DEPARTMENT OF THE NAVY * ATLANTIC DIVISION NAVAL FACILITIES ENGINEERING COMMAND

Final
Treatability Study Report for the Shallow Aquifer at the Hadnot Point Industrial Area Operable Unit
Camp Lejeune Marine Corps Base
Jacksonville, North Carolina

Baker
Baker Environmental, Inc

FOSTER WHEELER
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WESTON
MANAGERS DESIGNERS/CONSULTANTS

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Prepared For:

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Atlantic Division
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Engineering Command
Norfolk, Virginia

Under the

LANTDIV CLEAN Program

Comprehensive Long-Term
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Reference:
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S.O. No. 19133-70-SRN

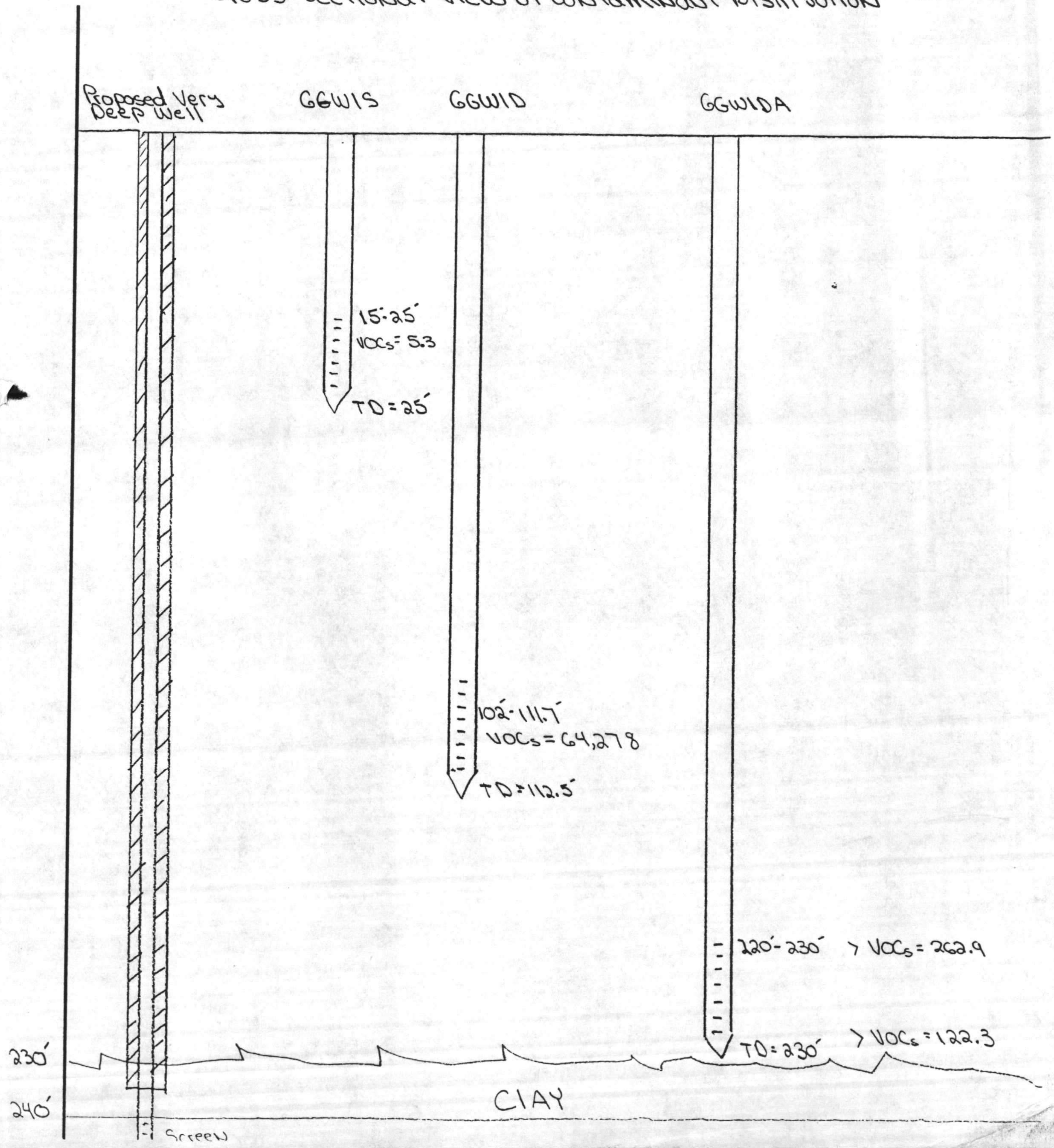
Subject: FIGURE 3

Sheet No. ______ of ______

Drawing No. ______

Computed by ______ Checked By ______ Date ______

Cross-Sectional View of Contaminant Distribution



Note: Wells 6GW10A, 6GW15D, 6GW35D, 6GW30D, 6GW36D, 6GW37D, and 6MW3D were installed during the Phase II investigation. Groundwater data from these wells have not been validated. Additionally, these well have not been surveyed - Approximate locations shown.
- All other wells were installed during the Phase I investigation. Groundwater data obtained from these wells were collected in October - November, 1992.

LEGEND

4,100	Total VOCs in ug/l
6GW1S	EXISTING SHALLOW MONITORING WELL
6GW9	SHALLOW MONITORING WELL INSTALLED BY BAKER ENVIRONMENTAL, Inc., 1992
6GW1D	DEEP MONITORING WELL INSTALLED BY BAKER ENVIRONMENTAL, Inc., 1992
BHSG1	STAFF GAUGE INSTALLED BY BAKER ENVIRONMENTAL, Inc., 1992
	Estimated Groundwater Flow Direction

SOURCE: LANTDIV, FEBRUARY 1992

DATE	APRIL 1993
SCALE	1"= 200'
DRAWN	R.E.L.
REVIEWED	RPW
S.O.#	19133-22-SRN
CADD#	133502RI

NORTH

REMEDIAL INVESTIGATION CTO-0133
MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

BAKER ENVIRONMENTAL, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental, Inc.

MONITORING WELL AND STAFF GAUGE LOCATION MAP FOR SITE 6
Deep Groundwater - Total VOCs

SCALE 1"= 200' DATE APRIL 1993

FIGURE No. 2

6GW1D
Phase II monitoring well

FINAL

TREATABILITY STUDY FOR THE HADNOT POINT INDUSTRIAL AREA SHALLOW AQUIFER

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

CONTRACT TASK ORDER 0017

Prepared For:

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

Under the:

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Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

MAY 13, 1993

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O O'BRIEN & GERE PRELIMINARY ENGINEERING REPORT

1.0 INTRODUCTION

The Atlantic Division Naval Facilities Engineering Command has directed Baker Environmental, Inc. (Baker) to conduct a treatability study for the shallow aquifer at the Hadnot Point Industrial Area (HPIA) Operable Unit Site at the Marine Corps Base Camp Lejeune (CLEJ) in Onslow County, North Carolina. This effort has been conducted in support of the remedial design for an Interim Remedial Action (IRA) for the shallow aquifer at Hadnot Point. This IRA has been documented in a Final Record of Decision (ROD) for this Site (Baker, September 17, 1992). The Navy/Marine Corps has obtained concurrence on this IRA from the State of North Carolina and the United States Environmental Protection Agency (USEPA) Region IV.

A detailed description of this Treatability Study, its objectives and management plan, was presented in the Remedial Design Project Plans for the Shallow Aquifer at the HPIA Operable Unit, submitted by Baker in January,1993. This report includes a summary of the Treatability Study project description and presents the results of the Treatability Study activities along with recommendations based on these results.

1.1 Site Description

Camp Lejeune covers 170 square miles and is located just north of Jacksonville, North Carolina in Onslow County. The base is bounded to the southeast by the Atlantic Ocean, to the northeast by State Route 24 and to west by State Route 17 (Figure 1-1) . This base is primarily a training facility and includes necessary support personnel and industrial support activities.

The HPIA was the first facility at MCB Camp Lejeune and was constructed in the 1940's. Currently, HPIA is comprised of approximately 75 buildings that include: maintenance shops, refueling facilities, warehouses, storage yards, rail facilities, a steam generation plant, a training facility, a fire station, dormitories, a snack bar, administrative offices, commissaries, and a dry-cleaning facility (Figure 1-2).

A former fuel tank farm (Site 22) is located within the HPIA Operable Unit boundaries. This site, which is not being administered under CERCLA regulations, is currently being remediated by a fuel recovery groundwater treatment system.

