If after thorough examination of the resultant analytical data and determination that future risks of exposure are negligible, it may be recommended that sampling program activities be discontinued.

4.0 REFERENCES

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U.S. Geological Survey (USGS). 1992. Study and Interpretation of the Chemical Characteristics of Natural Water. Third Edition. Prepared by John D. Hem for the U.S. Department of the Interior.

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TABLES

TABLE 1-1

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well No.	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)	Sand Pack Interval Depth (feet, bgs)	Bentonite Interval Depth (feet, bgs)	Stick-Up (feet, ags)
41-GW02	NA	NA	NA	NA	NA	NA	NA	NA	NA
41-GW10	1994	13.93	12.1	14.0	13.0	3.0 - 13.0	1.5 - 14.0	0.5 - 1.5	1.8
41-GW11	1994	24.69	21.5	16.0	15.0	5.0 - 15.0	3.0 - 16.0	0.5 - 3.0	3.2
41-GW11DW	1994	23.63	21.5	52.0	50.0	40.0 - 50.0	37.0 52.0	35.0 - 37.0	2.1
41-GW12	1994	8.41	6.4	17.0	16.0	6.0 - 16.0	4.0 - 17.0	2.0 - 4.0	2.0

Notes:

ags = above ground surface
bgs = below ground surface
msl = mean sea level
NA = Information not available

TABLE 1-2

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well No.	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)	Sand Pack Interval Depth (feet, bgs)	Bentonite Interval Depth (feet, bgs)	Stick-Up (feet, ags)
74-GW01	1984	NA	NA	NA	24.5	8.5 - 23.5	NA	NA	NA
74-GW02	1984	NA	NA	NA	26.5	12.5 - 27.5	NA	NA	NA
74-GW03A	1986	NA	NA	NA	26.5	11.5 - 26.5	NA	NA	NA
74-GW07	1994	34.52	32.4	17.0	16.5	6.5 - 16.5	3.5 - 17.0	1.5 - 3.5	2.1

Notes:

ags = above ground surface
bgs = below ground surface
msl = mean sea level
NA = Information not available

TABLE 1-3

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number (Sample Date)	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
41-GW02 (02-27-97)	1055	0.5	2.2	725	20.8	6.51	36.4
	1103	1.0	2.0	700	19.7	6.64	61.3
	1110	1.5	2.5	700	19.6	6.64	45.8
	1115	2.0	2.8	700	19.1	6.55	47.2
	1120	2.5	2.5	700	19.4	6.59	26.2
	1125	3.0	2.5	700	19.8	6.61	11.1
41-GW10 (02-27-97)	0745	0.5	4.7	79	16.5	4.77	39.6
	0750	1.0	4.6	80	17.0	4.81	23.6
	0755	1.5	4.6	84	16.5	4.80	13.6
	0800	2.0	4.5	88	16.0	4.79	9.3
	0805	2.5	4.4	87	15.5	4.79	4.1
	0810	3.0	4.7	88	15.0	4.81	5.5
41-GW11 (02-27-97)	0935	1	2.2	1000	18.0	7.11	10.8
	0942	2	2.2	960	18.0	7.00	8.1
	0949	3	2.2	950	18.0	6.88	4.3
41-GW11DW (02-27-97)	0920	0.5	2.0	1600	20.0	6.61	9.7
	0930	1.0	1.8	1550	20.5	6.66	6.1
	0941	1.5	2.2	1480	20.0	6.68	3.5
	0954	2.0	2.0	1500	20.0	6.68	5.4
	1007	2.5	1.8	1500	20.5	6.69	3.1
	1016	3.0	2.0	1500	20.5	6.67	1.6
41-GW12 (02-27-97)	1157	0.5	2.3	230	21.0	6.21	25.8
	1201	1.0	2.5	230	18.5	6.38	19.1
	1206	1.5	2.5	220	18.5	6.40	18.7
	1216	2.0	2.5	230	19.0	6.38	17.3
	1220	2.5	2.3	225	18.0	6.37	13.8
	1225	3.0	2.2	220	18.5	6.42	22.9

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

TABLE 1-4

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number (Sample Date)	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
74-GW01 (02-07-97)	0904	0.5	3.8	58	15.0	4.37	13.4
	0910	1.0	4.4	53	14.5	4.45	5.7
	0915	1.5	4.2	50	14.5	4.44	3.1
	0920	2.0	4.0	50	14.0	4.42	2.2
	0925	2.5	4.1	51	14.0	4.50	1.9
	0930	3.0	4.2	50	14.0	4.57	1.3
74-GW02 (02-07-97)	1112	0.5	4.3	79	15.0	4.14	1.2
	1119	1.0	4.2	79	15.0	4.23	0.8
	1126	1.5	4.0	79	14.5	4.34	0.6
	1132	2.0	4.4	79	14.5	4.60	0.9
	1139	2.5	4.5	79	15.0	4.66	0.5
	1146	3.0	4.4	77	15.0	4.66	0.6
74-GW03A (02-07-97)	0740	0.5	2.5	65	12.0	4.29	172.0
	0748	1.0	2.0	60	15.0	4.35	153.0
	0756	1.5	2.3	59	14.0	4.35	177.0
	0804	2.0	2.4	59	14.5	4.36	109.0
	0812	2.5	2.4	60	14.5	4.36	49.1
	0820	3.0	2.2	60	15.0	4.37	28.9
74-GW07 (02-07-97)	1008	0.5	1.8	62	14.0	3.97	13.7
	1014	1.0	1.6	65	13.5	3.93	9.8
	1020	1.5	1.6	68	14.0	4.16	7.3
	1026	2.0	1.5	65	14.5	4.34	2.0
	1031	2.5	1.5	65	14.5	4.40	1.9
	1037	3.0	1.5	68	14.5	4.46	1.3

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

TABLE 1-5

SAMPLING SUMMARY - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Location	Media	CLP Volatiles[1]	TAL Metals[2]	Total Dissolved Solids[3]	Total Suspended Solids[3]	Laboratory Sample Identification
41-GW02	Groundwater	X	X	X	X	41-GW02-97A
41-GW10	Groundwater	X	X	X	X	41-GW10-97A
41-GW11	Groundwater	X	X	X	X	41-GW11-97A
41-GW11-DW	Groundwater	X	X	X	X	41-GW11DW-97A
41-GW12	Groundwater	X	X	X	X	41-GW12-97A
41-UT-SW01	Surface Water	X	X			41-UT-SW01-97A
41-UT-SW02	Surface Water	X	X			41-UT-SW02-97A
41-UT-SW03	Surface Water	X	X			41-UT-SW03-97A
41-TC-SW10	Surface Water	X	X			41-TC-SW10-97A
41-TC-SW11	Surface Water	X	X			41-TC-SW11-97A
41-TC-SW12	Surface Water	X	X			41-TC-SW12-97A
41-DD-SW01	Surface Water	X	X			41-DD-SW01-97A
41-DD-SW02	Surface Water	X	X			41-DD-SW02-97A
41-UT-SD01	Sediment	X	X			41-UT-SD01-97A
41-UT-SD02	Sediment	X	X			41-UT-SD02-97A
41-UT-SD03	Sediment	X	X			41-UT-SD03-97A
41-TC-SD10	Sediment	X	X			41-TC-SD10-97A
41-TC-SD11	Sediment	X	X			41-TC-SD11-97A
41-TC-SD12	Sediment	X	X			41-TC-SD12-97A
41-DD-SD01	Sediment	X	X			41-DD-SD01-97A
41-DD-SD02	Sediment	X	X			41-DD-SD02-97A

Notes:

(1) Target Compound List Volatiles by U.S. Environmental Protection Agency, Contract laboratory Program, Statement of Work, Document Number OLM01.8.

(2) Target Analyte List Metals by U.S. Environmental Protectoin Agency, Contract Laboratory Protocol, Statement of Work, Document Number ILM03.0.

(3) Total Suspended and Dissolved Solids by Solid Waste Method 160.1 and 160.2.

X = Requested analysis

TABLE 1-6

SAMPLING SUMMARY - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Location	Media	TAL Metals[1]	Total Dissolved Solids[2]	Total Suspended Solids[2]	Laboratory Sample Identification
74-GW01	Groundwater	X	X	X	74-GW01-97A
74-GW02	Groundwater	X	X	X	74-GW02-97A
74-GW03A	Groundwater	X	X	X	74-GW03A-97A
74-GW07	Groundwater	X	X	X	74-GW07-97A

Notes:

(1) Target Analyte List Metals by U.S. Environmental Protectoin Agency, Contract Laboratory Protocol, Statement of Work, Document Number ILM03.0.

(2) Total Suspended and Dissolved Solids by Solid Waste Method 160.1 and 160.2.

X = Requested analysis

TABLE 1-7

AQUEOUS DETECTION AND QUANTITATION LIMITS - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITES 41 AND 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	CRDL or CRQL	NCWQS	MCL
Volatile Organics (µg/L):				
Chloromethane	OLM01.8	10	NA	NA
Vinyl Chloride	OLM01.8	10(1)	0.015	2
Bromomethane	OLM01.8	10	NA	NA
Chloroethane	OLM01.8	10	NA	NA
1,1-dichloroethene	OLM01.8	10(1)	7	7
Acetone	OLM01.8	10	700	NA
Carbon Disulfide	OLM01.8	10	700	NA
Methylene Chloride	OLM01.8	10(1)	5	5
1,2-dichloroethene (Total)	OLM01.8	10	70	70
1,1-dichloroethane	OLM01.8	10	700	NA
2-butanone	OLM01.8	10	NA	NA
Chloroform	OLM01.8	10(1)	0.19	100
1,1,1-trichloroethane	OLM01.8	10	200	200
Carbon Tetrachloride	OLM01.8	10(1)	0.3	5
Benzene	OLM01.8	10(1)	1	5
1,2-dichloroethane	OLM01.8	10(1)	0.38	5
Trichloroethene	OLM01.8	10(1)	NA	5
1,2-dichloropropane	OLM01.8	10(1)	0.56	5
Bromodichloromethane	OLM01.8	10(1)	0.6	100
Cis-1,3-dichloropropene	OLM01.8	10	NA	NA
4-methyl-2-pentanone	OLM01.8	10	NA	NA
Toluene	OLM01.8	10	1000	1000
Trans-1,3-dichloropropene	OLM01.8	10(1)	0.2	NA
1,1,2-trichloroethane	OLM01.8	10(1)	NA	5
Tetrachloroethene	OLM01.8	10(1)	0.7	5
2-hexanone	OLM01.8	10	NA	NA
Dibromochloromethane	OLM01.8	10	NA	NA
Chlorobenzene	OLM01.8	10	50	100
Ethylbenzene	OLM01.8	10	29	700
Xylene, Total	OLM01.8	10	530	10000
Styrene	OLM01.8	10	100	100
Bromoform	OLM01.8	10(1)	0.19	100
1,1,2,2-tetrachloroethane	OLM01.8	10	NA	NA

TABLE 1-7 (Continued)

AQUEOUS DETECTION AND QUANTITATION LIMITS - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITES 41 AND 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	CRDL or CRQL	NCWQS	MCL
Metals (µg/L):				
Aluminum	ILM03.0	100	NA	NA
Antimony	ILM03.0	60[1]	6	NA
Arsenic	ILM03.0	10	50	50
Barium	ILM03.0	200	2000	2000
Beryllium	ILM03.0	5[1]	4	NA
Cadmium	ILM03.0	5	5	5
Calcium	ILM03.0	5000	NA	NA
Chromium	ILM03.0	10	100	50
Cobalt	ILM03.0	50	NA	NA
Copper	ILM03.0	25	1300	1000
Iron	ILM03.0	100	NA	300
Lead	ILM03.0	3	15	15
Magnesium	ILM03.0	5000	NA	NA
Manganese	ILM03.0	15	NA	50
Mercury	ILM03.0	0.2	2	1.1
Nickel	ILM03.0	40	100	100
Potassium	ILM03.0	5000	NA	NA
Selenium	ILM03.0	5	50	50
Silver	ILM03.0	10	NA	18
Sodium	ILM03.0	5000	NA	NA
Thallium	ILM03.0	10[1]	2	NA
Vanadium	ILM03.0	50	NA	NA
Zinc	ILM03.0	20	NA	2100
Wet Chemistry (mg/L):				
Total Dissolved Solids	160.1	10	500	50
Total Suspended Solids	160.2	5	NA	NA

Notes:

[1] Limit greater than North Carolina Water Quality Standard or Federal Maximum Contaminant Level

CRDL = Contract Required Detection Limit
CRQL = Contract Required Quantitation Limit
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.)
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 1-8

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	SWL (02/28/97)	SWE (02/28/97)
41-GW01	22.60	6.57	16.03
41-GW02	14.63	3.81	10.82
41-GW03	19.23	9.42	9.81
41-GW04	11.99	5.64	6.35
41-GW07	22.73	8.25	14.48
41-GW08	19.48	7.03	12.45
41-GW09	25.98	8.22	17.76
41-GW10	13.93	4.45	9.48
41-GW11	24.69	9.07	15.62
41-GW11DW	23.63	11.83	11.80
41-GW12	8.41	3.51	4.90

Notes:

[1] Top of well casing expressed in feet above mean sea level

SWL = Static water level taken from top of well casing
SWE = Static water elevation expressed in feet above mean sea level

TABLE 1-9

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	SWL (02-07-97)	SWE (02-07-97)
74-GW01	35.88	9.37	26.51
74-GW02	35.23	10.43	24.80
74-GW03A	36.14	3.97	32.17
74-GW04	35.37	5.76	29.61
74-GW05	34.30	3.17	31.13
74-GW06	33.12	12.69	20.43
78-GW07	34.52	3.30	21.22
74-GW08	30.55	11.07	19.48

Notes:

[1] Top of well casing expressed in feet above mean sea level

SWL = Static water level taken from top of well casing
SWE = Static water elevation expressed in feet above mean sea level

TABLE 2-1

TRIP BLANK ANALYTICAL RESULTS
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	41-TB01-97A	41-TB02-97A
DATE SAMPLED	02/21/97	02/27/97
UNITS	UG/L	UG/L
VOLATILES		
CHLOROMETHANE	10 U	10 U
BROMOMETHANE	10 U	10 U
VINYL CHLORIDE	10 U	10 U
CHLOROETHANE	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U
ACETONE	10 U	10 U
CARBON DISULFIDE	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U
CHLOROFORM	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U
2-BUTANONE	10 U	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U
TRICHLOROETHENE	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U
BENZENE	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U
BROMOFORM	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U
2-HEXANONE	10 U	10 U
TETRACHLOROETHENE	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U
TOLUENE	10 U	10 U
CHLOROBENZENE	10 U	10 U
ETHYLBENZENE	10 U	10 U
STYRENE	10 U	10 U
XYLENE (TOTAL)	10 U	10 U

U = Not detected
ug/L = Micrograms per liter

TABLE 2-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Contaminants	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above	
		NCWQS	MCL	Min.	Max.			NCWQS	MCL
Volatile Organics	Benzene	1	5	4 J	4 J	41-GW11	1/5	1	0
	Chlorobenzene	50.0	100	3 J	3 J	41-GW11	1/5	0	0
Total Metals	Aluminum	NE	50	74	1390	41-GW10	5/5	NA	5
	Arsenic	50	50	3.2	3.3	41-GW02	2/5	0	0
	Barium	2000	2000	19.5	511	41-GW11	5/5	0	0
	Chromium	50	100	0.3	1	41-GW10	2/5	0	0
	Cobalt	NE	NE	0.4	13.6	41-GW12	4/5	NA	NA
	Iron	300	300	258	32700	41-GW11	5/5	4	4
	Lead	15	15	1.5	20.9	41-GW11	4/5	1	1
	Manganese	50	50	6.3	376	41-GW02	5/5	4	4
	Nickel	100	100	1.4	8.1	41-GW11	5/5	0	0
	Zinc	2100	NE	3.5	12.2	41-GW12	5/5	0	NA
Wet Chemistry	Total Dissolved Solids	500	NE	72	1100	41-GW11DW	5/5	3	NA
	Total Suspended Solids	NE	NE	6	54.0	41-GW02	4/5	NA	NA

Notes:

- Organic and Metal concentrations presented in micrograms per liter (µg/L) or parts per billion.
- Wet chemistry concentrations presented in milligrams per liter (mg/L) or parts per million.

J - Estimated Value.
NCWQS - North Carolina Water Quality Standards (North Carolina Administrative Code, Title 15A, Subchapter 2L).
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 2-3

POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	41-GW02-97A	41-GW10-97A	41-GW11-97A	41-GW11DW-97A	41-GW12-97A
DATE SAMPLED	02/27/97	02/27/97	02/27/97	02/27/97	02/27/97
VOLATILES (ug/L)					
BENZENE	10 U	10 U	4 J	10 U	10 U
CHLOROBENZENE	10 U	10 U	3 J	10 U	10 U
INORGANICS (ug/L)					
ALUMINUM, TOTAL	205	1390	112	74	88.2
ARSENIC, TOTAL	3.3	1.8 U	3.2	1.8 U	1.8 U
BARIUM, TOTAL	69.3	35.7	511	46	19.5
CALCIUM, TOTAL	118000	5280	82300	203000	42600
CHROMIUM, TOTAL	0.3 U	1	0.3	0.3 U	0.3 U
COBALT, TOTAL	2.6	0.4	0.52	0.3 U	13.6
IRON, TOTAL	27200	258	32700	2810	5400
LEAD, TOTAL	1.3 U	1.7	20.9	2.2	1.5
MAGNESIUM, TOTAL	20900	1210	18800	6430	2510
MANGANESE, TOTAL	376	6.3	162	120	119
NICKEL, TOTAL	1.4	1.7	8.1	5.8	1.5
POTASSIUM, TOTAL	16100	279	28400	2480	761
SODIUM, TOTAL	26600	11200	41400	186000	5940
ZINC, TOTAL	3.5	4.6	7.6	4.7	12.2
WET CHEMISTRY (mg/L)					
TOTAL DISSOLVED SOLIDS	560	72	500	1100	180
TOTAL SUSPENDED SOLIDS	44	6	54	4 U	8

U = Not detected
J = estimated value
ug/L = micrograms per liter
mg/L = milligrams per liter

TABLE 2-4

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Analytes	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above	
		NCWQS	Region IV	Min.	Max.			NCWQS	Region IV
Volatiles	ND						0/8	NA	NA
Total Metals	Aluminum	NE	NE	139	1380	41-UT-SW01	8/8	NA	NA
	Arsenic	50	190	2.4	2.4	41-UT-SW01	1/8	0	0
	Barium	NE	NE	16.3	63	41-DD-SW02	8/8	NA	NA
	Chromium	50	11	0.37	1.80	41-UT-SW01	6/8	0	0
	Cobalt	NE	NE	0.49	0.95	41-DD-SW02	4/8	NA	NA
	Iron	1000	NE	768	3510	41-DD-SW02	8/8	4	NA
	Lead	25	1.32	1.4	2.6	41-UT-SW01	7/8	0	7
	Manganese	NE	NE	12.6	343	41-DD-SW02	8/8	NA	NA
	Nickel	88	88	1.0	2.5	41-DD-SW02	7/8	0	0
	Vanadium	NE	NE	0.53	3.0	41-UT-SW01	3/8	NA	NA
	Zinc	50	59	2.7	99.4	41-TC-SW12	8/8	1	1

Notes:

- Concentrations presented in micrograms per liter (µg/L) or parts per billion.

NA - Not applicable
NCWQS - North Carolina Class C Nutrient Sensitive Water (NSW) Standards (North Carolina Administrative Code, Title 15A, Subchapter 2B)
ND - Not Detected
NE - Not Established
Region IV - U.S. Environmental Protection Agency, Region IV - Freshwater Aquatic Life Criteria [Water Management Division 304(a)].

TABLE 2-5

POSITIVE DETECTIONS IN SURFACE WATER
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	41-DD-SW01-97A	41-DD-SW02-97A	41-TC-SW10-97A	41-TC-SW11-97A	41-TC-SW12-97A	41-UT-SW01-97A	41-UT-SW02-97A	41-UT-SW03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
INORGANICS (ug/L)								
ALUMINUM, TOTAL	262	139	423	372	354	1380	199	189
ARSENIC, TOTAL	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	2.4	1.8 U	1.8 U
BARIUM, TOTAL	37	63	31.2	28.9	29.4	16.3	21.6	20.3
CALCIUM, TOTAL	33400	75700	13500	13100	13200	20900	29300	27900
CHROMIUM, TOTAL	0.3 U	0.3 U	0.66	0.37	0.58	1.8	0.44	0.4
COBALT, TOTAL	0.3 U	0.95	0.7	0.53	0.3 U	0.3 U	0.49	0.3 U
IRON, TOTAL	2390	3510	1050	850	901	1230	834	768
LEAD, TOTAL	2.3	1.4	1.3 U	2.1	2	2.6	1.8	1.7
MAGNESIUM, TOTAL	4230	9750	1530	1480	1500	1270	1920	1840
MANGANESE, TOTAL	36.7	343	26.9	26.7	27.2	12.6	32.3	30.7
NICKEL, TOTAL	0.7 U	2.5	1.7	1.5	1.6	1	1.9	1.7
POTASSIUM, TOTAL	3880	9170	1620	1530	1570	1660	1360	1320
SODIUM, TOTAL	9030	21400	10800	10400	10600	14300	10700	10600
VANADIUM, TOTAL	0.5 U	0.5 U	0.53	0.5 U	0.72	3	0.5 U	0.5 U
ZINC, TOTAL	3.7	2.7	7	7.3	99.4	26.2	10.7	10.4

U = Not detected
ug/L = microgram per liter

TABLE 2-6

SUMMARY OF SEDIMENT ANALYTICAL RESULTS -FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Compounds or Analytes	Comparison Criteria	Comparison Criteria		Location of Maximum Detection	Detection Frequency	Detections Above Comparison Criteria
			Min.	Max.			
Volatiles	2-Butanone	NE	8 J	8 J	41-TC-SD10	1/8	NA
Metals	Antimony	12	0.29	0.56	41-UT-SD02	3/8	0
	Aluminum	NE	267	7550	41-TC-SD10	8/8	NA
	Arsenic	7.24	0.84	0.84	41-TC-SD10	1/8	0
	Barium	NE	1.3	36.4	41-TC-SD10	8/8	NA
	Beryllium	NE	0.04	0.07	41-TC-SD12	3/8	NA
	Cadmium	1.0	0.07	0.12	41-TC-SD12	2/8	0
	Chromium	52.3	0.4	7.5	41-TC-SD10	8/8	0
	Cobalt	NE	0.1	1.0	41-TC-SD10	4/8	NA
	Copper	18.7	0.3	1.3	41-TC-SD10	3/8	0
	Iron	NE	134	1310	41-TC-SD12	8/8	NA
	Lead	30.2	0.62	12.0	41-TC-SD10	8/8	0
	Manganese	NE	0.31	10.3	41-TC-SD10	8/8	NA
	Nickel	15.9	0.19	1.9	41-TC-SD10	3/8	0
	Selenium	NE	0.77	0.77	41-TC-SD10	1/8	NA
	Vanadium	NE	0.2	10.1	41-TC-SD10	7/8	NA
	Zinc	124	0.78	10.9	41-TC-SD12	8/8	0

Notes:

- Volatile Compound concentrations presented in micrograms per kilogram (µg/L) or parts per billion.
- Metal concentrations presented in milligrams per kilogram (mg/kg) or parts per million.

NA - Not applicable
ND - Not Detected
NE - Not Established
Comparison Criteria - U.S. Environmental Protection Agency, Region IV - Adoption of Risk-Based Values for Aquatic Life fro
The National Oceanic and Atmospheric Administration (NOAA).