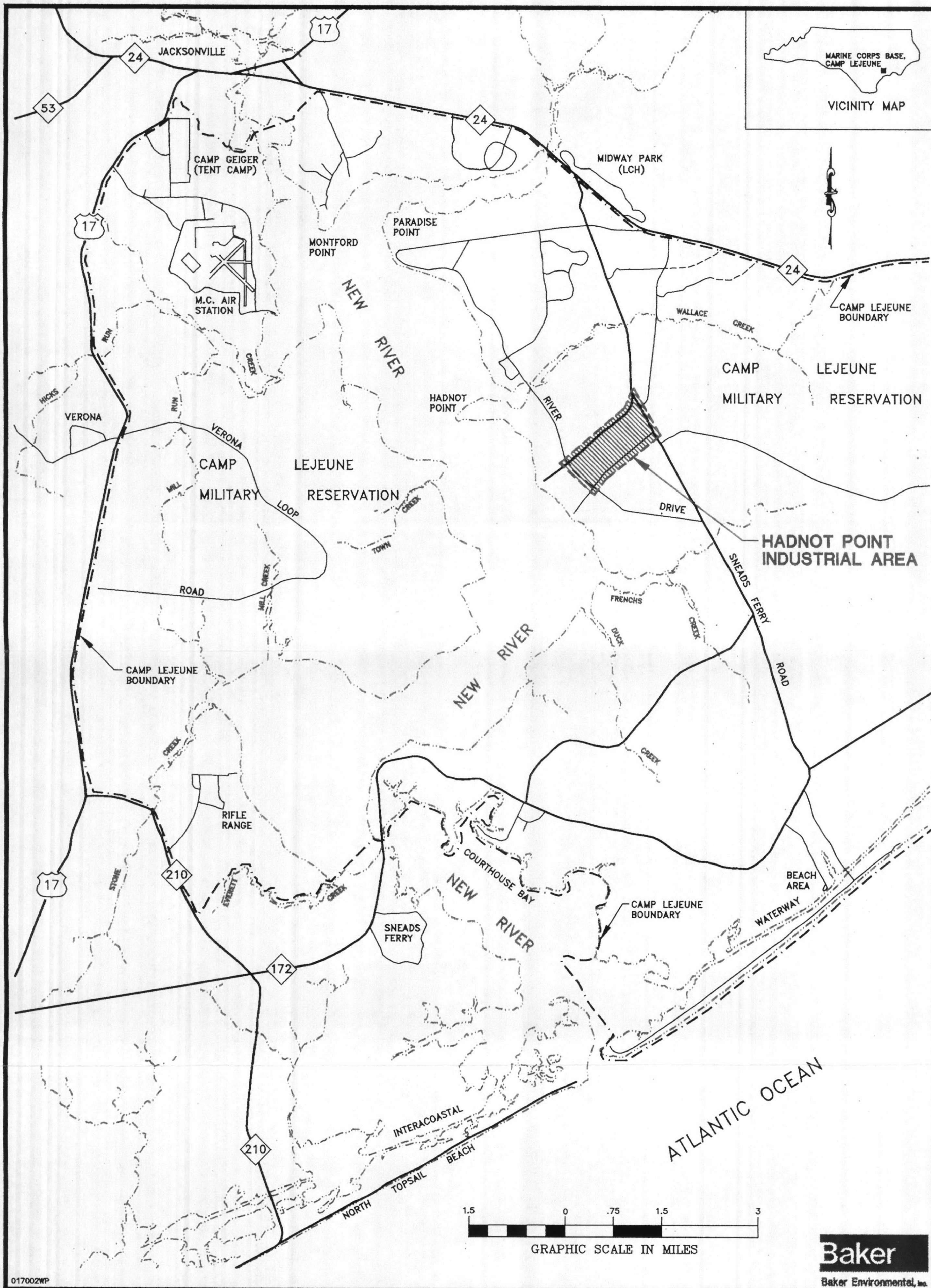
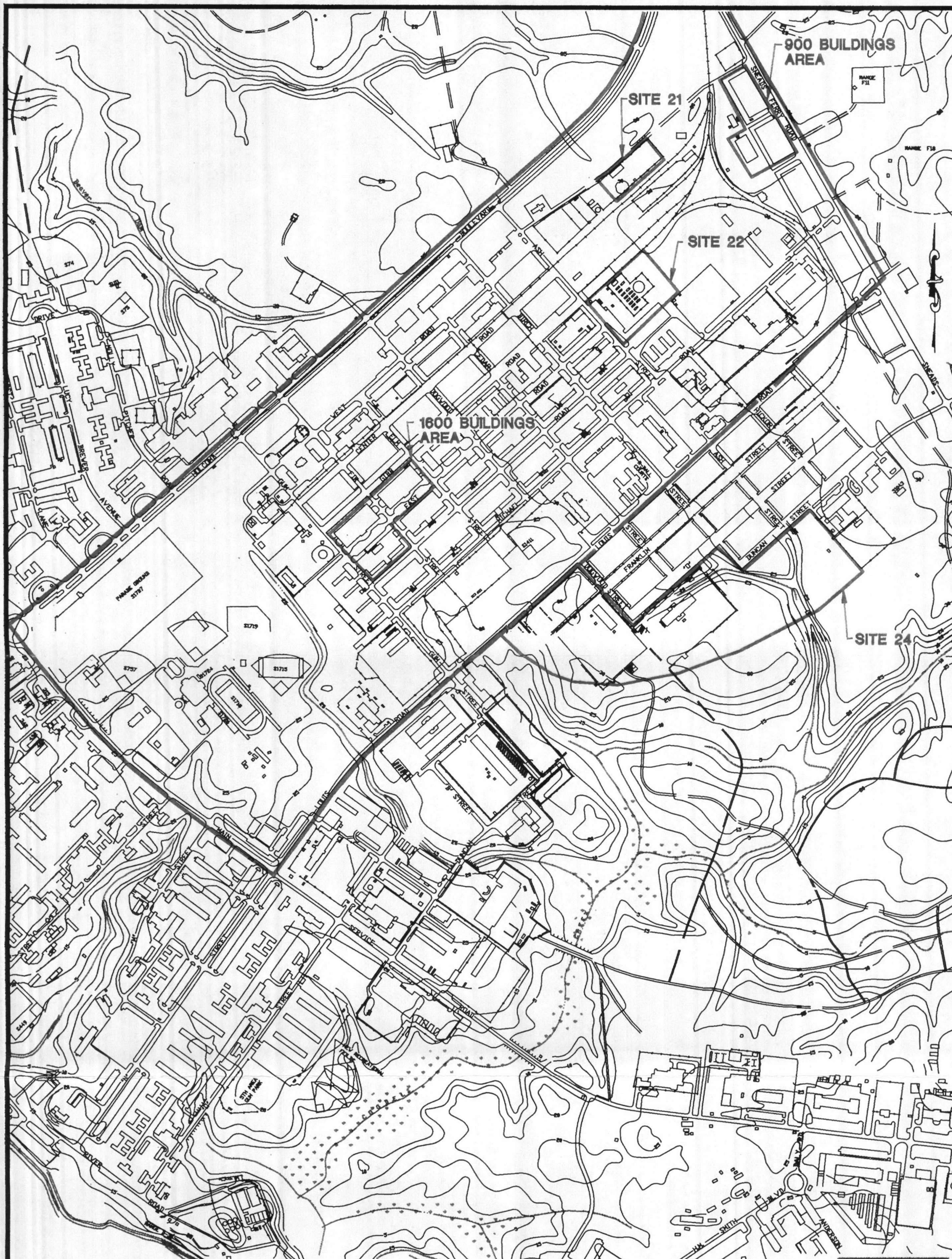


FIGURE 1–1
LOCATION MAP
TREATABILITY STUDY
FOR SHALLOW AQUIFER AT HPIA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA



SOURCE: LANTDIV, FEBRUARY 1992
017003WP

300 0 150 300
1 inch = 300 ft.

FIGURE 1-2
SITE MAP
TREATABILITY STUDY
FOR SHALLOW AQUIFER AT HPIA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

The specific location of the Aquifer and Pilot-Scale Treatability Tests are the 900 Series buildings located at the northeast end of HPIA on Sneads Ferry Road.

1.2 Waste Stream Description

Previous studies indicate that the shallow groundwater is contaminated primarily with fuel related compounds, benzene, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), solvents, and metals, such as antimony, arsenic, beryllium, chromium, iron, lead, manganese, mercury, and nickel. Several compounds were detected at concentrations exceeding the Federal and North Carolina drinking water standards for groundwater.

Prior to this Treatability Study, the most recent shallow groundwater data was collected in January 1991 by ESE. Based upon the results of the 1991 sampling, the following compounds were identified as potential contaminants of concern for the shallow aquifer at the HPIA: benzene; 1,2-DCE; TCE; antimony; arsenic; beryllium; chromium; iron; lead; manganese; mercury; and, nickel. Table 1-1 presents a summary of the 1991 shallow aquifer groundwater data with respect to the contaminants of concern. Oil and grease data are not included on Table 1-1 due to the fact that this analysis was not conducted on any of the 1991 samples. The maximum concentrations of benzene (7900 µg/L) were detected in a monitoring well immediately adjacent to the fuel tank farm (Site 22). Maximum concentrations of 1,2-DCE (42,000 µg/L) and TCE (14,000 µg/L) were detected in the northeast corner of the site (near the 900 series buildings) and in the southwestern portion of the site (near the 1600 series buildings), respectively. Metals concentrations were elevated throughout most of the site, especially near the fuel farm (lead).

Based on review of existing data, two major areas of contaminated groundwater (source areas) have been identified in the shallow aquifer at HPIA as shown on Figure 1-3. The first area or plume is located northeast of Cedar Street near the 900 series buildings. The other plume is located southwest of Cedar Street near the 1600 buildings.

1.3 Remedial Technology Description

A description of the liquid treatment processes that were evaluated in the bench-scale and pilot-scale tests are presented in this subsection.

TABLE 1-1
SUMMARY OF CONTAMINANTS OF CONCERN DETECTED IN THE SHALLOW GROUNDWATER AQUIFER, JANUARY 1991

Potential Contaminants of Concern	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW5	HPGW6	HPGW7	HPGW8	HPGW9-1	HPGW10	HPGW11	HPGW12	HPGW13	HPGW14	HPGW15
VOC (µg/L)															
Benzene	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <
1,2-Dichloroethene	73	10 <	10 <	5 <	5 <	5 <	5 <	5 <	1200	5 <	5 <	5 <	5 <	5 <	7
Trichloroethene	91	5 <	5 <	0.9 J	5 <	5 <	5 <	2 J	14000	5 <	5 <	5 <	5 <	5 <	4 J
Inorganics (µg/L)															
Chromium	87	64.3	16.7	187	3.6 B	1590	313	91.8	66.4	310	140	25.5	48.9	127	21.4
Iron	64100	34800	10400	100000	3100	265000	65700	40900	19800	119000	31800	5600	33500	87200	4800
Lead	16.6	29.4	11.4	66.6	13.6	60.7	112	54.1	128	186	45.2	15.7	9	66.5	16.6
Manganese	168	77	53.9	425	162	487	136	46.5	45	255	103	18.3	30.3	80	18.3
Antimony	13.3 <	15.6 B	46.5 B	21.9 B	13.3 <	13.3 <	22 <	22	17.6 B	22 <	22 <	22 <	13.3 <	13.3 <	22 <
Arsenic	8 B	24.1	15.6	15.5	1.5 <	31.5	18.3	28.4	3 B	39.9	9.1 B	1.8 <	47	45.6	1.8 <
Beryllium	6	1.7 BG	1.2 B	6.7	0.86 B	20	4.8 B	2.1	0.79 B	5.6	2.1 <	2.1 <	0.59 B	2.7 B	2.1 <
Mercury	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	1.4	0.25	0.13	0.1 <	0.82	0.1 B	0.1 <	0.1 <	0.26	0.1 <
Nickel	31.3 B	16.9 B	12.1 B	57	5.2 <	161	50.7	25.2	15.1 B	92.2	23.6 B	11 <	21.2 B	41.6	11 <

Potential Contaminants of Concern	HPGW16	HPGW17-1	HPGW18	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23	HPGW24-1	HPGW25	HPGW26	HPGW29	22GW1	22GW2
VOC (µg/L)														
Benzene	5 <	5 <	N/A	5 <	5 <	5 <	5 <	24	3 J	5 <	5 <	5 <	7900	5 <
1,2-Dichloroethene	5 <	5 <	N/A	0.8 J	5 <	5 <	5 <	8900	42000 D	5 <	5 <	5 <	5 <	5 <
Trichloroethene	5 <	5 <	N/A	2 J	5 <	3 J	5 <	3700	180	5 <	5 <	5 <	5 J	5 <
Inorganics (µg/L)														
Chromium	209	37	N/A	13.8	424	45	79.8	76.3	26.3	205	13	179	457	26.3
Iron	47200	10500	N/A	36200	2E+05	56600	24400	23300	19200	46600	19000	76200	1E+05	16200
Lead	100	23.7	N/A	31.7	20	49.4	39.4	45	21.4	71.6	9	29.1	307	16.2
Manganese	98.3	31.3	N/A	79	217	136	94.1	68.8	54.8	118	10.6 B	236	284	763
Antimony	22 <	22 <	N/A	13.3	21.9B	13.3 <	24.6 B	24.6 <	22 <	13.3 <	13.3 <	13.3 <	20.9 B	13.3
Arsenic	17.3	1.8 <	N/A	5 B	49.4	12.1	7.2 B	6.6 B	4.2 B	13.2	1.5 <	25.6	50.3	11
Beryllium	5.3	2.1 <	N/A	2.3 B	9.5	3.7 B	0.6 B	1 B	2.1 <	2.8 B	0.5 <	8.7	5.8	0.5
Mercury	0.13 B	0.1 <	N/A	N/A	0.5	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.35	0.1
Nickel	41	11.9 B	N/A	7.3 B	168	30.8 B	23.2 B	33.2 B	14 <	39.2 B	5.2 <	93.5	186	17

Notes: < = Compound was analyzed, but not detected at the listed detection limit
J = Value is estimated
B = Reported value is < contract required detection limit (CRDL), but > instrument detection limit (IDL)
D = Compound identified in an analysis at a secondary dilution factor

N/A = Not Analyzed

LEGEND

APPROXIMATE SOURCE AREA OF GROUNDWATER CONTAMINATION IN THE SHALLOW AQUIFER

20 EXISTING SHALLOW MONITORING WELL

24-2 EXISTING INTERMEDIATE MONITORING WELL

24-3 EXISTING DEEP MONITORING WELL

SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 1-3
APPROXIMATE AREA OF GROUNDWATER CONTAMINATION IN THE SHALLOW AQUIFER
HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

1.3.1 Bench-Scale

Bench-scale testing was designed to simulate the following processes:

- Oil/water separation was used as pretreatment to remove free oil and oily sludges through gravity separation.