TABLE 2-7

POSITIVE DETECTIONS IN SEDIMENT
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	41-DD-SD01-97A	41-DD-SD02-97A	41-TC-SD10-97A	41-TC-SD11-97A	41-TC-SD12-97A	41-UT-SD01-97A	41-UT-SD02-97A	41-UT-SD03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
VOLATILES (ug/kg)								
2-BUTANONE	13 U	12 U	8 J	13 U	16 U	13 U	12 U	12 U
INORGANICS(mg/kg)								
ANTIMONY, TOTAL	0.37 U	0.35 U	0.47 U	0.32	0.36 U	0.32 U	0.56	0.29
ALUMINUM, TOTAL	1170	355	7550	440	1010	1760	267	268
ARSENIC, TOTAL	0.42 U	0.39 U	0.84	0.33 U	0.4 U	0.36 U	0.39 U	0.32 U
BARIUM, TOTAL	6.7	2.6	36.4	4.8	10	7.1	1.3	2.5
BERYLLIUM, TOTAL	0.02 U	0.02 U	0.45	0.02 U	0.07	0.04	0.02 U	0.02 U
CADMIUM, TOTAL	0.05 U	0.04 U	0.07	0.04 U	0.12	0.04 U	0.04 U	0.04 U
CALCIUM, TOTAL	712	140	1510	138	617	1500	125	143
CHROMIUM, TOTAL	1.3	0.76	7.5	0.8	1.3	1.7	0.49	0.4
COBALT, TOTAL	0.07 U	0.14	1	0.1	0.41	0.06 U	0.07 U	0.05 U
COPPER, TOTAL	0.16 U	0.15 U	1.3	0.13 U	0.3	0.32	0.15 U	0.13 U
IRON, TOTAL	1100	263	3590	1050	1310	663	369	134
LEAD, TOTAL	4	1.5	12	0.89	4	5.2	0.62	0.77
MAGNESIUM, TOTAL	31.9	13.5	221	17.3	43.3	55.9	8.8	9
MANGANESE, TOTAL	2.6	1.4	10.3	3.3	6.4	1.7	0.32	0.31
NICKEL, TOTAL	0.16 U	0.15 U	1.9	0.13 U	0.29	0.19	0.15 U	0.13 U
POTASSIUM, TOTAL	53.8	37.8	284	43.5	62.3	50.4	28.4	26.6
SELENIUM, TOTAL	0.44 U	0.41 U	0.77	0.35 U	0.43 U	0.38 U	0.41 U	0.34 U
SODIUM, TOTAL	30.4 U	28.3 U	139	24.3 U	29.4 U	25.9 U	28.4 U	23.5 U
VANADIUM, TOTAL	1	0.35	10.1	0.41	1.4	1.5	0.2	0.09 U
ZINC, TOTAL	7.9	0.78	9.3	4.1	10.9	7.7	4	3

U = Not detected
J = estimated value
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram

TABLE 2-8

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS - FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Analytes	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above	
		NCWQS	MCL	Min.	Max.			NCWQS	MCL
Total Metals	Aluminum	NE	50	228	2430	74-GW03A	4/4	NA	4
	Barium	2000	2000	21.6	89.7	74-GW07	4/4	0	0
	Cobalt	NE	NE	2.3	2.3	74-GW03A	1/4	NA	NA
	Iron	300	300	49.3	1770	74-GW07	3/4	2	2
	Lead	15	15	1.2	2.8	74-GW01	3/4	0	0
	Manganese	50	50	2.1	11.7	74-GW02	4/4	0	0
	Zinc	2100	NE	3.4	3.4	74-GW03A	1/4	0	NA
Wet Chemistry	Total Dissolved Solids	500	NE	44	62	74-GW02	4/4	0	NA
	Total Suspended Solids	NE	NE	10	10.0	74-GW03A	4/5	NA	NA

Notes:

- Organic and Metal concentrations presented in micrograms per liter (µg/L) or parts per billion.
- Wet chemistry concentrations 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).
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).

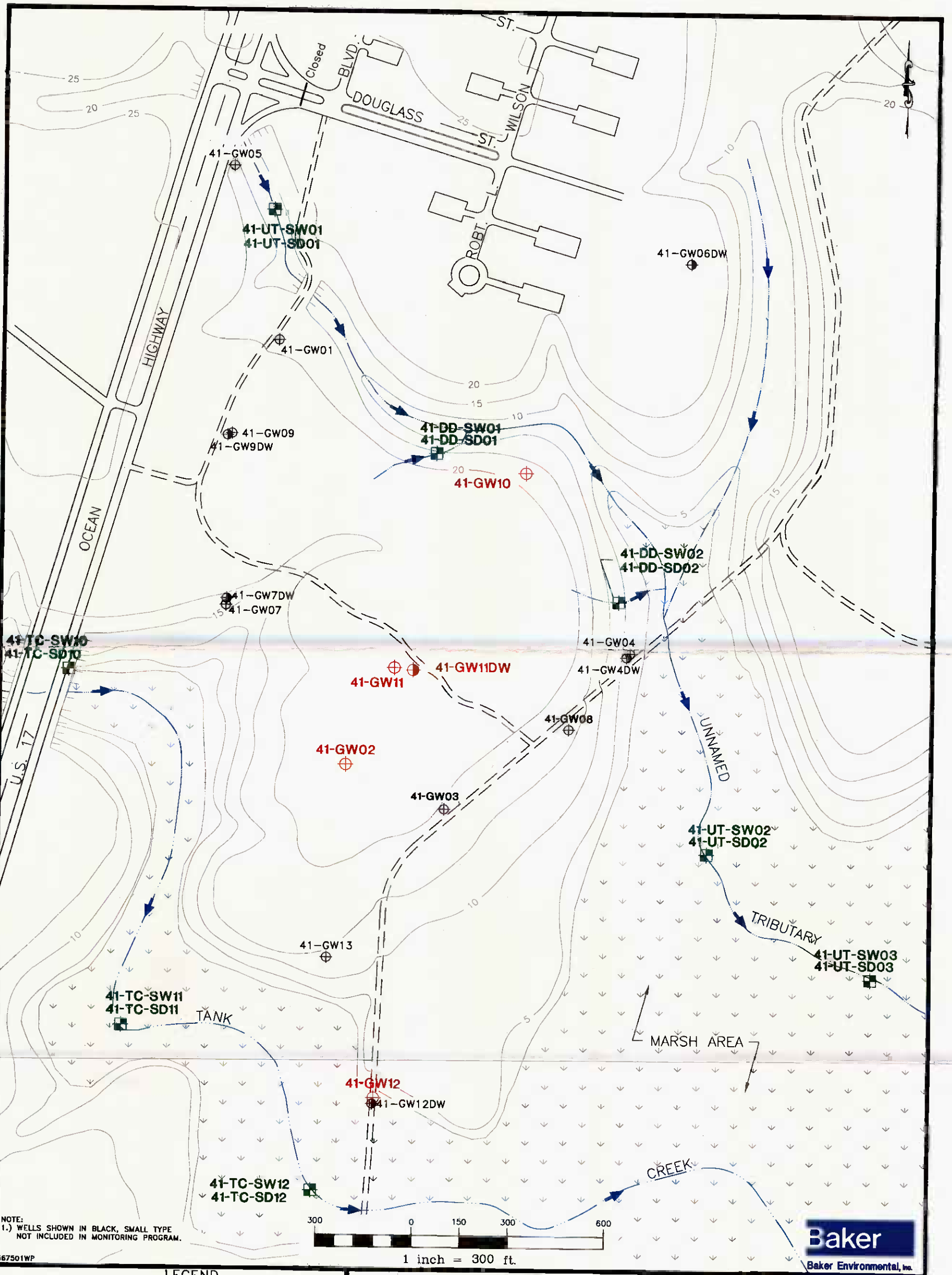
TABLE 2-9

POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	74-GW01-97A	74-GW02-97A	74-GW03A-97A	74-GW07-97A
DATE SAMPLED	02/07/97	02/07/97	02/07/97	02/07/97
TOTAL METALS (ug/L)				
ALUMINUM, TOTAL	228	239	2430	260
BARIUM, TOTAL	21.6	33.8	37.5	89.7
CALCIUM, TOTAL	1190	5640	202	385
COBALT, TOTAL	1.8 U	1.8 U	2.3	1.8 U
IRON, TOTAL	5.8 U	49.3	504	1770
LEAD, TOTAL	2.8	1.2	1.5	1.1 U
MAGNESIUM, TOTAL	1320	1860	610	1990
MANGANESE, TOTAL	2.1	11.7	2.3	3.2
SODIUM, TOTAL	6250	5060	5240	7310
ZINC, TOTAL	1 U	1 U	3.4	1 U
WET CHEMISTRY (mg/L)				
TOTAL DISSOLVED SOLIDS	44	62	46	60
TOTAL SUSPENDED SOLIDS	4 U	4 U	10	4 U

U = Not detected
J = estimated value
ug/L = micrograms per liter
mg/L = milligrams per liter

FIGURES



NOTE:
1.) WELLS SHOWN IN BLACK, SMALL TYPE NOT INCLUDED IN MONITORING PROGRAM.

367501WP

LEGEND

- 41GW11DW — DEEP MONITORING WELL
- 41GW01 — SHALLOW MONITORING WELL
- 41-TC-SW01 / 41-TC-SD01 — SURFACE WATER AND SEDIMENT SAMPLING STATIONS
- 5 — TOPOGRAPHIC ELEVATION LINES
- ROAD (IMPROVED)
- ROAD (UNIMPROVED)
- DIRECTION OF SURFACE WATER FLOW

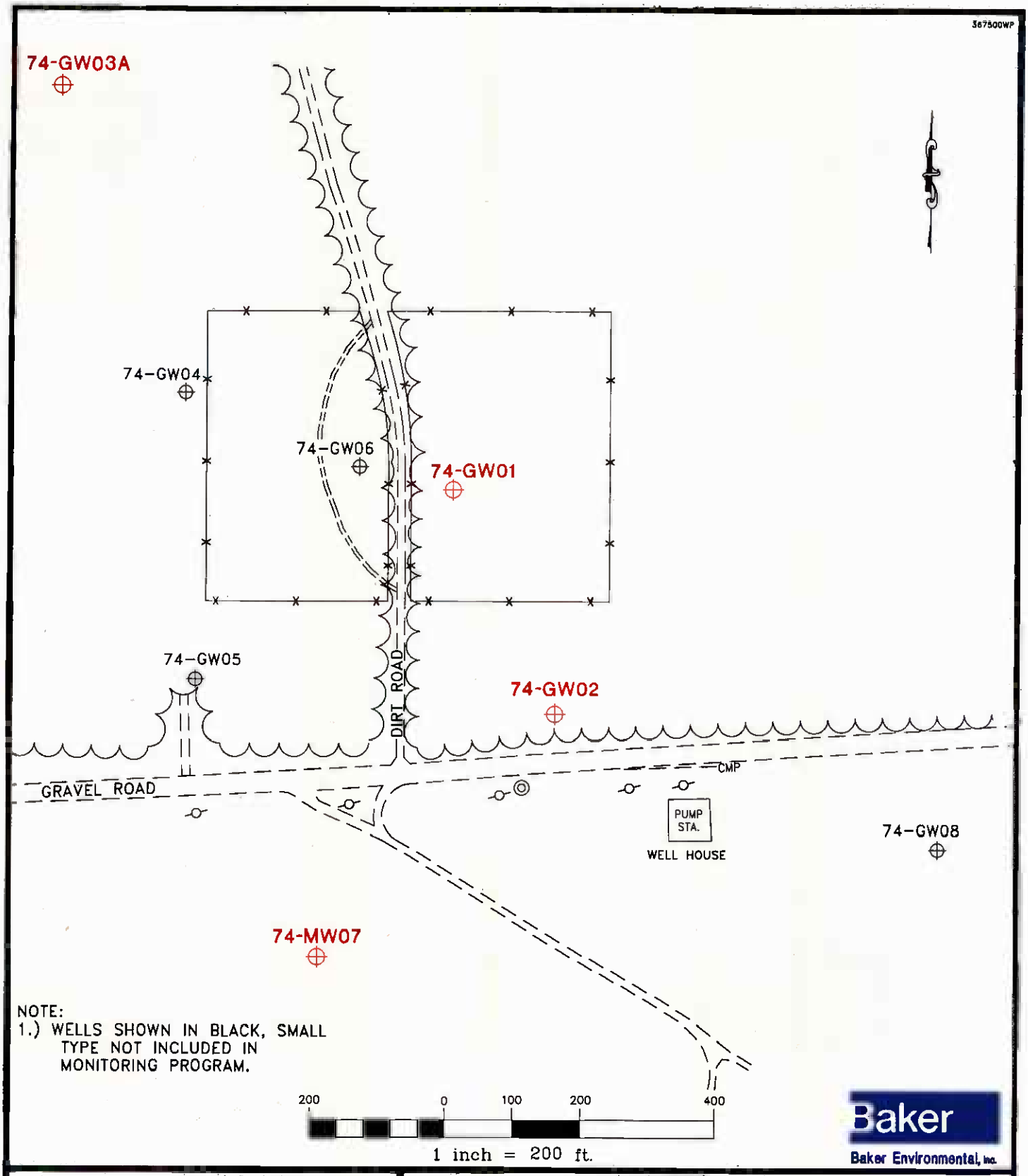
SOURCE: LANTDIV, OCT. 1991

Baker Environmental, Inc.

FIGURE 1-1
SAMPLING LOCATION MAP
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01775JJTB1V



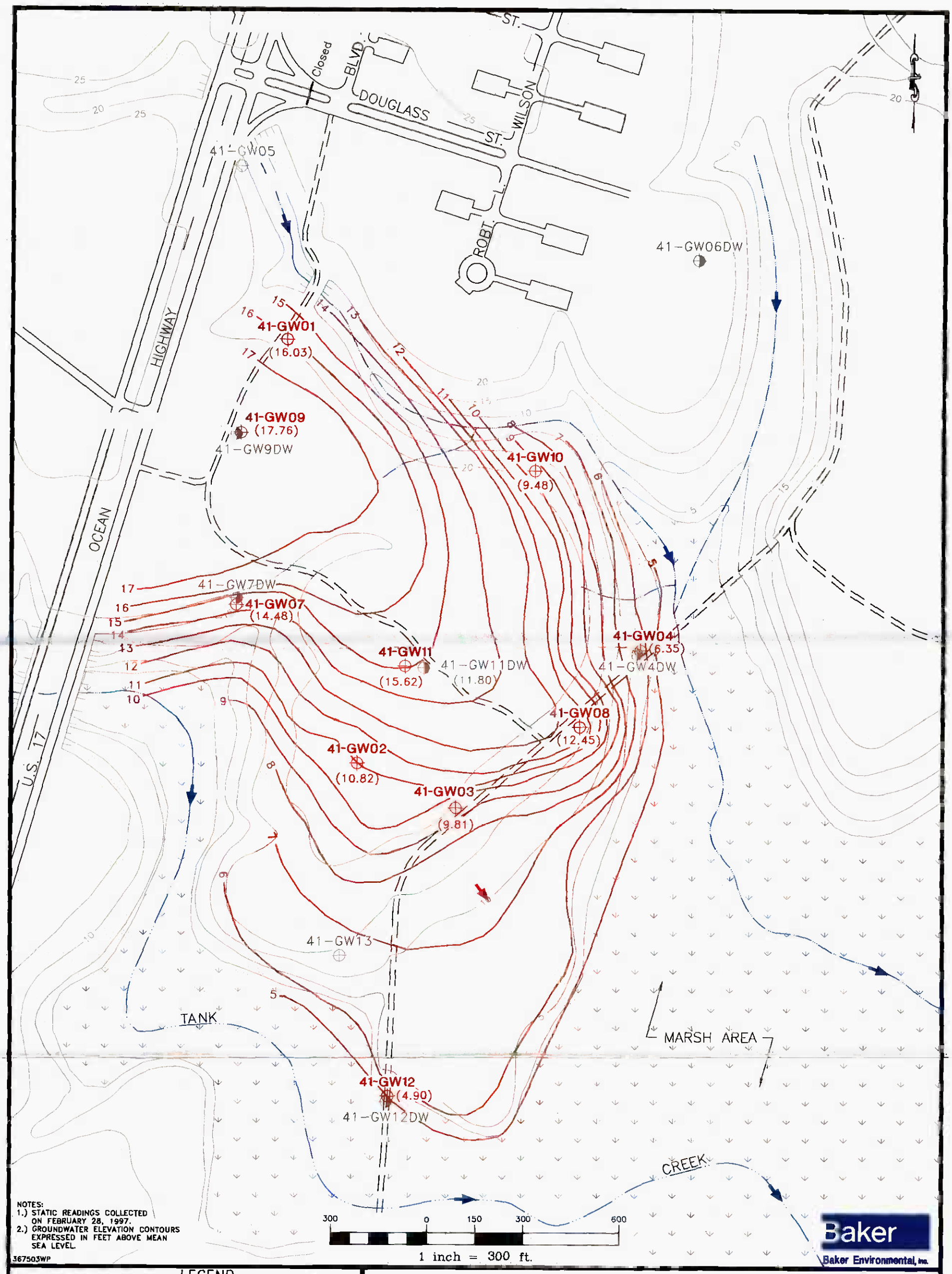
LEGEND

- 74-GW01 SHALLOW MONITORING WELL
- SANITARY MANHOLE
- UTILITY POLE
- TREE LINE
- FENCE (APPROXIMATE)

SOURCE: REVISED FROM LANTDIV. OCT. 1991

FIGURE 1-2
SAMPLING LOCATION MAP
OPERABLE UNIT NO. 4 – SITE 74
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTES:
1.) STATIC READINGS COLLECTED ON FEBRUARY 28, 1997.
2.) GROUNDWATER ELEVATION CONTOURS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL.

367503WP

Baker Environmental, Inc.

LEGEND

- 41-GW11DW — DEEP MONITORING WELL
- 41-GW01 (16.03) — SHALLOW MONITORING WELL AND GROUNDWATER ELEVATION
- 5 — GROUNDWATER ELEVATION CONTOUR
- ROAD (IMPROVED)
- ROAD (UNIMPROVED)
- INTERMITTENT STREAM
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- DIRECTION OF SURFACE FLOW DIRECTION

SOURCE: LANTDIV, OCT. 1991

FIGURE 1-3
SHALLOW GROUNDWATER CONTOUR MAP
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

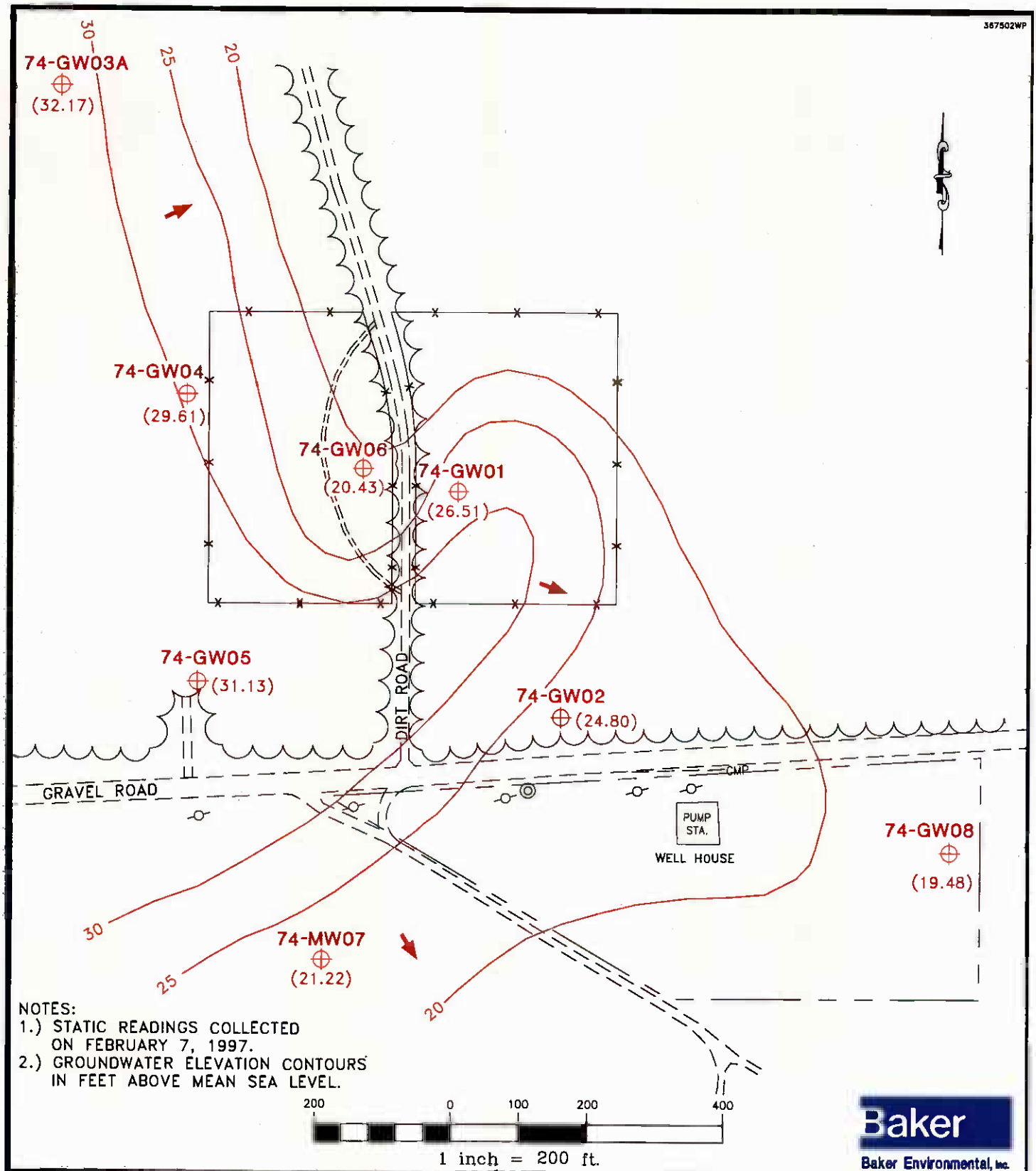
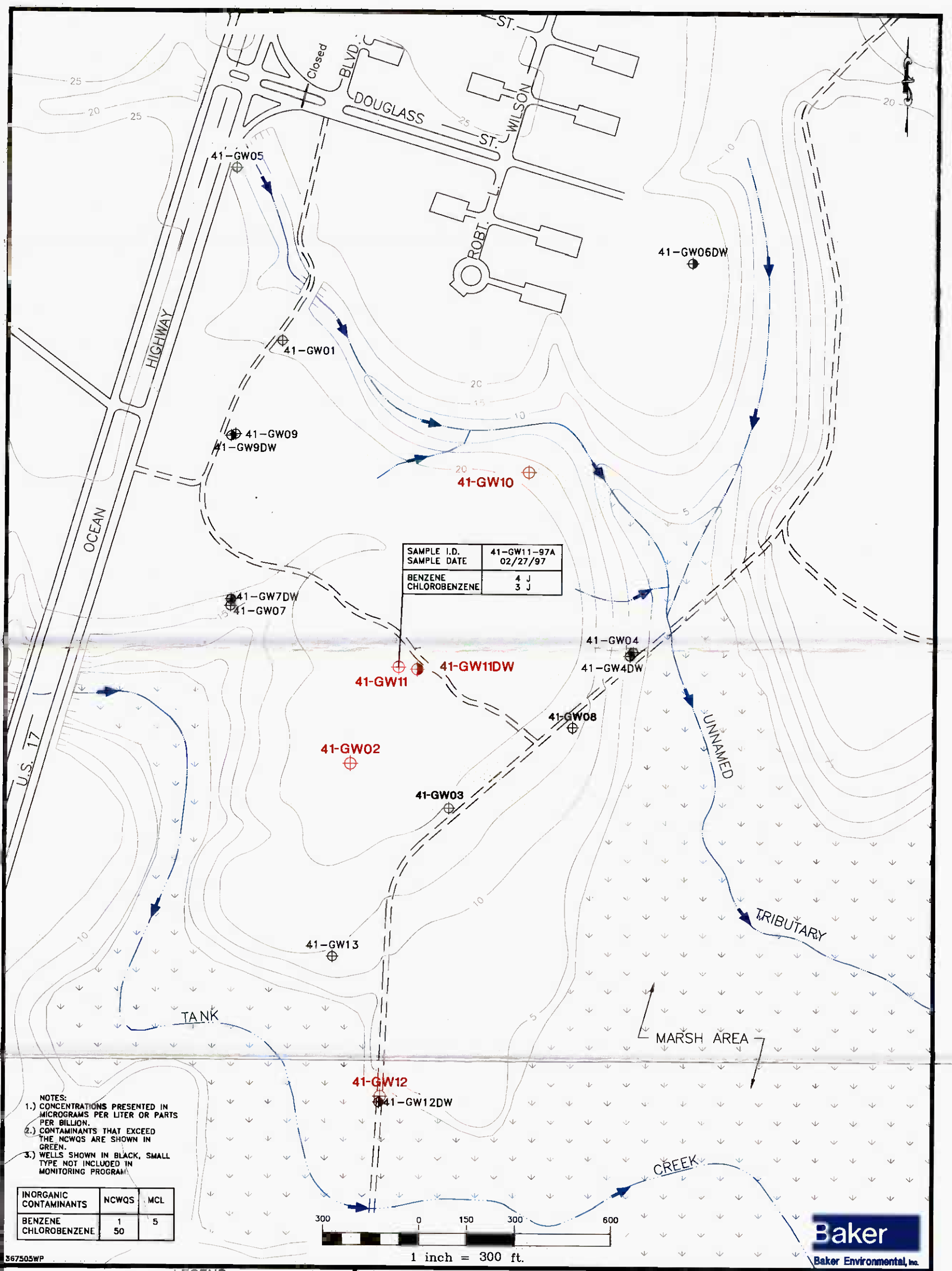