- Metals Removal was used to remove inorganics from the groundwater. The metals removal processes included flocculation, precipitation, and sedimentation:

  - Flocculation is the process by which very small, unsettleable particles suspended in a liquid medium collide and agglomerate into larger heavier particles or flocs and settle out.

  - Precipitation is the process in which materials in solution are transferred into a solid phase for removal.

  - Sedimentation is the process used to remove suspended solids from aqueous waste streams by gravity separation.

1.3.2 Pilot-Scale

Pilot-Scale testing consisted of the following processes:

- Air Stripping is a physical treatment process in which water and air are brought into contact with each other for the purpose of transferring volatile substances from solution in a liquid to solution in a gas.

- Carbon Adsorption is a physical process that binds organic molecules to the surface of the activated carbon particles. Activated carbon has an enormous surface area. One gram of commercially activated carbon is estimated to have a surface area of 1,000 to 1,400 square meters. The process involves contacting a waste stream with carbon, usually by flow through a series of packed bed reactors.

2.0 GEOLOGIC CONDITIONS

The following subsections present summaries of the regional and site geology encountered in the HPIA.

2.1 Regional Geology

MCB Camp Lejeune is located in the Atlantic Coastal Plain physiographic province. The region is underlain by several thousand feet of unconsolidated deposits ranging in age from Lower Cretaceous to Holocene. These sediments consist of interbedded sands, clays, calcareous clays, shell beds, and gravel. Regionally, they comprise 10 aquifers and nine confining units which overlie a bedrock basement of Pre-Cambrian and Jurassic/Triassic age. Generally, these deposits dip and thicken gently eastward (i.e., seaward) with thicknesses ranging from 1,500 feet to 5,000 feet. The sediment complex at Jacksonville, North Carolina, is approximately 1,500 feet thick (U.S.G.S. W-RIR 894128). Table 2-1 presents a generalized stratigraphic column for this area.

2.2 Site Geologic Conditions

USGS studies at MCB Camp Lejeune indicate that the Base is underlain by seven sand and limestone aquifers separated by confining units of silt and clay. These include the water table (surficial), Castle Hayne, Beaufort, Peedee, Black Creek, and Upper and Lower Cape Fear aquifers. The combined thicknesses of these sediments is approximately 1,500 feet. Less permeable clay and silt beds function as confining or semi-confining units which separate the aquifers and impede the flow of groundwater between aquifers.

Lithologic information obtained during monitoring well, recovery well and piezometer installation at Hadnot Point Industrial Area (HPIA) indicate that the site is underlain by silty sand with extensive, but discontinuous, layers of silty clay and silty-sandy clay. Peat, wood fragments, and plant debris are present in a one or two foot layer in the southwest portion of the HPIA, suggesting a historical marsh environment. Peat was also encountered at a depth of 18 feet in the northwest portion of the site. Other geologic materials underlying the site include fill (up to four feet thick) adjacent to construction areas, and marl.

TABLE 2-1

GENERALIZED RELATION BETWEEN GEOLOGIC AND HYDROGEOLOGIC UNITS IN THE COASTAL PLAIN OF NORTH CAROLINA

Geologic Units			Hydrogeologic Units
System	**Series**	**Formation**	**Aquifer and Confining Unit**
Quaternary	Holocene Pleistocene	Undifferentiated	Surficial Aquifer
Tertiary	Pliocene	Yorktown Formation(1)	Yorktown Confining Unit
			Yorktown Aquifer
	Miocene	Eastover Formation(1)	
		Pungo River Formation(1)	Pungo River Confining Unit
			Pungo River Aquifer
		Belgrade Formation(2)	Castle Hayne Confining Unit
	Oligocene	River Bed Formation	Castle Hayne Aquifer
	Eocene	Castle Hayne Formation	
			Beaufort Confining Unit
	Paleocene	Beaufort Formation	Beaufort Aquifer
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee Confining Unit
			Peedee Aquifer
		Black Creek and Middendorf Formations	Black Creek Confining Unit
			Black Creek Aquifer
			Upper Cape Fear Confining Unit
		Cape Fear Formation	Upper Cape Fear Aquifer
			Lower Cape Fear Confining Unit
			Lower Cape Fear Aquifer
	Lower Cretaceous(1)	Unnamed Deposits(1)	Lower Cretaceous Confining Unit
			Lower Cretaceous Aquifer
Pre-Cretaceous Basement Rocks		--	--

(1) Geologic and hydrologic units probably not present beneath Camp Lejeune.
(2) Constitutes part of the surficial aquifer and Castle Hayne Confining Unit beneath Camp Lejeune.
(3) Estimated to be confined to deposits of Paleocene Age in the study area.

Source: U.S.G.S., Water Resources Investigations Report 89-4096, "Assessment of Hydrologic and Hydrogeologic Data at Camp Lejeune Marine Corps Base, North Carolina," 1989.

3.0 HYDROGEOLOGY

The following subsections present summaries of the regional and site hydrogeologic conditions encountered in the HPIA.

3.1 Regional Hydrogeology

The hydrogeologic framework of the Jacksonville, North Carolina area includes seven principal aquifers listed in superposition as follows: (1) the surficial water table; (2) the Castle Hayne; (3) Beaufort; (4) Peedee; (5) Black Creek; (6) Upper Cape Fear; and (7) Lower Cape Fear. Only the surficial and Castle Hayne Aquifers are of concern in this report. Aquifers below the Castle Hayne lie in a thick sequence of sand and clay. Although some of these aquifers are used for water supply elsewhere in the coastal plain, they contain saltwater in the Camp Lejeune area and are not used (U.S.G.S., W-RIR 89-4096).

The surficial aquifer is found in beds and lenses of sand and clay. These deposits range in thickness from 25 to 100 feet and overlie the sediments containing the Castle Hayne aquifer. The sand lenses are the major water-bearing strata and are very heterogeneous and discontinuous because of the complex marine/estuarine environments in which they were deposited. In some areas, the surficial aquifer is reported to contain water contaminated by waste disposal practices (Putnam, 1983).

The Castle Hayne Aquifer underlies the surficial aquifer. Most of the supply wells in the area tap this aquifer at depths ranging from 50 to 300 feet. This aquifer ranges in thickness from 250 to 400 feet but brackish water is normally encountered below 300 feet. The water-bearing zones are a series of sandstone, limestone and clay beds of the Oligocene River Bend Formation and the Middle Eocene Castle Hayne Formation.

The upper half of the Castle Hayne Aquifer is primarily sand; the lower half is sand and limestone. The top of the aquifer ranges from about 20 feet above sea level in the northern part of the area to about 40 feet below sea level in the southeastern part. The aquifer thickens toward the southeast from 175 feet at the Marine Corps Air Station to about 375 feet at the coast (U.S.G.S., W-RIR 89-4096).

Clay layers occur in both the Castle Hayne and the surficial aquifers. However, no continuous clay layer separates the surficial and the Castle Hayne. The clay layers appear to be more continuous in the northwestern part of the base (U.S.G.S., W-RIR 89-4096).

Confining sediment beds restrict the direct exchange of groundwater between the surficial and the Castle Hayne aquifers. However, some hydraulic connection between the two aquifers has been observed (Department of the Navy, 1990).