FIGURE 1-4
SHALLOW GROUNDWATER CONTOUR MAP
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



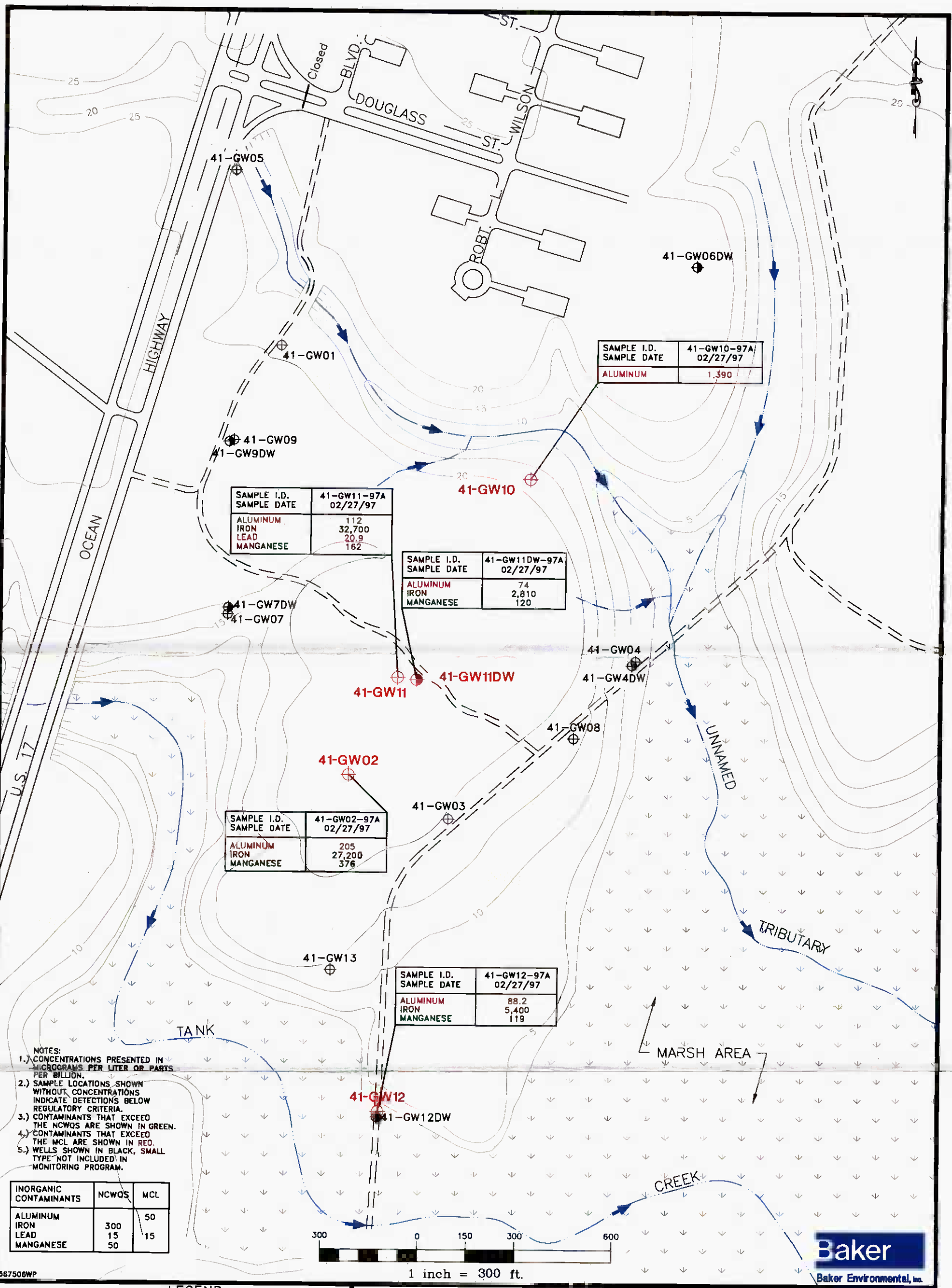
LEGEND

- 41GW11DW — DEEP MONITORING WELL
- 41GW01 — SHALLOW MONITORING WELL
- 5 — TOPOGRAPHIC ELEVATION LINES
- ROAD (IMPROVED)
- ROAD (UNIMPROVED)
- DIRECTION OF SURFACE WATER FLOW

SOURCE: LANTDIV, OCT. 1991

FIGURE 2-1
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTES:
1.) CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.
2.) SAMPLE LOCATIONS SHOWN WITHOUT CONCENTRATIONS INDICATE DETECTIONS BELOW REGULATORY CRITERIA.
3.) CONTAMINANTS THAT EXCEED THE NCWQS ARE SHOWN IN GREEN.
4.) CONTAMINANTS THAT EXCEED THE MCL ARE SHOWN IN RED.
5.) WELLS SHOWN IN BLACK, SMALL TYPE NOT INCLUDED IN MONITORING PROGRAM.

INORGANIC CONTAMINANTS	NCWQS	MCL
ALUMINUM		50
IRON	300	
LEAD	15	15
MANGANESE	50	

367506WP

LEGEND

- 41GW11DW — DEEP MONITORING WELL
- 41GW01 — SHALLOW MONITORING WELL
- 5 — TOPOGRAPHIC ELEVATION LINES
- ROAD (IMPROVED)
- ROAD (UNIMPROVED)
- DIRECTION OF SURFACE WATER FLOW

SOURCE: LANTDIV, OCT. 1991

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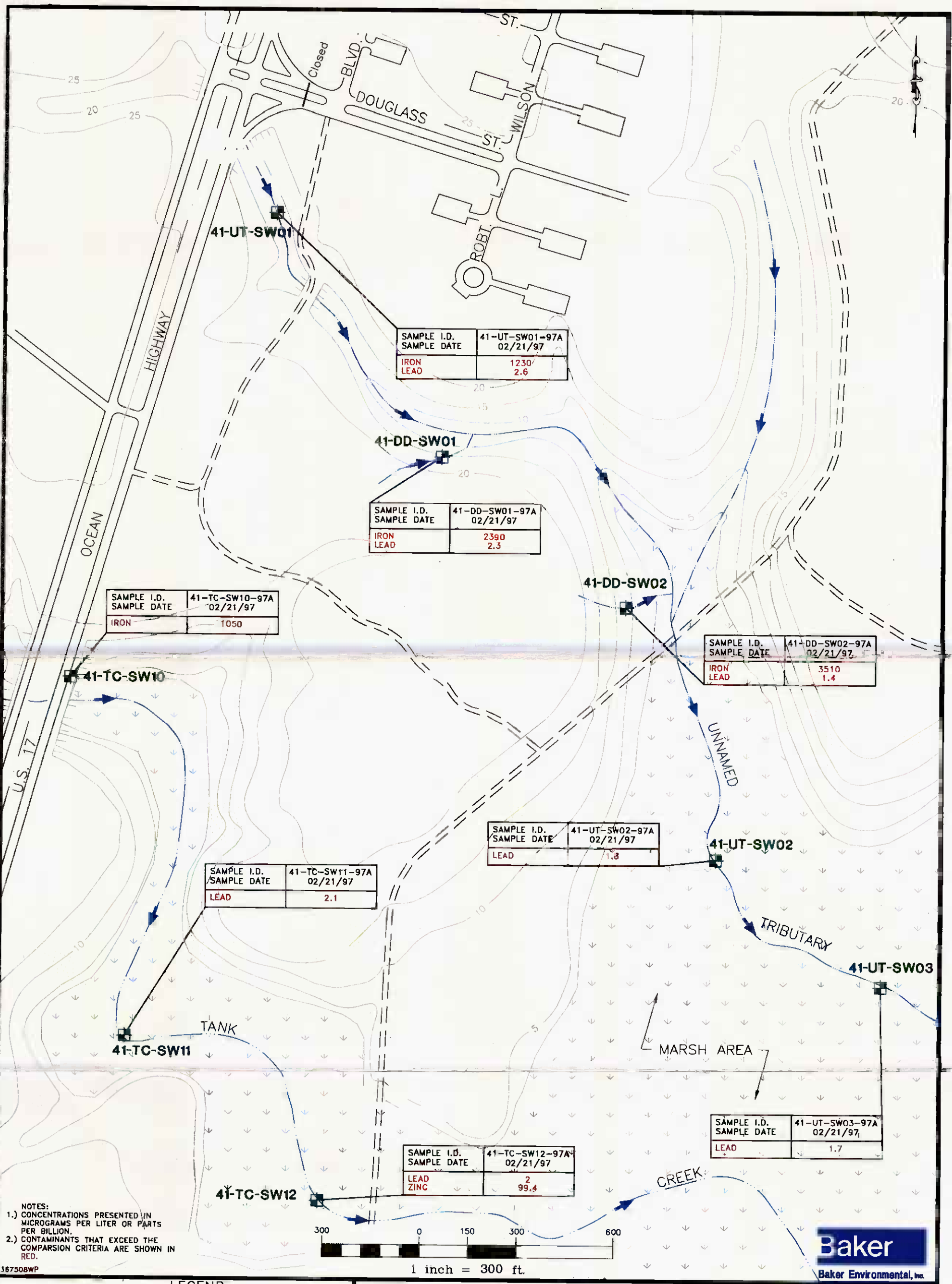
FIGURE 2-2
METALS IN GROUNDWATER ABOVE SCREENING STANDARDS
OPERABLE UNIT NO. 4 – SITE 41
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTES:
1.) CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.
2.) CONTAMINANTS THAT EXCEED THE COMPARSION CRITERIA ARE SHOWN IN RED.

367508WP

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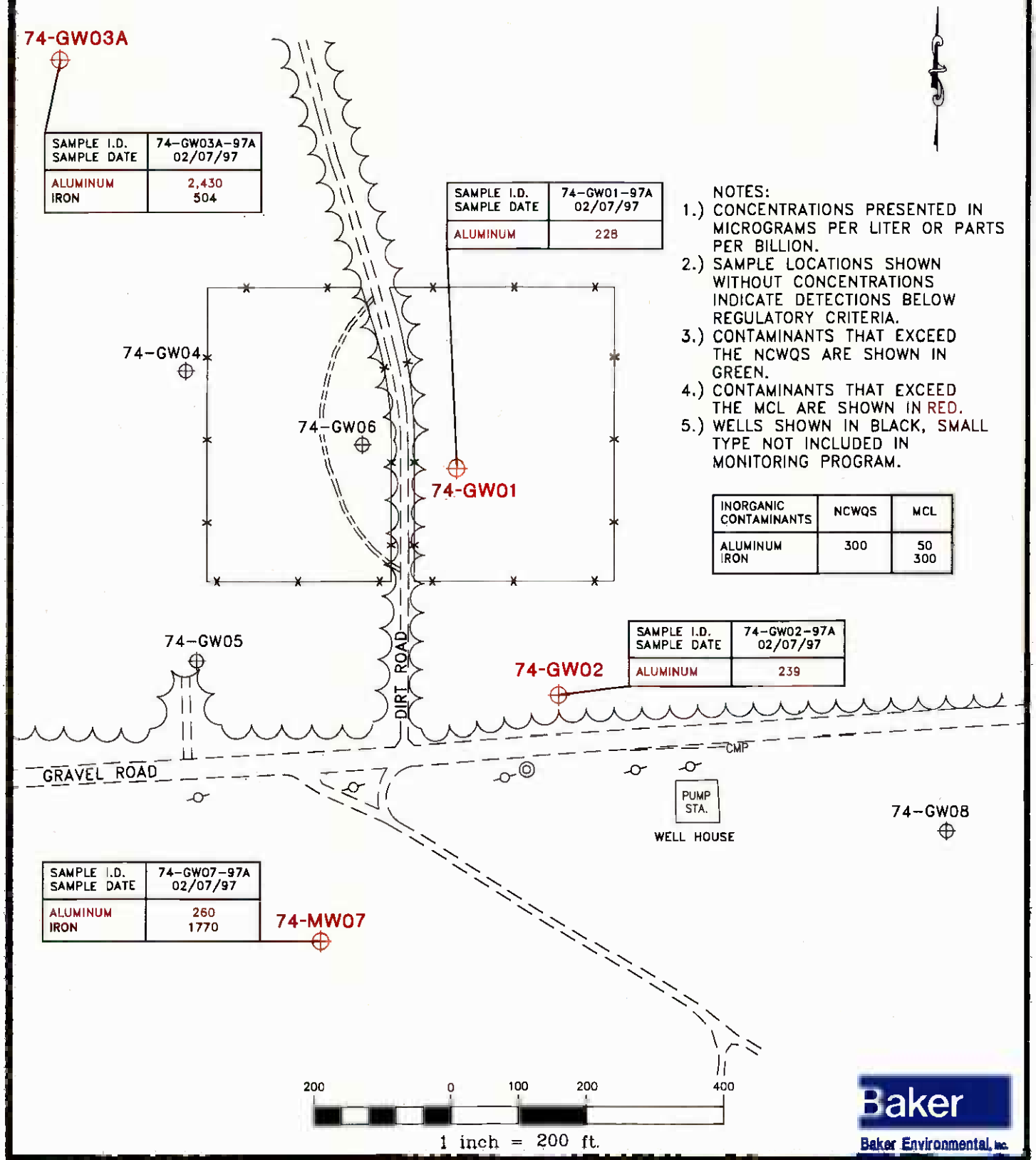
LEGEND

41-TC-SW01 SURFACE WATER SAMPLING STATIONS
5 TOPOGRAPHIC ELEVATION LINES
ROAD (IMPROVED)
ROAD (UNIMPROVED)
DIRECTION OF SURFACE WATER FLOW

SOURCE: LANTDIV, OCT. 1991

FIGURE 2-3
METALS IN SURFACE WATER ABOVE COMPARSION CRITERIA
OPERABLE UNIT NO. 4 – SITE 41
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTES:
1.) CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.
2.) SAMPLE LOCATIONS SHOWN WITHOUT CONCENTRATIONS INDICATE DETECTIONS BELOW REGULATORY CRITERIA.
3.) CONTAMINANTS THAT EXCEED THE NCWQS ARE SHOWN IN GREEN.
4.) CONTAMINANTS THAT EXCEED THE MCL ARE SHOWN IN RED.
5.) WELLS SHOWN IN BLACK, SMALL TYPE NOT INCLUDED IN MONITORING PROGRAM.

INORGANIC CONTAMINANTS	NCWQS	MCL
ALUMINUM	300	50
IRON		300

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LEGEND

74-GW01 SHALLOW MONITORING WELL
SANITARY MANHOLE
UTILITY POLE
TREE LINE
FENCE (APPROXIMATE)

SOURCE: REVISED FROM LANTDIV. OCT. 1991

FIGURE 2-4
METALS IN GROUNDWATER ABOVE SCREENING STANDARDS
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

Figure 3-1 Trees, knocked down during two hurricanes, were presumably removed from an adjacent gravel road and placed atop well 41-GW03.

Figure 3-2 The downed trees were removed from atop the well and an access path was cleared. Weather resistant paint was then applied to the bollards and protective casing of well 41-GW03.

Figure 3-3 Shallow monitoring well 74-GW02 was constructed during the 1984 Confirmation Study. The well had begun to exhibit signs of deterioration.

Figure 3-4 The bollards and protective casing of monitoring well 74-GW02 were first scraped to remove peeling paint and rust, and then weather resistant paint was applied. New padlocks were also installed on each of the Site 74 monitoring wells.

ATTACHMENTS

ATTACHMENT A
MONITORING WELL DEVELOPMENT RECORDS

Baker

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FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 41 GW12

DATE: 2-1-97

GEOLOGIST/ENGINEER: JEFF TEASIC

TIME START 1644
TIME FINISH 1659
INITIAL WATER LEVEL (FT) 4.14
TOTAL WELL DEPTH (TD) 16.50
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 2.10
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A)
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
1644	2.5	6.61	16.0	295	16.0	LT. BROWN VERY TURBID
1646	5.0	6.60	15.7	292	16.0	LT. BROWN VERY TURBID
1648	7.5	6.56	15.9	280	16.0	TAN LESS TURBID
1650	10.0	6.57	15.4	278	15.5	TAN CLOUDY
1652	12.5	6.54	15.3	265	15.5	LT. TAN CLOUDY
1654	15.0	6.52	15.4	260	16.0	TAN CLOUDY
1657	17.5	6.51	15.3	255	16.0	TAN CLOUDY
1659	20.0	6.50	15.3	265	16.0	TAN CLOUDY

Baker

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FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 41GW02

DATE: 2-1-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START 1544
TIME FINISH 1604
INITIAL WATER LEVEL (FT) 4.29
TOTAL WELL DEPTH (TD) 20.50
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 2.75 GAL.
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A) 20 MIN.
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
1544	3	6.48	17.3	650	16.0	GRAY BROWN VERY TURBID
1547	6	6.49	15.9	700	16.0	GRAY BROWN VERY TURBID
1550	9	6.49	15.9	720	16.0	GRAY BROWN VERY TURBID
1553	12	6.48	15.8	720	16.0	GRAY BROWN VERY TURBID
1556	15	6.49	15.8	725	16.0	GRAY BROWN VERY TURBID
1559	18	6.51	15.5	725	16.0	GRAY BROWN VERY TURBID
1604	21	6.50	15.7	650	16.0	GRAY BROWN VERY TURBID

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 41 GW11

DATE: 2-1-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START 1440
TIME FINISH 1448
INITIAL WATER LEVEL (FT) 9.48
TOTAL WELL DEPTH (TD) 15.0
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 0.93 GAL.
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A) 8 min
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
1440	1	6.61	20.9	90	18	BROWN VERY TURBID
1442	3	6.56	18.2	80	17	BROWN VERY TURBID
	5	6.52	16.5	80	17	GRAY LESS TURBID
1445	7	6.53	16.4	79	16	LT. GRAY CLOUDY
1448	10	6.50	16.2	78	16	LT. GRAY CLOUDY

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 41 GW110W

DATE: 2-1-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START 1345
TIME FINISH 1418
INITIAL WATER LEVEL (FT) 12.43
TOTAL WELL DEPTH (TD) 50.0
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 6.38
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A) 33 min
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
1345	6.5	6.38	18.3	1150	18.5	LT. GRAY CLOUDY
1356	13.0	6.49	17.9	1425	18.5	GRAY TURBID
1400	19.5	6.50	17.9	1450	18.5	GRAY CLOUDY
1405	26.0	6.51	18.1	1350	18.5	GRAY CLOUDY
1412	32.5	6.58	17.8	1450	18.5	GRAY VERY CLOUDY
1418	39.0	6.54	18.1	1400	18.5	GRAY VERY CLOUDY

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 41GW10

DATE: 1-31-97

GEOLOGIST/ENGINEER: JEFF TEBSIC

TIME START 1011
TIME FINISH 1058
INITIAL WATER LEVEL (FT) 5.03
TOTAL WELL DEPTH (TD) 13.50
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 1.44 GAL
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE HAND PUMP
TOTAL TIME (A) 47 min
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
1011	2	6.27	12.7	105	12.5	BROWN VERY CLOUDY
1016	4	6.71	13.1	200	13.0	BROWN VERY CLOUDY
1024	6	7.08	13.3	330	13.5	BROWN VERY CLOUDY
1033	8	7.04	12.8	360	13.0	BROWN VERY CLOUDY
1040	10	7.02	13.6	365	13.8	BROWN VERY CLOUDY
1053	12	7.07	13.3	370	13.8	BROWN VERY CLOUDY
1058	14	6.93	13.9	360	14.0	BROWN VERY CLOUDY

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 746W01

DATE: 1-30-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START
TIME FINISH
INITIAL WATER LEVEL (FT) 9.75
TOTAL WELL DEPTH (TD) 23.50
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 2.5 GAL.
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A)
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
	2.5	4.38	14.6	40	14.0	LT. GRAY - WHITE VERY TURBID
	5.0	4.34	14.7	39	16.0	LT. GRAY - WHITE VERY TURBID
	7.5	4.34	14.6	40	15.0	LT. GRAY - WHITE VERY TURBID
	10.0	4.29	14.0	39	15.0	LT. GRAY - WHITE VERY TURBID
	12.5	4.34	14.1	35	15.0	LT. GRAY - WHITE VERY TURBID
	15.0	4.36	14.3	40	15.0	LT. GRAY - WHITE VERY TURBID
	17.5	4.38	14.7	40	15.5	LT. GRAY - WHITE VERY TURBID
	20.0	4.39	14.4	40	15.0	LT. GRAY - WHITE VERY TURBID
	22.5	4.39	14.5	40	15.0	LT. GRAY TURBID
	25.0	4.39	14.5	40	15.0	

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 74GW02

DATE: 1-31-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START
TIME FINISH
INITIAL WATER LEVEL (FT) 11.10
TOTAL WELL DEPTH (TD) 25.50
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 2.5 GAL.
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A)
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
	2.5	4.15	13.4	72	15.0	LT. BROWN CLOUDY
	5.0	4.33	15.3	50	15.0	TAN CLOUDY
	7.5	4.36	15.4	80	16.5	TAN CLOUDY
	10.0	4.40	15.8	75	17.0	TAN CLOUDY
	12.5	4.41	15.6	78	16.5	TAN CLOUDY
	15.0	4.43	15.7	78	16.5	TAN CLOUDY
	17.5	4.50	15.7	78	16.5	TAN CLOUDY
	20.0	4.52	15.6	78	16.5	TAN CLOUDY
	22.5	4.56	15.3	78	16.5	TAN CLOUDY
	25.0	4.53	14.9	78	16.0	TAN CLOUDY
	27.5	4.60	15.6	78	16.5	TAN CLOUDY
	30.0	4.58	15.2	78	16.5	TAN CLOUDY

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 74GW03A

DATE: 1-30-97

GEOLOGIST/ENGINEER: J.P. TEPSIC

TIME START
TIME FINISH
INITIAL WATER LEVEL (FT) 3.84
TOTAL WELL DEPTH (TD) 20.60
WELL DIAMETER (INCHES)
CALCULATED WELL VOLUME 2.85 GAL.
BOREHOLE DIAMETER (INCHES)
BOREHOLE VOLUME
AMOUNT OF WATER ADDED DURING DRILLING
DEVELOPMENT METHOD
PUMP TYPE WATERRA
TOTAL TIME (A)
AVERAGE FLOW (GPM)(B)
TOTAL ESTIMATED WITHDRAWAL AxB=
HNU/OVA READING

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
	3	3.89	13.7	50		
	6	3.99	12.6	50	14.5	LT. BROWN VERY TURBID
	9	4.06	13.2	52	15.5	BROWN TO GRAY VERY TURBID
	12	4.06	13.5	50	15.5	BROWN TO GRAY VERY TURBID
	15	4.06	12.9	52	15.0	BROWN TO GRAY VERY TURBID
	18	4.09	12.9	52	15.0	BROWN TO GRAY VERY TURBID
	21	4.07	12.9	52	15.0	BROWN TO GRAY VERY TURBID SLIGHTLY LIGHTER
	24	4.11	13.1	52	15.0	GRAY TURBID