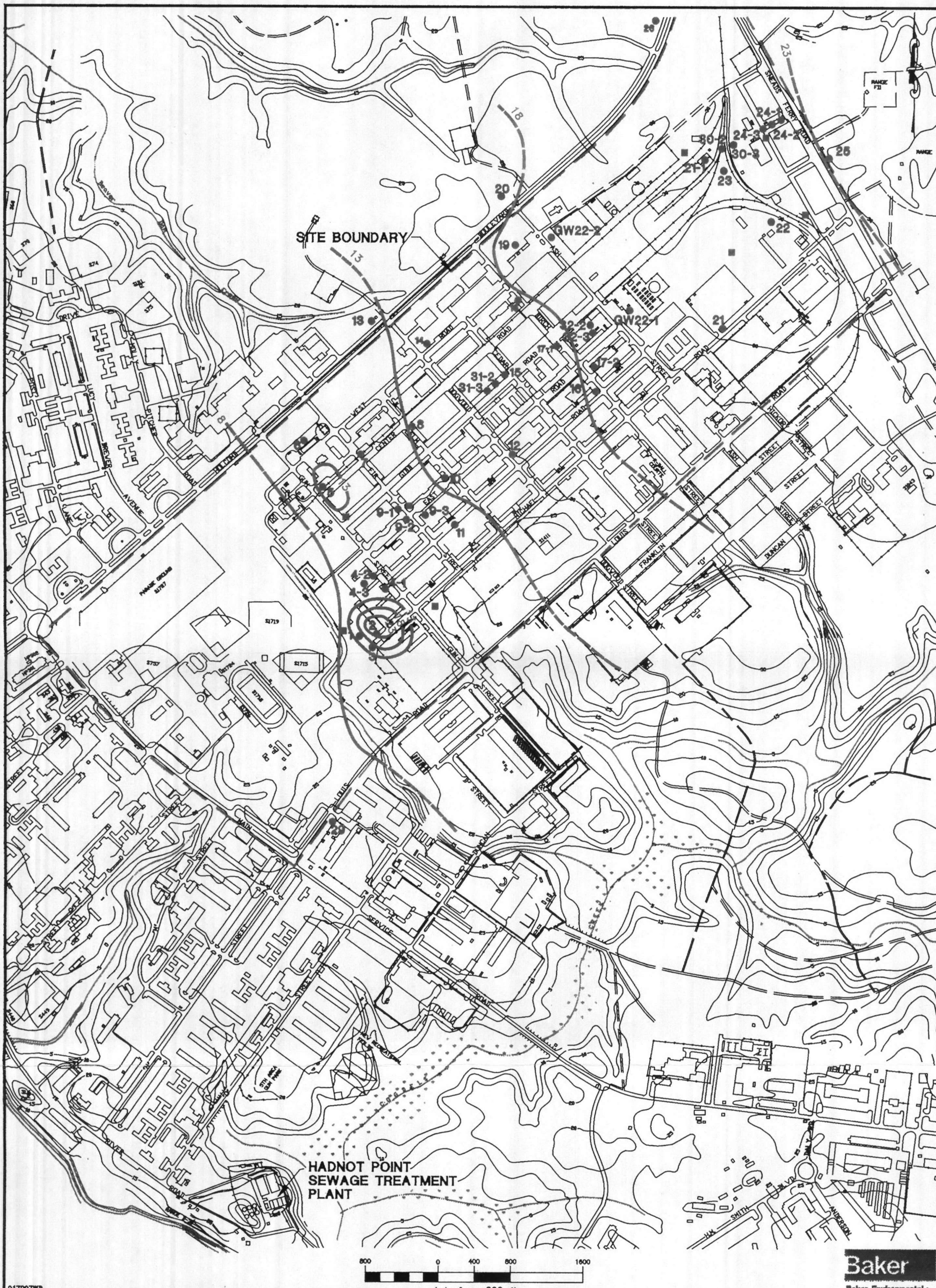
3.2 Site Hydrogeologic Conditions

The groundwater system at the HPIA consists of an unconfined shallow aquifer (i.e., surficial aquifer) and underlying semi-confined aquifers. The shallow aquifer is separated from the underlying aquifers by a discontinuous clay and sandy clay layer. Groundwater in this zone ranges in depths from 6 to 23 feet below ground surface, based on two rounds of water level measurements collected in January and February 1991 (ESE, 1991b). Seasonal water level fluctuations were reported to range from 1 to 4 feet.

In general, groundwater in the shallow aquifer flows to the southwest, towards the New River. Figure 3-1 presents a potentiometric surface map of the water table constructed from water level measurements taken from the shallow monitoring wells on February 20, 1991 by Environmental Science and Engineering, Inc.. The ESE report indicated some mounding of groundwater in the southern corner of HPIA. A surface drainage ditch, which was observed to be full of water, is located in this portion of the HPIA and may act as a recharge point (ESE, 1991b).

The following shallow aquifer characteristics were calculated by O'Brien & Gere based on the results of an 8-hour pump test conducted in 1988:

- Transmissivity = 500 gpd/ft
- Well yield = 3 gpm
- Saturated thickness = 19 - 22 feet
- Radius of influence = 300 - 400 feet



LEGEND

EXISTING MONITORING WELL LOCATION

8 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

SOURCE: LANTDIV, FEBRUARY 1992

FIGURE 3-1
SHALLOW GROUNDWATER ELEVATION CONTOUR MAP (2-20-91)
HADNOT POINT INDUSTRIAL AREA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

4.0 TREATABILITY STUDY ACTIVITIES APPROACH

4.1 Test Objectives

The Feasibility Study (FS) for the HPIA Operable Unit provided remedial screening of potential technologies for the treatment of the contaminants of concern. This treatability study will provide remedy selection testing to evaluate the remedial technologies' performance in meeting the site-specific clean-up goals for the HPIA Operable Unit. The cleanup goals include Federal and North Carolina Groundwater MCLs that are shown on Table 4-1. These goals have been defined by the USEPA Region IV and the North Carolina DEHNR. The treatability studies will provide data to support the design of pretreatment components (e.g., metals removal, oil separation) and the air stripping treatment unit. Additionally, the pilot study will provide data to evaluate whether other treatment components (i.e., carbon adsorption) are required as part of the treatment system in order to meet cleanup goals.

4.2 Bench-Scale Treatability Studies

This section describes the experimental design and procedures, as well as equipment and materials used to perform bench-scale treatability testing on groundwater samples from the HPIA Operable Unit. A representative sample of groundwater (approximately 70 liters) was collected prior to the aquifer pump test to perform sample characterization and bench-scale treatability testing. Based on the sample characterization results, oil/water separation and gravity settling tests were conducted on the groundwater samples. Analytical results for the sample characterization and treatability tests are provided in Section 5.1, Bench-Scale Studies.

4.2.1 Experimental Design and Procedures

The procedures used to collect the characterization samples, to conduct the oil/water separation, and gravity settling tests are discussed in the following subsections.

4.2.1.1 Sample Characterization

A representative composite groundwater sample was obtained from groundwater pumping well HPIA-GW-24, located within the HPIA Operable Unit. A raw unfiltered aliquot of this

TABLE 4-1

FEDERAL AND STATE CRITERIA FOR THE CONTAMINANTS OF CONCERN IDENTIFIED FOR THE SHALLOW AQUIFER

Contaminant of Concern	North Carolina* Water Quality Criteria for Groundwater (µg/L)	Federal Drinking Water MCLs (µg/L)	North Carolina* Water Criteria for Fresh Surface Water (µg/L) Class C Waters	North Carolina* Water Quality Criteria for Tidal Salt Waters (µg/L) Class SC Waters
TCE	2.8	5	92.4 (4)	92.4 (4)
1,2-DCE	--	70	--	--
Benzene	1	5	71.4 (4)	71.4 (4)
Antimony	--	6	--	--
Arsenic	50	50	50 (1)	50 (1)
Beryllium	--	4	.117 (4) 6.5 (1)	.117 (4)
Chromium	50	100	50 (1)	20 (1)
Iron	300	--	1000 (5)	--
Lead	50	15(3)	25 (1)	25 (1)
Manganese	50	--	--	--
Mercury	1.1	2	0.012 (1)	.025 (1)
Nickel	150	100	88 (1)	--

* From NC Administrative Code 15A NCAC 2B.0200

(1) Protection of Aquatic Life.

(2) -- = No standard established.

(3) MCL is action level for public water supply systems.

(4) Protection of Human Health through consumption of fish/shell fish.

(5) NC Action Level for discharge to fresh waters.

water was submitted for analysis of Target Analyte List (TAL) metals and selected engineering parameters. The purpose of the analysis was to determine a representative value for total inorganics and oil & grease content of groundwater from the HPIA Operable Unit. In addition, a groundwater aliquot was field filtered through a 0.45-micron filter using a vacuum pump. This sample was analyzed for TAL metals to provide information on concentrations of dissolved metals in HPIA groundwater. A summary of the analytical methods, sample preservation, and other pertinent details regarding the bench-scale analytical requirements is presented in Table 4-2.

Comparison of sample characterization data with anticipated discharge criteria and knowledge of general engineering practices will provide a reliable indication as to whether pretreatment for metals and/or solids removal is necessary. For instance, if dissolved metals concentrations are below anticipated discharge criteria, then physical treatment to remove suspended solids (gravity settling and/or filtration) would provide adequate pretreatment. If dissolved metals concentrations exceed anticipated discharge criteria, then some form of chemical treatment or advanced physical treatment (e.g. ultrafiltration) may be required.

4.2.1.2 Oil/Water Separation

Oil/water separation treatability testing was conducted on HPIA groundwater samples to assess the need for free phase oil and grease removal prior to organics removal (e.g., air stripping and/or carbon adsorption) and to provide information in sizing separation equipment and product storage. The treatability testing consisted of a single oil/water separation run. To set up the test run, groundwater (well mixed near room temperature) was poured into a large pyrex jar and allowed to sit quiescently over a one hour period. Samples for oil and grease analysis were extracted from below the discernible oil layer at various time intervals. A description of the detailed test procedures implemented in the treatability testing are outlined below:

TEST PROCEDURES FOR OIL/WATER SEPARATION TREATABILITY TESTING

(1) Set up bench-scale oil/water separation apparatus as shown in Figure 4-1.

(2) Retrieve groundwater samples from cold storage (approximately 4 degrees C) and place in a warm water bath. Allow temperature of samples to reach approximate room temperature.

Table 4-2

Groundwater Characterization and Bench-Scale Treatability Testing Analytical Requirements Summary Table

Parameter	Method	Practical Quantitation Limit (ug/l)	Sample Volume Requirement	Container Type	Sample Preservation	Holding Time
Target Analyte List Metals						
Aluminum	EPA 200.7	40	500 ml	Plastic	Cool to 4 C HNO3 to pH < 2	180 Days Except Mercury at 28 Days
Antimony	EPA 204.2	2				
Arsenic	EPA 206.2	5				
Barium	EPA 200.7	2				
Beryllium	EPA 200.7	2				
Cadmium	EPA 213.2	1				
Calcium	EPA 200.7 EPA 215.1	5				
Chromium	EPA 218.2	5				
Cobalt	EPA 200.7	5				
Copper	EPA 200.7	7				
Iron	EPA 200.7	6				
Lead	EPA 239.2	5				
Magnesium	EPA 200.7	100				
Manganese	EPA 200.7	1				
Mercury	EPA 245.1	0.2				
Nickel	EPA 200.7	20				
Potassium	EPA 200.7	200				
Selenium	EPA 270.2	2				
Silver	EPA 200.7	20				
Sodium	EPA 200.7	100				
Thallium	EPA 279.2	5				
Vanadium	EPA 200.7	7				
Zinc	EPA 200.7	50				
Engineering Parameters						
Ammonia	EPA 350.2	100	500 ml	Plastic	Cool to 4 C H2SO4 to pH < 2	28 Days
Bicarbonate	SM 403/406C	1000	500 ml	Plastic	None Required	14 Days
Carbonate	SM 403/406C	1000	500 ml	Plastic	None Required	14 Days
Chloride	EPA 325.2	1000	250 ml	Plastic	None Required	28 Days
Hardness	EPA 130.2	1000	150 ml	Plastic	HNO3 to pH < 2	180 Days
Nitrate/Nitrite	EPA 353.2	10	250 ml	Plastic	Cool to 4 C H2SO4 to pH < 2	28 Days
Oil and Grease	EPA 413.1	2000	1000 ml	Glass	Cool 4 C H2SO4 to pH < 2	28 Days
Total Dissolved Solids	EPA 160.1	1000	250 ml	Plastic	Cool to 4 C	7 Days
Total Suspended Solids	EPA 160.2	1000	250 ml	Plastic	Cool to 4 C	7 Days