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 74GW07

DATE: 1-30-97

GEOLOGIST/ENGINEER: JEFF TEPSIC

TIME START	1515
TIME FINISH	1610
INITIAL WATER LEVEL (FT)	2.83
TOTAL WELL DEPTH (TD)	16.0
WELL DIAMETER (INCHES)	
CALCULATED WELL VOLUME	2.5 GAL.
BOREHOLE DIAMETER (INCHES)	
BOREHOLE VOLUME	
AMOUNT OF WATER ADDED DURING DRILLING	
DEVELOPMENT METHOD	
PUMP TYPE	WATERRA
TOTAL TIME (A)	
AVERAGE FLOW (GPM)(B)	
TOTAL ESTIMATED WITHDRAWAL AxB=	
HNU/OVA READING	

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPEC. COND. (µmhos/cm)	TEMP (°C)	COLOR AND TURBIDITY
	2.5	4.26	13.8	65	14.0	BROWN TURBID
	5.0	4.34	14.5	65	15.0	BROWN GRAY CLOUDY
	7.5	4.38	14.8	60	15.0	LT. GRAY CLOUDY
	10.0	4.41	14.8	60	15.0	LT. GRAY SLIGHTY CLOUDY
	12.5	4.43	15.0	60	15.5	LT. GRAY CLEARING
	15.0	4.45	15.0	60	15.5	LT. GRAY CLEARING
	17.5	4.45	14.8	60	16.0	LT. GRAY CLEARING
	20.0	4.45	14.9	60	16.0	LT. GRAY CLEARING
	22.5	4.55	15.0	60	16.0	LT. GRAY CLEARING
	25.0	4.49	14.9	60	15.5	CLEAR

ATTACHMENT B
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 #: Weston Ramirez
Delivery Order #:
Project Number: 367
Project Name: Monitoring
Field Team: JPT/TFT
SEND RESULTS TO: Tom Trebilcock

Notes ~~Sample~~ Number	1997 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: CLP Volatiles	TAL Metals	TSS & TDS	Type of Container(s) (3) G/2	P/1	P/1	Number of Container(s)	General Comments: Sample No. ~~Remarks~~
GW	2/27	0811	Site41	X		X	X	X					41-GW10-97A
GW		0955				X	X	X					41-GW11-97A
GW		1021				X	X	X					41-GW11DW-97A
GW		1130				X	X	X					41-GW02-97A
GW		1230				X	X	X					41-GW12-97A
Blank	2/27	0800				X							41-TB02-97A

COC # 01497A-003

Relinquished By: [signature] Date: 2/27/97 Time: 1700
Received By: FedEx 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; O - Glass

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

Courier Name: FedEx
Courier Pickup Number: 355274241
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 #: B. Ramirez
Delivery Order #:
Project Number: 367
Project Name: Monitoring - CLEJ
Field Team: Tepsic / Trebilcock
SEND RESULTS TO: Tom Trebilcock

Sample Number	1997 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: CLP Liq. VOAs	TAL Liq. Metals	CLP Sol. VOAs	TAL Sol. Metals	Type of Container(s) (3)	Number of Container(s)	General Comments: Sample No. / Remarks
										G/2	P/1	COC # 00497A-002
SW	2/21	0940	Site 41	X		X	X					41-TC-SW12-97A
SD		0945						X	X	G/1	G/1	41-TC-SD12-97A
SW		1025				X	X					41-TC-SW11-97A
SD		1030						X	X			41-TC-SD11-97A
SW		1200				X	X					41-UT-SW03-97A
SD		1205						X	X			41-UT-SD03-97A
SW		1240				X	X					41-UT-SW02-97A
SD		1245						X	X			41-UT-SD02-97A
SW		1320				X	X					41-DD-SW02-97A
SD	↓	1325	↓	↓				X	X			41-DD-SD02-97A

Relinquished By: [signature] Date: 2/21 Time: 1800
Received By: FedEx 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: FedEx
Courier Pickup Number: 355827427 6
File Name:

WESTC | lytics Use Only

Custody Transfer Record/Lab Work Request

WESTON

Client: Baker Environmental
Est. Final Proj. Sampling Date: 2-28-97
Work Order #:
Project Contact/Phone #: Tom Trebilcock
AD Project Manager: B. Ramirez
QC: Del: TAT:
Date Rec'd: Date Due:
Account #:

Refrigerator #

#/Type Container	Liquid																	
	Solid																	
Volume	Liquid																	
	Solid																	
Preservatives																		

ANALYSES REQUESTED → ORGANIC: CLP VOA | BNA | Pest/PCB | Herb; INORG: TAL Metal | CN

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

Lab ID	Client ID/Description	Matrix QC Chosen (✓) MS	MSD	Matrix	Date Collected 1997	Time Collected	WESTON Analytics Use Only
	41-UT-SW01-97A			SW	2/21	1540	X X
	41-UT-SD01-97A			SD		1545	X X
	41-DD-SW01-97A			SW		1455	X X
	41-DD-SD01-97A			SD		1500	X X
	41-TC-SW01-97A			SW		1630	X X
	41-TC-SD01-97A			SD		1635	X X
	41-TB01-97A			—		1645	X

FIELD PERSONNEL: COMPLETE ONLY SHADED AREAS

Special Instructions:
- Routine Turn
- Fed Ex 355-8274226

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

WESTON Analytics Use Only

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

COC Tape was: 1) Present on Outer Package Y or N
2) Unbroken on Outer Package Y or N
3) Present on Sample Y or N
4) Unbroken on Sample Y or N
COC Record Present Upon Sample Rec'd Y or N

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

Relinquished by	Received by	Date	Time
JJ.	FedEx	2/21/97	1800

Relinquished by	Received by	Date	Time

RFW 21-21-001/A-7/91 ___ L372 ___ L373 ___ L375 ___ L377 ___ L378 Ref# _____ Cooler# 1 381-596a

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 #: Weston B. Ramirez
Delivery Order #:
Project Number: 367
Project Name: Monitoring
Field Team: JPT/JFT
SEND RESULTS TO: Tom Trebilcock

Notes ~~Sample~~ Number	1997 Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: TAL Metals	Analytical Methods: TSS/TDS										Number of Container(s)	Type of Container(s) (3)	General Comments: Sample No. ~~Remarks~~
																		P/1	COC # 00497A-001
GW	2/7	0835	Site 74	X		X	X												74-GW03A-97A
↓	↓	0935		X		X	X												74-GW01-97A
↓	↓	1040		X		X	X												74-GW07-97A
↓	↓	1150	↓	X		X	X												74-GW02-97A
																			Entered 2/11/97

Relinquished By: JPT, JFT Date: 2/7/97 Time: 1500
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: FedEx
Courier Pickup Number: 3558274300
File Name: _____

ATTACHMENT C
SAMPLE TRACKING FORM

Sample Tracking and Chain-of-Custody Documentation - Site 41
Monitoring and O&M Program Support, CTO-367
MCB, Camp Lejeune, North Carolina

MATRIX	SAMPLE ID	DATE SHIPPED	Analysis Requested				Analysis Received				DATE RECEIVED	TURNAROUND TIME	RFW #	COMMENTS
			CLP Volatiles (SOW OLM01.8)	TAL Metals (CLP SOW ILM03.0)	Total Dissolved Solids	Total Suspended Soilds	CLP Volatiles (SOW OLM01.8)	TAL Metals (CLP SOW ILM03.0)	Total Dissolved Solids	Total Suspended Soilds				
	COC# OU497A-002													
Groundwater	41-GW02-97A	2/27/97	X	X	X	X	X	X	X	X	3/31/97	34	9702G185	
	41-GW10-97A	2/27/97	X	X	X	X	X	X	X	X	3/31/97	34	9702G185	
	41-GW11-97A	2/27/97	X	X	X	X	X	X	X	X	3/31/97	34	9702G185	
	41-GW11DW-97A	2/27/97	X	X	X	X	X	X	X	X	3/31/97	34	9702G185	
	41-GW12-97A	2/27/97	X	X	X	X	X	X	X	X	3/31/97	34	9702G185	
	41-TB02-97A	2/27/97	X				X				3/31/97	34	9702G185	
	COC# OU497A-003													
Surface Water	41-UT-SW01-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-UT-SW02-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-UT-SW03-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SW10-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SW11-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SW12-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-DD-SW01-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-DD-SW02-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
Sediment	41-UT-SD01-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-UT-SD02-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-UT-SD03-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SD10-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SD11-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TC-SD12-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-DD-SD01-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-DD-SD02-97A	2/21/97	X	X			X	X			3/31/97	40	9702G185	
	41-TB01-97A	2/21/97	X				X				3/31/97	40	9702G185	
TOTALS			23	21	5	5	23	21	5	5				

Sample Tracking and Chain-of-Custody Documentation - Site 74
Monitoring and O&M Program Support, CTO-367
MCB, Camp Lejeune, North Carolina

MATRIX	SAMPLE ID	DATE SHIPPED	Analysis Requested			Analysis Received			DATE RECEIVED	TURNAROUND TIME	RFW #	COMMENTS
			TAL Metals (CLP SOW ILM03.0)	Total Dissolved Solids	Total Suspended Soilds	TAL Metals (CLP SOW ILM03.0)	Total Dissolved Solids	Total Suspended Soilds				
Groundwater	**COC# OU497A-001**											
	74-GW01-97A	2/7/97	X	X	X	X	X	X	2/21/97	14	9702G949	
	74-GW02-97A	2/7/97	X	X	X	X	X	X	2/21/97	14	9702G949	
	74-GW03A-97A	2/7/97	X	X	X	X	X	X	2/21/97	14	9702G949	
	74-GW07-97A	2/7/97	X	X	X	X	X	X	2/21/97	14	9702G949	
TOTALS			4	4	4	4	4	4				

ATTACHMENT D
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 41 and 74.
Sample Station Identifier	Each sample station has been assigned a unique identification number. Monitoring well locations may include the qualifiers "DW" which denotes a deep monitoring well and"GW" which denotes groundwater. Sample stations also include surface water and sediment locations. In these cases, "SW" denotes surface water and "SD"denotes the sediment stations. These samples were collected from Tank Creek and an unnamed tributary. The locations are identified by, "TC" which denotes Tank Creek, and "UT" which denotes the unnamed tributary.
Year	The investigation was conducted during 1997.
Quarter	The investigation was conducted during the first 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 41-GW11DW-97A refers to:

41-GW11DW-97A	Site 41
41-GW11DW-97A	Groundwater sample
41-GW11DW-97A	Monitoring well No.11
41-GW11DW-97A	Deep monitoring well
41-GW11DW-97A	Year 1997
41-GW11DW-97A	The first quarter (i.e., January through March)

SAMPLE DESIGNATIONS (Continued)

Sample number 41-TC-SW12-97A refers to:

41-TC-SD12-97A	Site 41
41-TC-SD12-97A	Tank Creek
41-TC-SD12-97A	Sediment sample
41-TC-SD12-97A	Sampling station No. 12
41-TC-SD12-97A	Year 1997
41-TC-SD12-97A	The first quarter (i.e., January through March)

Sample number 41-UT-SW01-97A refers to:

41-UT-SW01-97A	Site 41
41-UT-SW01-97A	Unnamed tributary
41-UT-SW01-97A	Surface water sample
41-UT-SW01-97A	Sampling station No. 1
41-UT-SW01-97A	Year 1997
41-UT-SW01-97A	The first quarter (i.e., January through March)

The same sample designation format applies to Site 74. Under this sample designation format the sample number 74-GW01-97A refers to:

74-GW01-97A	Site 74
74-GW01-97A	Groundwater sample
74-GW01-97A	Sampling station No. 1
74-GW01-97A	Year 1997.
74-GW01-97A	The first quarter (i.e., January through March)