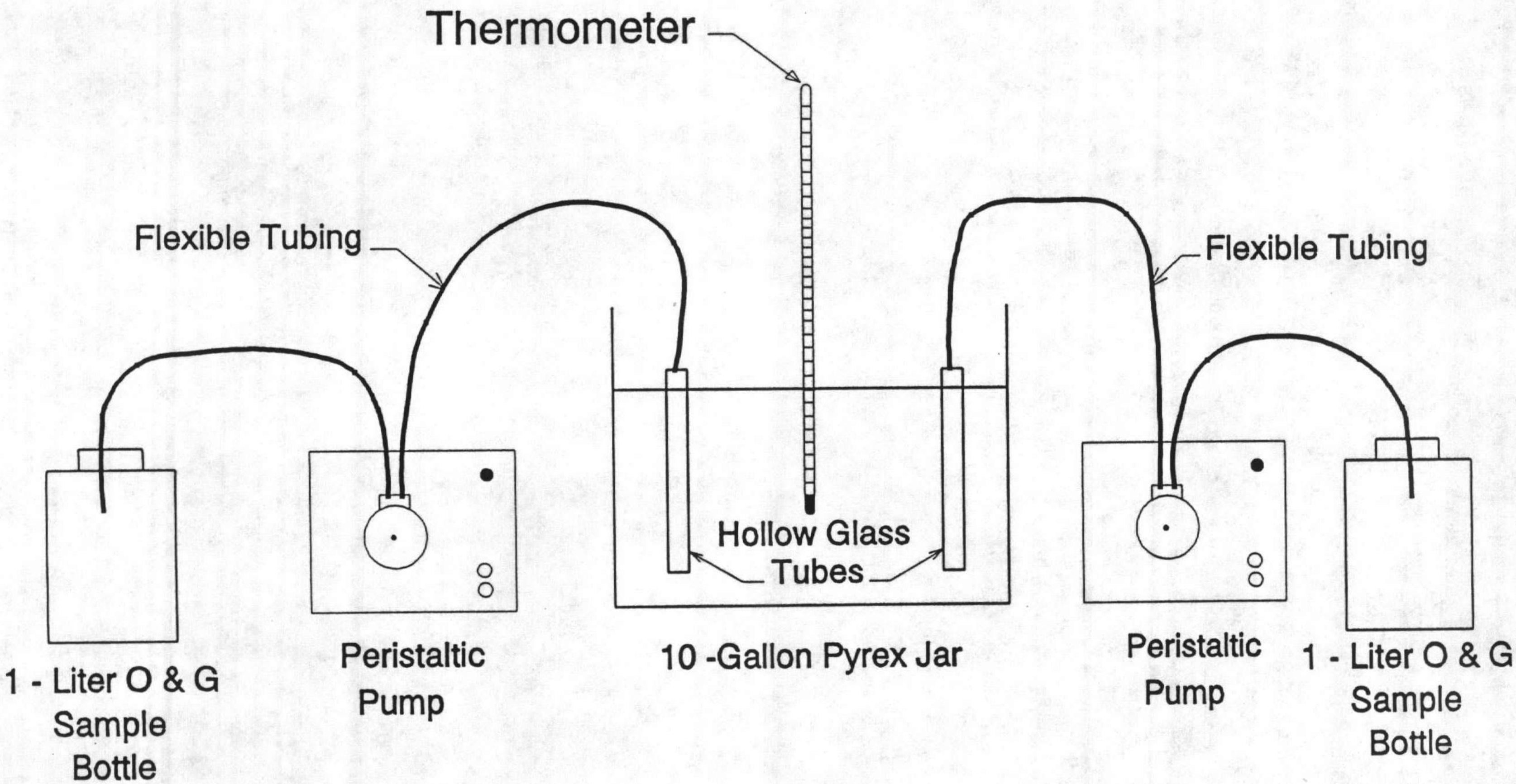


Figure 4-1
Oil and Grease Removal Equipment

(3) Measure 1 liter of groundwater using a 1 liter glass beaker and pour into the 9 gallon glass Pyrex vessel. Continue measuring and adding groundwater until approximately 10 liters is added to vessel. Record total volume of groundwater added.

(4) Once groundwater has been completely added to vessel, start tracking time. Collect samples at the following time intervals: 15 minutes, 30 minutes, and 60 minutes. Record observations of settling or separation (i.e., visible layer(s) of oil and grease, sediment), as well as the general appearance of sample in vessel. The sampling procedure is discussed in more detail below.

(a) After each time interval is reached, turn on sampling pump and withdraw a 1 liter sample. The tubing with pipette end from pump suction should be inserted below the discernible oil layer to ensure that floating oil and grease is not collected in sample withdrawn from vessel.

(b) Place each 1 liter sample in a 1 liter amber glass jar for analysis of oil and grease. In addition to the three samples, collect an additional sample at 60 minutes for Quality Assurance/Quality Control.

(c) Record the following information on all samples to be submitted for analysis:

- Project Name
- Client
- Sample No.
- Date of Sample
- Sampler(s) Initials

(5) Fill out chain-of-custody form(s) for samples and submit for analysis.

(6) Place residuals from treatability study in 5-gallon plastic buckets and firmly seal lid for subsequent disposal.

4.2.1.3 <u>Gravity Settling</u>

Gravity settling tests were conducted on groundwater samples collected from the HPIA Operable unit. The purpose of performing the tests was to determine if gravity settling will

provide sufficient physical treatment to remove metals to levels that will meet anticipated discharge criteria. Based on the sample characterization results (presented in Section 5.0), it was determined that chemical treatment (metals precipitation jar tests) would not be necessary because the metals of concern were primarily associated with the suspended solids. However, because addition of appropriate polymers can enhance the coagulation and flocculation of solid particles, agglomeration of smaller particles and subsequent settling of solids, evaluation of cationic/anionic polymer addition was included in the treatability testing.

The treatability testing consisted of two test runs. The first run evaluated gravity settling of raw groundwater samples and the second run investigated the settling characteristics of raw groundwater when mixed with a predetermined optimal dosage of polymer. The optimal polymer type and dosage was determined by mixing aliquots of raw groundwater with three dosages each of cationic and anionic polymer and selecting the mixture that qualitatively appeared to yield the best settling.

A description of the detailed test procedures implemented in the treatability testing are outlined below:

TESTING PROCEDURES FOR GRAVITY SETTLING AND SELECTION OF OPTIMUM POLYMER DOSAGE

(1) Set up bench-scale gravity settling apparatus and polymer testing equipment as shown in Figure 4-2.

(2) Retrieve groundwater samples from cold storage (approximately 4 degrees C) and place in a warm water bath. Allow temperature of samples to reach approximate room temperature.

(3) Pour raw groundwater sample into a beaker and mix with a glass stirring rod. Obtain and place two samples in plastic containers for initial analysis (before gravity settling) of total suspended solids (TSS) and metals (Al, As, Cr, Fe, Pb, and Mn).

(4) Clean four 1000 ml graduated cylinders and identify as #1, #2, #3, and #4. Fill each cylinder with a well mixed sample of raw groundwater.

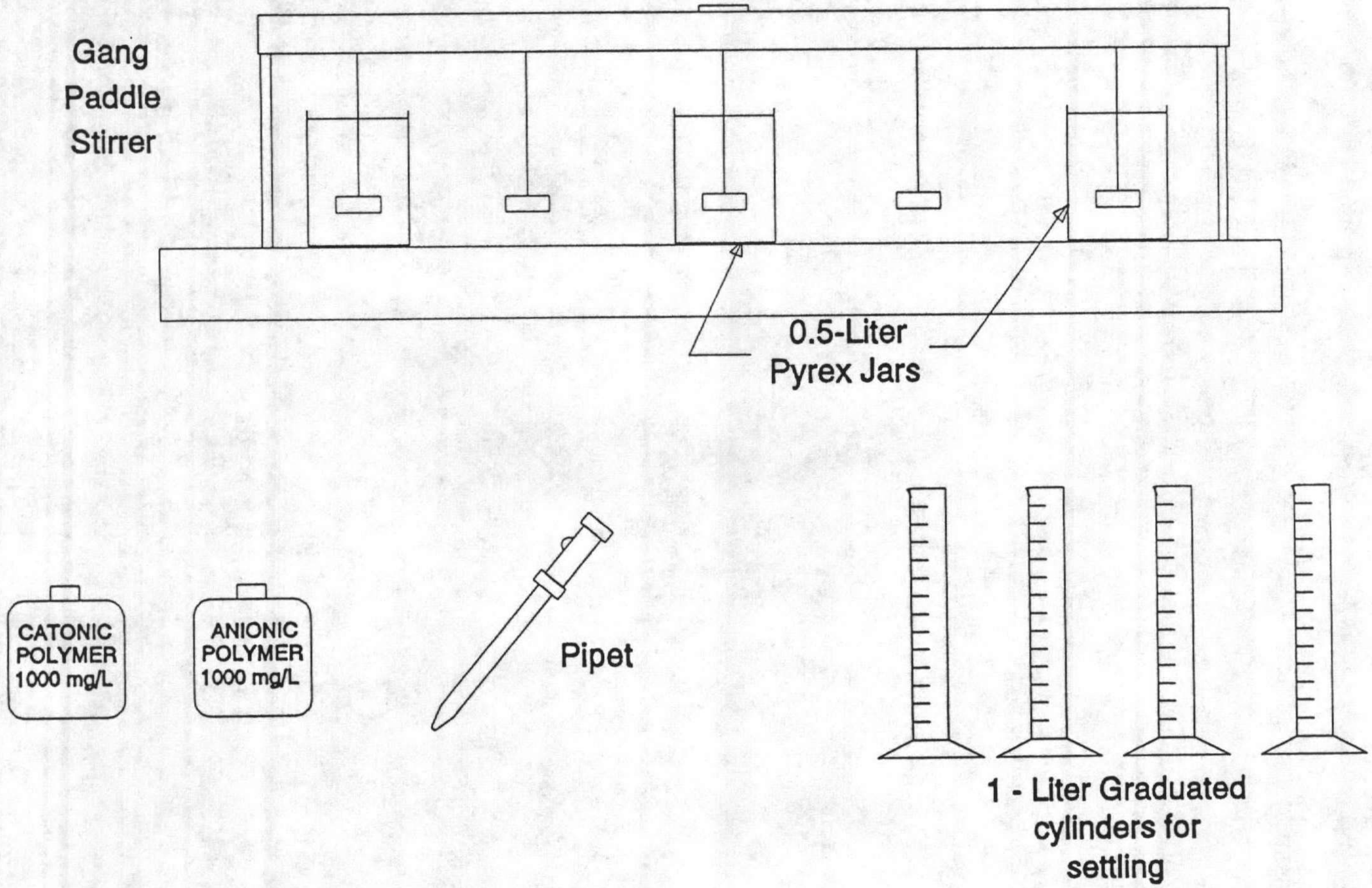


Figure 4-2
Solids Settling Apparatus

(5) Start clock after last cylinder is filled. Pump top 250 ml of supernatant out of cylinder #1 at 10 minutes, cylinder #2 at 20 minutes, cylinder #3 at 30 minutes, and cylinder #4 at 60 minutes. Each sample should be obtained by placing suction tubing of pump in top of cylinder and drawing sample off. Place samples in appropriate containers and designate for the following analysis:

- Cylinder #1 10 min. TSS
- Cylinder #2 20 min. TSS
- Cylinder #3 30 min. TSS
- Cylinder #4 60 min. TSS, Al, As, Cr, Fe, Pb, Mn

Observe and record settling characteristics of sample in each cylinder at each sampling interval.

(6) Evaluate mixtures of raw groundwater with several anionic and cationic polymer dosages to qualitatively determine an optimal polymer type and dosage. For this treatability study, the polymers evaluated were Armstrong APS (anionic) and Calgon Pol-E-Z 692 (cationic).

The evaluation was performed in the following manner:

Anionic/Cationic Polymer Evaluation

(a) Mix in separate glass beakers an aliquot of raw groundwater with anionic polymer at dosages of 0.25, .5, 1, and 2 mg/L, respectively.

(b) Place beakers under a paddle stirrer and agitate each mixture at a low speed for approximately 5 minutes.

(c) Repeat Steps (a) and (b) above, except use cationic polymer.

(d) Observe and record characteristics of mixtures (i.e. are there agglomerates of solids particles, settling of particles, and a well defined supernatant?)

(e) Based on visual observations and best engineering judgment, identify the polymer and dosage which appears to yield the most favorable results with the minimum quantity of polymer used.

(7) Obtain two additional raw groundwater samples and place in two separate containers for initial analysis (before gravity settling with chemical treatment) of TSS and metals (Al, As, Cr, Fe, Pb, and Mn). These will serve as QA/QC samples for the raw groundwater settling run.

(8) Mix raw groundwater and polymer in a 2000 ml glass beaker. The type (anionic or cationic) and dosage should be that determined in step (6) outlined above. Fill each of four clean 1 liter graduated cylinders with a well mixed sample of raw groundwater and polymer and repeat Step (5) above, except collect samples at the following time intervals from each cylinder and designate for analysis as follows:

- Cylinder #1 5 min. TSS
- Cylinder #2 10 min. TSS
- Cylinder #3 15 min. TSS
- Cylinder #4 30 min. TSS; Al, As, Cr, Fe, Pb, Mn

(9) Record the following information on all samples to be submitted for analysis:

- Project Name
- Client
- Sample No.
- Date of Sample
- Sampler(s) Initials

(10) Fill out chain-of-custody form(s) for samples and submit for analysis.

(11) Place residuals from treatability study in 5-gallon plastic buckets and firmly seal lid for subsequent disposal.

4.2.2 Equipment and Materials

This subsection presents a description of the test equipment and materials used in the bench-scale treatability testing of groundwater samples from the HPIA Operable unit.

4.2.2.1 Oil/Water Separation

The following equipment is required to set up the treatability apparatus and complete the oil/water separation bench-scale treatability testing:

Equipment

- (1) 9-gallon glass Pyrex vessel
- (2) Ring stands with adjustable clamps
- (2) Masterflex peristaltic pumps, including drive, pump head (#7016), and tygon tubing (#7016)
- (2) Glass Pipettes (attach to pump suction tubing)
- Miscellaneous glass beakers
- (2) Rubber stoppers (use as weight on pipette - suction tubing)
- (1) Thermometer (-20 to 110 deg. C)
- (1) Tape ruler
- (4) Amber glass jars, preserved with H_2SO_4 to pH$<$2
- (1) 5-gallon plastic bucket with lid (residual disposal)

Set up the test apparatus, as depicted in Figure 4-1.

4.2.2.2 Gravity Settling

The equipment and materials required to set up the treatability apparatus, determine the optimum polymer type and dosage, and perform gravity settling tests are summarized below:

Equipment

- (4) 1-liter graduated cylinders
- (1) Gang Paddle Stirrer
- (1) Portable Mixer (to prepare stock polymer solutions)

Miscellaneous glass beakers

(1) Ring stand w/clamp (for portable mixer)

Clear plastic jars with teflon lined caps for sample collection

Anionic Polyelectrolyte (APS Armstrong) - 1000 mg/L solution

Cationic Polymer (Calgon Pol-E-Z 692) - 1000 mg/L solution

(1) Pipette and Pipette Pump

(1) 5-gallon plastic bucket with lid (residual disposal)

Set up the test apparatus, as depicted in Figure 4-2.

4.2.3 Sampling and Analysis

Analytical methods, bottle requirements, and preservation and storage details used in the bench-scale treatability study are presented on Table 4-2.

4.3 Pilot-Scale Testing

In order to determine the effectiveness and implementability of using an air stripper and liquid phase carbon adsorption unit to treat groundwater, pilot-scale testing of this equipment was performed. This task consisted of extracting the groundwater through a submersible pump and discharging it through an air stripper and a carbon adsorption unit.

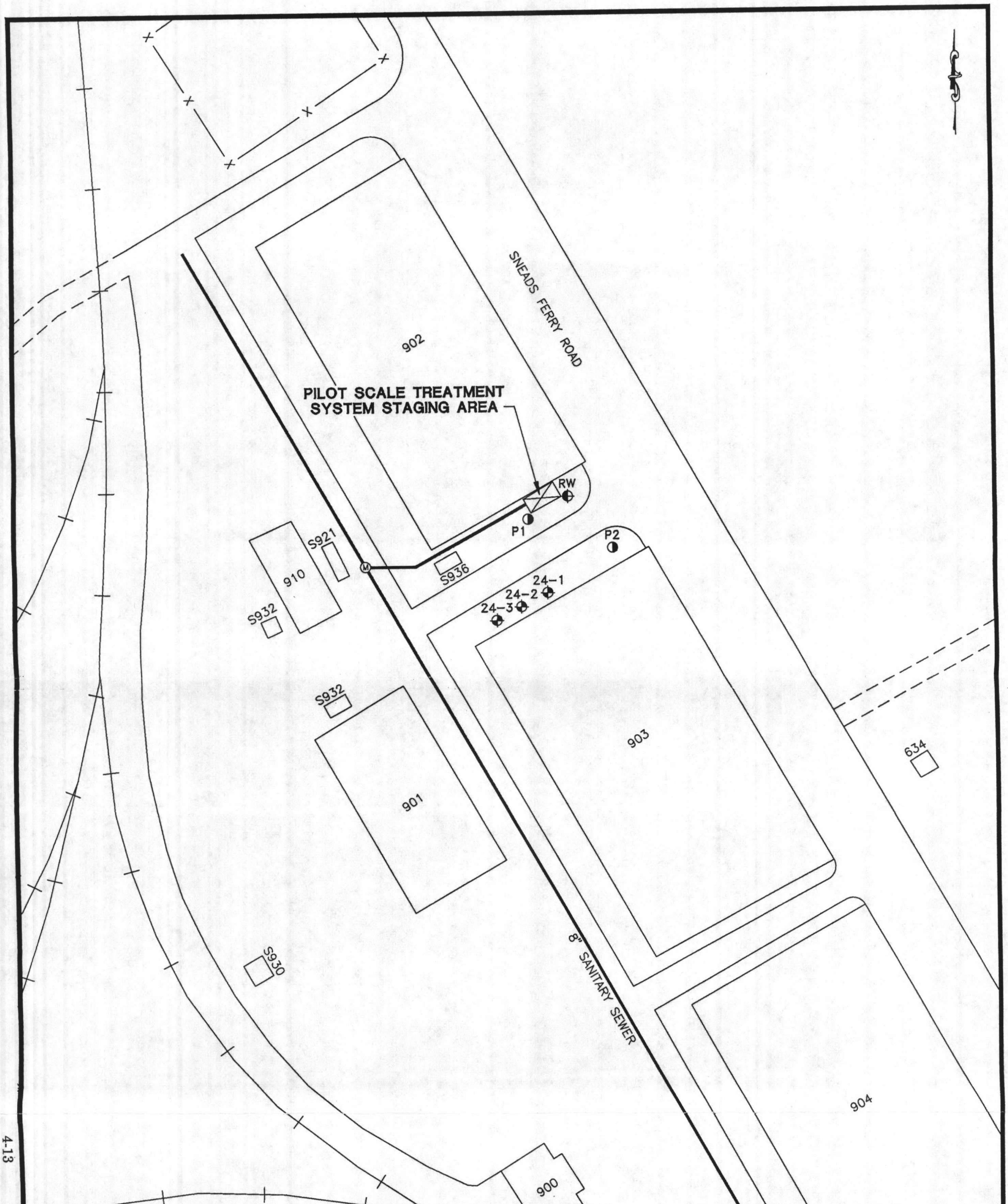
4.3.1 Experiment Design and Procedures

This subsection describes the design and procedures for conducting the pilot-scale test.

4.3.1.1 Aquifer Pump Test

During the week of January 24, 1993 Baker personnel installed a recovery well, and two piezometers for aquifer test activities. The recovery well and monitoring system consisted of a single 6-inch recovery well, three monitoring wells (previously installed) and two, 2-inch piezometers. The location of the wells, piezometers and pilot-scale treatment equipment are shown in Figure 4-3.

The recovery system consisted of a pressure transducer and an electric submersible pump installed 6 inches from the bottom of the well. The pump and transducer were secured to an



Baker
Baker Environmental, Inc.

LEGEND

24-1 EXISTING MONITORING WELL

RW RECOVERY WELL

P1 PIEZOMETER

FIGURE 4-3
APPROXIMATE LOCATION OF PIEZOMETER
AND RECOVERY WELL
TREATABILITY STUDY
FOR SHALLOW AQUIFER AT HPIA
MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

adjacent concrete filled post with a nylon rope. A solid 1 inch PVC pipe was used as the discharge line and extended from the pump to the flow meter. To allow for clear downhole observation of the recovery well, the electric cable, discharge line, and the rope were taped together at periodic intervals.

At the top of the well, the discharge line was connected to a totalizing flow meter with an accuracy of 0 .1 gpm. To regulate discharge flow from the pump a 3/4" gate valve was installed downstream from the flow meter. Groundwater pumped from the recovery well was discharged to the pilot-scale treatment system (see Section 4.3.1.2).

4.3.1.1.1 Recovery Well and Piezometer Construction

The recovery well, RW-1, was constructed of 6-inch nominal diameter, flush-joint and threaded stainless steel casing, with a 10-foot long, 0.010-inch slotted, continuous wrap screen. A medium-grained sand pack extending above the top of the screen was placed in the annulus between the screen and the borehole wall. A bentonite pellet seal was placed above the sand pack and hydrated with potable water. The remaining annular space was backfilled with a cement/bentonite mixture to ground surface. A PVC locking cap was fitted at the top of the well. A diagram of the well is located in Appendix L.

Following well construction activities, the recovery well was developed to remove fine grain sediments from the well boring and to facilitate the hydraulic connection between the well and the water-bearing layer. The recovery well was developed using a submersible pump. The well was overpumped and then allowed to recover. This process was repeated until the water was visually sediment-free. Approximately 150 gallons of water (5-6 well volumes) were removed. The water recovered from each well was contained in 55-gallon steel drums and labeled.

Piezometers P-1 and P-2 were constructed of 2-inch nominal diameter Schedule 40, flush-joint and threaded PVC casing, with a 10-foot long, 0.010-inch slotted screen. A medium-grained sand pack extending to a depth of one foot below the surface was placed in the annulus between the screen and the borehole wall. A one-foot thick bentonite pellet seal was placed above the sand pack and hydrated with potable water. A PVC locking cap was fitted at the top of the well. The piezometers are temporary and will be removed at a later date.