ATTACHMENT E
MONITORING PROGRAM ANALYTICAL RESULTS

GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
VOLATILE ORGANICS

SAMPLE ID	41-GW02-97A	41-GW10-97A	41-GW11-97A	41-GW11DW-97A	41-GW12-97A
DATE SAMPLED	02/27/97	02/27/97	02/27/97	02/27/97	02/27/97
VOLATILES (ug/L)					
CHLOROMETHANE	10 U	10 U	10 U	10 U	10 U
BROMOMETHANE	10 U	10 U	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U	10 U	10 U
CHLOROETHANE	10 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U	10 U	10 U	10 U
ACETONE	10 U	10 U	10 U	10 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	10 U	10 U
CHLOROFORM	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U
2-BUTANONE	10 U	10 U	10 U	10 U	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U	10 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	10 U	10 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U
BENZENE	10 U	10 U	4 J	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U
BROMOFORM	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	10 U	10 U	10 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	10 U	10 U	10 U
TOLUENE	10 U	10 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	10 U	3 J	10 U	10 U
ETHYLBENZENE	10 U	10 U	10 U	10 U	10 U
STYRENE	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	10 U	10 U	10 U	10 U	10 U

GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
TOTAL METALS AND WET CHEMISTRY

SAMPLE ID	41-GW02-97A	41-GW10-97A	41-GW11-97A	41-GW11DW-97A	41-GW12-97A
DATE SAMPLED	02/27/97	02/27/97	02/27/97	02/27/97	02/27/97
TOTAL METALS (ug/L)					
ALUMINUM, TOTAL	205	1390	112	74	88.2
ANTIMONY, TOTAL	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
ARSENIC, TOTAL	3.3	1.8 U	3.2	1.8 U	1.8 U
BARIUM, TOTAL	69.3	35.7	511	46	19.5
BERYLLIUM, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
CADMIUM, TOTAL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
CALCIUM, TOTAL	118000	5280	82300	203000	42600
CHROMIUM, TOTAL	0.3 U	1	0.3	0.3 U	0.3 U
COBALT, TOTAL	2.6	0.4	0.52	0.3 U	13.6
COPPER, TOTAL	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
IRON, TOTAL	27200	258	32700	2810	5400
LEAD, TOTAL	1.3 U	1.7	20.9	2.2	1.5
MAGNESIUM, TOTAL	20900	1210	18800	6430	2510
MANGANESE, TOTAL	376	6.3	162	120	119
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	1.4	1.7	8.1	5.8	1.5
POTASSIUM, TOTAL	16100	279	28400	2480	761
SELENIUM, TOTAL	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
SILVER, TOTAL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
SODIUM, TOTAL	26600	11200	41400	186000	5940
THALLIUM, TOTAL	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
VANADIUM, TOTAL	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ZINC, TOTAL	3.5	4.6	7.6	4.7	12.2
WET CHEMISTRY (mg/L)					
TOTAL DISSOLVED SOLIDS	560	72	500	1100	180
TOTAL SUSPENDED SOLIDS	44	6	54	4 U	8

SURFACE WATER ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
VOLATILE ORGANICS

SAMPLE ID	1-DD-SW01-97A	41-DD-SW02-97A	41-TC-SW10-97A	41-TC-SW11-97A	41-TC-SW12-97A	41-UT-SW01-97A	41-UT-SW02-97A	41-UT-SW03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
VOLATILES (ug/L)								
CHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMOMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-BUTANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMOFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ETHYLBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
STYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

SURFACE WATER ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
TOTAL METALS

SAMPLE ID	1-DD-SWO1-97A	41-DD-SW02-97A	41-TC-SW10-97A	41-TC-SW11-97A	41-TC-SW12-97A	41-UT-SW01-97A	41-UT-SW02-97A	41-UT-SW03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
TOTAL METALS (ug/L)								
ALUMINUM, TOTAL	262	139	423	372	354	1380	199	189
ANTIMONY, TOTAL	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
ARSENIC, TOTAL	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	2.4	1.8 U	1.8 U
BARIUM, TOTAL	37	63	31.2	28.9	29.4	16.3	21.6	20.3
BERYLLIUM, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
CADMIUM, TOTAL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
CALCIUM, TOTAL	33400	75700	13500	13100	13200	20900	29300	27900
CHROMIUM, TOTAL	0.3 U	0.3 U	0.66	0.37	0.58	1.8	0.44	0.4
COBALT, TOTAL	0.3 U	0.95	0.7	0.53	0.3 U	0.3 U	0.49	0.3 U
COPPER, TOTAL	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
IRON, TOTAL	2390	3510	1050	850	901	1230	834	768
LEAD, TOTAL	2.3	1.4	1.3 U	2.1	2	2.6	1.8	1.7
MAGNESIUM, TOTAL	4230	9750	1530	1480	1500	1270	1920	1840
MANGANESE, TOTAL	36.7	343	26.9	26.7	27.2	12.6	32.3	30.7
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	0.7 U	2.5	1.7	1.5	1.6	1	1.9	1.7
POTASSIUM, TOTAL	3880	9170	1620	1530	1570	1660	1360	1320
SELENIUM, TOTAL	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
SILVER, TOTAL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
SODIUM, TOTAL	9030	21400	10800	10400	10600	14300	10700	10600
THALLIUM, TOTAL	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
VANADIUM, TOTAL	0.5 U	0.5 U	0.53	0.5 U	0.72	3	0.5 U	0.5 U
ZINC, TOTAL	3.7	2.7	7	7.3	99.4	26.2	10.7	10.4

SEDIMENT ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
VOLATILE ORGANICS

SAMPLE ID	41-DD-SD01-97A	41-DD-SD02-97A	41-TC-SD10-97A	41-TC-SD11-97A	41-TC-SD12-97A	41-UT-SD01-97A	41-UT-SD02-97A	41-UT-SD03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
VOLATILES (ug/kg)								
CHLOROMETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
BROMOMETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
VINYL CHLORIDE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
METHYLENE CHLORIDE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
ACETONE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CARBON DISULFIDE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,1-DICHLOROETHENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,1-DICHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,2-DICHLOROETHENE (TOTAL)	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CHLOROFORM	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,2-DICHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
2-BUTANONE	13 U	12 U	8 J	13 U	16 U	13 U	12 U	12 U
1,1,1-TRICHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CARBON TETRACHLORIDE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
BROMODICHLOROMETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,2-DICHLOROPROPANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CIS-1,3-DICHLOROPROPENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
TRICHLOROETHENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
DIBROMOCHLOROMETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,1,2-TRICHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
BENZENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
TRANS-1,3-DICHLOROPROPENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
BROMOFORM	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
4-METHYL-2-PENTANONE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
2-HEXANONE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
TETRACHLOROETHENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
1,1,2,2-TETRACHLOROETHANE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
TOLUENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
CHLOROBENZENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
ETHYLBENZENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
STYRENE	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U
XYLENE (TOTAL)	13 U	12 U	16 U	13 U	16 U	13 U	12 U	12 U

SEDIMENT ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 41
MONITORING AND O&M SUPPORT, CTO-0367
TOTAL METALS

SAMPLE ID	41-DD-SD01-97A	41-DD-SD02-97A	41-TC-SD10-97A	41-TC-SD11-97A	41-TC-SD12-97A	41-UT-SD01-97A	41-UT-SD02-97A	41-UT-SD03-97A
DATE SAMPLED	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97	02/21/97
TOTAL METALS (mg/kg)								
ALUMINUM, TOTAL	1170	355	7550	440	1010	1760	267	268
ANTIMONY, TOTAL	0.37 U	0.35 U	0.47 U	0.32	0.36 U	0.32 U	0.56	0.29
ARSENIC, TOTAL	0.42 U	0.39 U	0.84	0.33 U	0.4 U	0.36 U	0.39 U	0.32 U
BARIUM, TOTAL	6.7	2.6	36.4	4.8	10	7.1	1.3	2.5
BERYLLIUM, TOTAL	0.02 U	0.02 U	0.45	0.02 U	0.07	0.04	0.02 U	0.02 U
CADMIUM, TOTAL	0.05 U	0.04 U	0.07	0.04 U	0.12	0.04 U	0.04 U	0.04 U
CALCIUM, TOTAL	712	140	1510	138	617	1500	125	143
CHROMIUM, TOTAL	1.3	0.76	7.5	0.8	1.3	1.7	0.49	0.4
COBALT, TOTAL	0.07 U	0.14	1	0.1	0.41	0.06 U	0.07 U	0.05 U
COPPER, TOTAL	0.16 U	0.15 U	1.3	0.13 U	0.3	0.32	0.15 U	0.13 U
IRON, TOTAL	1100	263	3590	1050	1310	663	369	134
LEAD, TOTAL	4	1.5	12	0.89	4	5.2	0.62	0.77
MAGNESIUM, TOTAL	31.9	13.5	221	17.3	43.3	55.9	8.8	9
MANGANESE, TOTAL	2.6	1.4	10.3	3.3	6.4	1.7	0.32	0.31
MERCURY, TOTAL	0.06 U	0.05 U	0.07 U	0.05 U	0.07 U	0.05 U	0.05 U	0.05 U
NICKEL, TOTAL	0.16 U	0.15 U	1.9	0.13 U	0.29	0.19	0.15 U	0.13 U
POTASSIUM, TOTAL	53.8	37.8	284	43.5	62.3	50.4	28.4	26.6
SELENIUM, TOTAL	0.44 U	0.41 U	0.77	0.35 U	0.43 U	0.38 U	0.41 U	0.34 U
SILVER, TOTAL	0.05 U	0.04 U	0.06 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
SODIUM, TOTAL	30.4 U	28.3 U	139	24.3 U	29.4 U	25.9 U	28.4 U	23.5 U
THALLIUM, TOTAL	0.44 U	0.41 U	0.56 U	0.35 U	0.43 U	0.38 U	0.41 U	0.34 U
VANADIUM, TOTAL	1	0.35	10.1	0.41	1.4	1.5	0.2	0.09 U
ZINC, TOTAL	7.9	0.78	9.3	4.1	10.9	7.7	4	3

GROUNDWATER ANALYTICAL RESULTS
FEBRUARY 1997
OPERABLE UNIT NO. 4 - SITE 74
MONITORING AND O&M SUPPORT, CTO-0367
TOTAL METALS AND WET CHEMISTRY

SAMPLE ID	74-GW01-97A	74-GW02-97A	74-GW03A-97A	74-GW07-97A
DATE SAMPLED	02/07/97	02/07/97	02/07/97	02/07/97
UNITS	UG/L	UG/L	UG/L	UG/L
TOTAL METALS (ug/L)				
ALUMINUM, TOTAL	228	239	2430	260
ANTIMONY, TOTAL	15.1 U	15.1 U	15.1 U	15.1 U
ARSENIC, TOTAL	1.7 U	1.7 U	1.7 U	1.7 U
BARIUM, TOTAL	21.6	33.8	37.5	89.7
BERYLLIUM, TOTAL	0.5 U	0.5 U	0.5 U	0.5 U
CADMIUM, TOTAL	2.4 U	2.4 U	2.4 U	2.4 U
CALCIUM, TOTAL	1190	5640	202	385
CHROMIUM, TOTAL	1.8 U	1.8 U	1.8 U	1.8 U
COBALT, TOTAL	1.8 U	1.8 U	2.3	1.8 U
COPPER, TOTAL	1.7 U	1.7 U	1.7 U	1.7 U
IRON, TOTAL	5.8 U	49.3	504	1770
LEAD, TOTAL	2.8	1.2	1.5	1.1 U
MAGNESIUM, TOTAL	1320	1860	610	1990
MANGANESE, TOTAL	2.1	11.7	2.3	3.2
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	8.7 U	8.7 U	8.7 U	8.7 U
POTASSIUM, TOTAL	758 U	758 U	758 U	758 U
SELENIUM, TOTAL	1.6 U	1.6 U	1.6 U	1.6 U
SILVER, TOTAL	2.9 U	2.9 U	2.9 U	2.9 U
SODIUM, TOTAL	6250	5060	5240	7310
THALLIUM, TOTAL	0.9 U	0.9 U	0.9 U	0.9 U
VANADIUM, TOTAL	1.6 U	1.6 U	1.6 U	1.6 U
ZINC, TOTAL	1 U	1 U	3.4	1 U
WET CHEMISTRY (mg/L)				
TOTAL DISSOLVED SOLIDS	44	62	46	60
TOTAL SUSPENDED SOLIDS	4 U	4 U	10	4 U