Following installation, the piezometers and recovery well were surveyed by James E. Stewart and Associates, Inc., of Jacksonville, North Carolina (registered in the State of North Carolina) using standard procedures. The top of casing and ground surface elevations were measured for the piezometer locations to the nearest 0.01-foot. A temporary benchmark was established on site based on existing National Geodetic Vertical Datum (NGCD) elevations relative to Mean Sea Level (MSL).

4.3.1.1.2 Step-Drawdown Test

Test Set Up

The step-drawdown test was initiated on February 1, 1993. Prior to the start of this test, static water levels were measured at all the locations equipped with pressure transducers and in seven outlying monitoring wells. These measurements were taken with a water level meter. These fluid levels are shown in Table 4-3.

To monitor hydrogeologic activity induced from the step-drawdown test, transducers were placed in four wells and two piezometers between Buildings 902 and 903. Transducers in piezometer P-1 and recovery well RW-1, located adjacent to Building 902, were controlled by a two channel In-Situ SE-1000C data logger. Transducers in piezometer P-2, and monitoring wells HPGW24-3, HPGW24-2, and HPGW24-1, located adjacent to Building 903, were controlled by a four channel In-Situ SE-2000 data logger. Each pressure was referenced to the initial static water levels. To maintain a constant position relative to the test datum the cable of each pressure transducer was secured to the protective casing of the well.

Both the SE-1000C and the SE-2000 were set to obtain water level data on a logarithmic scale. Water levels were recorded by the hydrologic monitors from pressure transducers according to the following schedules:

- SE-2000 (Well RW-1 and piezometer P-2)

Elapsed Time	Sampling Interval
▸ 0-5 seconds	0.5 seconds
▸ 5-20 seconds	1.0 seconds
▸ 20-120 seconds	5.0 seconds
▸ 2-10 minutes	0.5 minutes
▸ 10-100 minutes	2.0 minutes
▸ 100 minutes-end	5.0 minutes

Table 4-3
Summary of Fluid Level Measurements Prior to Step-Drawdown Test
February 1,1993
Hadnot Point Industrial Area
CTO-017

Date	Time	Well Number	Top of Casing Elevation (feet above MSL)	Depth to Groundwater (feet below top of casing)	Groundwater Elevation (feet above MSL)
2/01/93	13:12	RW-1	33.22	6.88	26.34
2/01/93	13:10	P-1	30.67	6.76	23.91
2/01/93	13:10	P-2	30.68	4.44	26.24
2/01/93	13:19	HPGW24-	32.82	6.68	26.14
2/01/93	13:23	HPGW24-	33.75	12.72	21.03
2/01/93	13:26	HPGW24-	32.34	11.61	20.73
2/01/93	11:08	HPGW21	33.59	10.57	23.02
2/01/93	11:15	GW22-1	31.52	9.14	22.38
2/01/93	11:20	GW22-2	28.84	8.13	20.71
2/01/93	09:01	HPGW22	32.35	6.72	25.63
2/01/93	08:57	HPGW23	32.09	9.27	22.82
2/01/93	09:07	HPGW25	32.58	6.75	25.83
2/01/93	10:41	HPGW30-	29.75	9.28	20.47
2/01/93	10:43	HPGW30-	29.72	9.25	20.47

Notes:

(MSL) - Mean Sea Level

Top of casing elevations for RW-1, P1, P2, HPIA 24-1, HPIA 24-2 and HPIA 24-3 were taken by James B.Stewart and Associates during February 1993. The remaining elevations were taken from the Remedial Action Report For Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer Study (E.S.E, Inc., April 1992).

- SE-1000C (Wells HPGW24-3,HPGW24-2, HPGW24-1 and piezometer P-2)

Elapsed Time	Sampling Interval
▸ 0-5 seconds	0.5 seconds
▸ 5-20 seconds	1.0 seconds
▸ 20-120 seconds	5.0 seconds
▸ 2-10 minutes	0.5 minutes
▸ 10-100 minutes	2.0 minutes
▸ 100 minutes-end	2.0 minutes

The step-drawdown test was initiated on February 1, 1993 at 4:42 PM. Based upon previous investigations at the site, it was originally estimated that the maximum sustained discharge capacity of the recovery well would be 5 gpm. The proposed initial discharge rates for the step-drawdown test were 3 gpm (60 percent of maximum), 4 gpm (80 percent of maximum), 5 gpm (100 percent), and 6 gpm (120 percent).

All groundwater extracted during the step-drawdown tests was treated in accordance with the procedures outlined in Section 4.3.1.1.1.

Recovery Well RW-1

Based on flow rates observed during installation and mobilization of the pump, two discharge rates, 1.0 gpm (step one) and 2.0 gpm (step two), were selected for the step-drawdown test. After some slight initial adjustments of the flow meter, the discharge rate stabilized at 1.00 gpm. After 62 minutes at 1 gpm (step 1) step two was initiated. To initiate step 2, the flow was increased to 1.7 gpm. Gradually the discharge rate was increased to 2.2 gpm. At this discharge rate the well was pumped dry at 7:27 PM. At this time the flow was adjusted to 1.5 gpm and remained stable until the test was terminated. The step 2 pumping rate (1.5 gpm) was maintained for 124 minutes.

Based on the observed flow rates and drawdown observed in this well no additional steps above 2.0 gpm were performed and a rate of 1.5 gpm was selected for the constant rate test.

Average flow rates, duration of each step, and observed drawdowns are summarized in Table 4-4.

TABLE 4-4

SUMMARY OF STEP-DRAWDOWN ACTIVITIES
HADNOT POINT INDUSTRIAL AREA
CTO-0017

Well Number	Flow Rate (gpm)	Duration (minutes)	Maximum Drawdown (feet)
RW-1	1.0	62	4.96
	1.5	124	9.55

Monitoring Well and Piezometer Observations

The SE-2000 data logger recorded water levels in P-2, HPGW24-1, HPGW24-2, and HPGW24-3 and the SE-1000C data logger recorded levels in P-1 and RW-1. A drawdown of 1 foot was observed at P-2 which is 60 feet from the recovery well. At location P-1 (28 feet from the recovery well) 3 inches of drawdown was observed and at HPGW24-1 (75 feet from the recovery well) 4.5 inches of drawdown was observed. No drawdown was observed in HPGW24-2 (97 feet from the recovery well)and HPGW24-3 (119 feet from the recovery well). These values are summarized in Table 4-5. The data obtained by these data loggers is presented in Appendix A.

4.3.1.1.3 Constant Rate Aquifer Test

Test Set Up

The purpose of the constant rate aquifer pump test was to evaluate aquifer characteristics (hydraulic conductivity, transmissivity, and storativity). The results of this test will be used in the design of a groundwater extraction remediation system for the shallow aquifer at HPIA.

Prior to the initiation of the 72-hour constant rate aquifer test, static water levels were manually measured in RW-1, P-1, P-2, HPGW24-1, HPGW24-2, HPGW24-3 and 8 other previously installed monitoring wells that were within approximately 1000 feet of the of the recovery well. These fluid level measurements are summarized on Table 4-6.

As in the step-drawdown test, the SE-2000 data logger recorded water levels in P-2, HPGW24-1, HPGW24-2, and HPGW24-3 and the SE1000C data logger recorded levels in P-1 and RW-1.

The SE-2000 (Well RW-1 and piezometer P-2) data logger was programed according to the following schedule:

Elapsed Time	Sampling Interval
▸ 0-20 seconds	0.5 seconds
▸ 20-60 seconds	1.0 seconds
▸ 1-10 minutes	0.2 minutes
▸ 10-100 minutes	2.0 minutes
▸ 100 minutes-end	5.0 minutes

Table 4-5
Summary of Maximum Drawdowns During Step Test
CTO-017

Well Number	Datum(TOC) Elevation (feet,MSL)	Initial Depth to Groundwater (feet)	Final Depth to Groundwater (feet)	Drawdown (feet)	Initial Groundwater Elevation (feet, MSL)	Final Groundwater Elevation (feet, MSL)
RW-1	33.22	6.88	21.26	14.38	26.34	11.96
P-1	30.67	6.76	7.00	0.24	23.91	23.67
P-2	30.68	4.44	5.42	0.98	26.24	25.26
HPGW24-1	32.82	6.68	7.05	0.37	26.14	25.77
HPGW24-2	33.75	12.72	12.77	0.05	21.03	20.98
HPGW24-3	32.34	11.61	11.66	0.05	20.73	20.68

Notes:

(MSL) - Mean Sea Level

(TOC) - Top of Casing

Top of casing elevations for RW-1, P1, P2, HPIA 24-1, HPIA 24-2 and HPIA 24-3 were taken by James B.Stewart and Associates during February 1993. The remaining elevations were taken from the Remedial Action Report For Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer Study (E.S.E, Inc., April 1992).

Table 4-6
Summary of Fluid Level Measurements
Prior to the Start of the Constant Rate Pump Test
February 6, 1993
Hadnot Point Industrial Area
CTO-017

Date	Time	Well Number	Top of Casing Elevation (feet above MSL)	Depth to Groundwater (feet below top of casing)	Groundwater Elevation (feet above MSL)
2/02/93	07:50	RW-1	33.22	7.45	25.77
2/02/93	07:55	P-1	30.67	7.30	23.37
2/02/93	07:51	P-2	32.34	5.10	27.24
2/02/93	07:59	HPGW24-1	32.31	7.30	25.01
2/02/93	08:07	HPGW24-2	33.73	12.75	20.98
2/02/93	08:12	HPGW24-3	32.80	13.00	19.8
2/02/93	09:20	HPGW21	33.59	10.70	22.89
2/02/93	09:31	HPGW22-1	31.52	9.59	21.93
2/02/93	09:40	HPGW22-2	28.84	8.47	20.37
2/02/93	09:07	HPGW22	32.35	7.00	25.35
2/02/93	08:55	HPGW23	32.09	9.75	22.34
*	*	HPGW25	32.58		
2/02/93	08:45	HPGW30-2	29.75	9.55	20.2
2/02/93	08:39	HPGW30-3	29.72	9.60	20.12

Notes:

(MSL) - Mean Sea Level

* - Not initially measured

Top of casing elevations for RW-1, P1, P2, HPIA 24-1, HPIA 24-2 and HPIA 24-3 were taken by James B.Stewart and Associates during February 1993. The remaining elevations were taken from the Remedial Action Report For Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer Study (E.S.E, Inc., April 1992). April 1992).

The SE-1000C (Wells HPGW24-3, HPGW24-2, HPGW24-1 and piezometer P-2) was programed according to the following schedule:

Elapsed Time	Sampling Interval
▸ 0-2 seconds	0.2 seconds
▸ 2-120 seconds	5.0 seconds
▸ 2-10 minutes	0.5 minutes
▸ 10-100 minutes	2.0 minutes
▸ 100-end	10.0 minutes

Test Operation

The constant rate aquifer pump test began on February 2, 1993, at 10:05 AM. Over the length of the 72.5 hour drawdown phase of the aquifer test, a total of 5,312 gallons of groundwater were produced for an average flow rate of 1.22 gpm. Flow rate measurements recorded for the recovery well are provided in Appendix B.

Test flows were continually monitored during the drawdown phase. Difficulty was experienced achieving a constant flow rate of 1.2 gpm. Flow rates ranged from .6 gpm to 1.6 gpm. As flows began to deviate from 1.2 gpm by more than .25 gpm the 3/4 inch gate valve was appropriately adjusted.

The groundwater levels and the maximum drawdowns measured in the recovery well piezometers and monitoring wells, at an elapsed time of approximately 1,260 minutes are provided in Table 4-7. Drawdown data obtained by the data loggers is presented in Appendix C.

Upon termination of the drawdown phase of the test on February 5,1993 at 10:45 AM, both data loggers were set to monitor recovery data using the same scale that was used for the drawdown phase of the test. This data are provided in Appendix D and are summarized in Table 4-8.

All extracted groundwater was pumped through the pilot-scale treatment system before being released into the HPIA sanitary system. The capacity of the mobile pilot-scale treatment system was adequate to treat the groundwater as it was discharged and no additional liquid storage was needed.

Table 4-7
Summary of Maximum Drawdowns During Constant Rate Aquifer Test
CTO-017

Well Number	Datum(TOC) Elevation (feet,MSL)	Initial Depth to Groundwater (feet)	Final Depth to Groundwater (feet)	Drawdown (feet)	Initial Groundwater Elevation (feet, MSL)	Final Groundwater Elevation (feet, MSL)
RW-1	33.22	7.45	20.87	13.42	25.77	12.35
P-1	30.67	7.30	7.92	0.62	23.37	22.75
P-2	32.34	5.10	6.96	1.86	27.24	25.38
HPGW24-1	32.31	7.30	8.17	0.87	25.01	24.14
HPGW24-2	33.73	12.75	12.89	0.14	20.98	20.84
HPGW24-3	32.80	13.00	13.16	0.16	19.80	19.64
HPGW21	33.59	10.70	10.70	0.00	22.89	22.89
GW22-1	31.52	9.59	9.56	0.00	21.93	21.96
GW22-2	28.84	8.47	8.56	0.09	20.37	20.28
HPGW22	32.35	7.00	7.30	0.30	25.35	25.05
HPGW23	32.09	9.75	9.86	0.11	22.34	22.23
HPGW25	32.58	7.08	7.34	0.26	25.50	25.24
HPGW30-2	29.75	9.55	9.68	0.13	20.20	20.07
HPGW30-3	29.72	9.60	9.44	0.00	20.12	20.28

Notes:

(MSL) - Mean Sea Level

(TOC) - Top of Casing

Top of casing elevations for RW-1, P1, P2, HPIA 24-1, HPIA 24-2 and HPIA 24-3 were taken by James B.Stewart and Associates during February 1993. The remaining elevations were taken from the Remedial Action Report For Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer Study (E.S.E, Inc., April 1992).

Table 4-8
Summary of Fluid Level Measurements After Recovery
February 6, 1993
Hadnot Point Industrial Area
CTO-017

Date	Time	Well Number	Top of Casing Elevation (feet above MSL)	Depth to Groundwater (feet below top of casing)	Groundwater Elevation (feet above MSL)
2/06/93	10:34	RW-1	33.22	7.78	25.44
2/06/93	10:44	P-1	30.67	7.48	23.192
2/06/93	10:34	P-2	30.68	5.45	25.226
2/06/93	10:44	HPGW24-1	32.82	7.53	25.287
2/06/93	10:44	HPGW24-2	33.75	12.77	20.985
2/06/93	10:44	HPGW24-3	32.34	13.05	19.294
2/06/93	10:01	HPGW21	33.59	10.66	22.93
2/06/93	10:08	GW22-1	31.52	9.42	22.1
2/06/93	10:12	GW22-2	28.84	8.46	20.38
2/06/93	09:46	HPGW22	32.35	7.46	24.89
2/06/93	09:38	HPGW23	32.09	9.72	22.37
2/06/93	09:08	HPGW25	32.58	9.60	22.98
2/06/93	9:30	HPGW30-2	29.75	9.60	20.15
2/06/93	09:30	HPGW30-3	29.72	9.64	20.08

Notes:

(MSL) - Mean Sea Level

Top of casing elevations for RW-1, P1, P2, HPIA 24-1, HPIA 24-2 and HPIA 24-3 were taken by James B.Stewart and Associates during February 1993. The remaining elevations were taken from the Remedial Action Report for Hadnot Point Industrial Area Operable Unit Shallow Soils and Castle Hayne Aquifer Study (E.S.E., Inc., April 1992).

4.3.1.2 Pilot-Scale Treatability Testing

Groundwater pumped from recovery well RW-1 during the aquifer pump test was discharged to a pilot-scale treatment system. This treatment system was mobilized and set-up along side the recovery well and adjacent to Building 904, as shown on Figure 4-3. Effluent from the treatment system was discharged to the 8-inch sanitary sewer line at the south end of Building 902. Final discharge of the treated groundwater was through the HPIA Sewage Treatment Plant (STP).

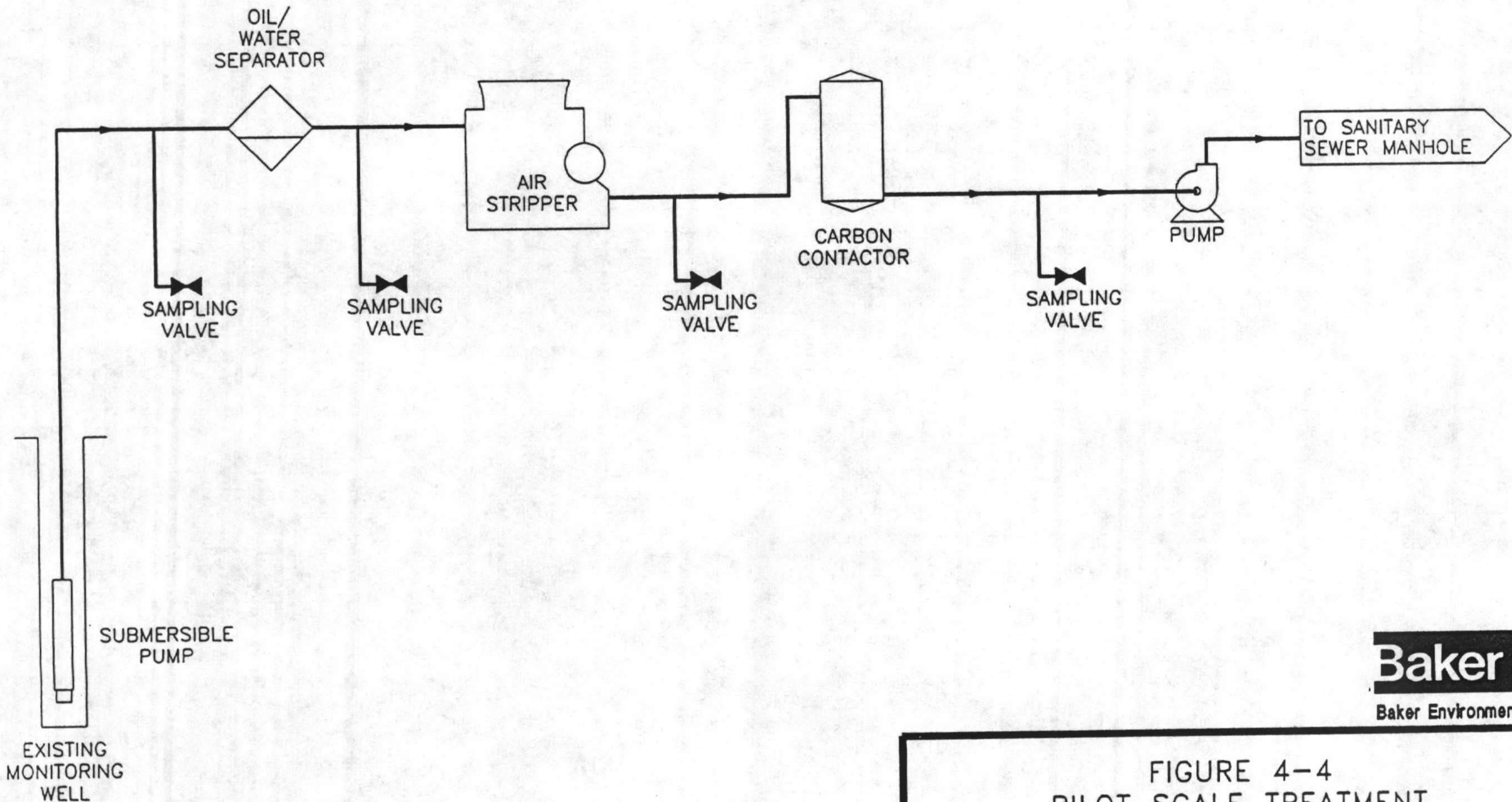
The pilot-scale treatment system consisted of an oil/water separator, an air stripper, and a carbon adsorption tank as shown schematically on Figure 4-4. The oil/water separator consisted of two, 350-gallon FRP tanks connected in series. A 300-gallon steel surge tank was placed downstream of the oil/water separator and equipped with an electric sump pump and float switch to discharge water to the air stripper. The air stripper was a shallow tray-style stripper consisting of two trays and equipped with a one horsepower, 625 cubic feet per minute (CFM) air blower. The holding capacity of the air stripper tank was 400 gallons. Hydrostatic pressure caused by influent from the oil/water separator surge tank forced effluent from the air stripper to the carbon adsorption tank. The carbon adsorption unit was a single tank with 800 pounds of activated carbon manufactured by Hadley Industries. Effluent from the carbon adsorption unit was discharged to the HPIA sanitary sewer system.

4.3.2 Sampling and Analysis

A sampling and analysis program was conducted during the duration of the aquifer pump test and pilot-scale treatability study in order to quantify the effectiveness of the various treatment components. This program included chemical analysis for volatile organics, metals, and engineering parameters, as well as multi-concentration acute toxicity testing. Table 4-9 summarizes the analytical requirements of the pilot-scale study.

Samples were collected at the start-up, at regular intervals (approximately 12 hours), and at completion of the aquifer pump test. These samples were collected from sampling ports at the following locations:

- Influent to the air stripper
- Effluent from the air stripper
- Effluent from the carbon adsorption



Baker Environmental, Inc.

FIGURE 4-4
PILOT SCALE TREATMENT
SYSTEM SCHEMATIC
TREATABILITY STUDY
FOR SHALLOW AQUIFER AT HPIA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

017001WP

Table 4-9

Pilot-Scale Treatability Testing Analytical Requirements Summary Table

Parameter	Method	Practical Quantitation Limit (ug/l)	Sample Volume Requirement	Container Type	Sample Preservation	Holding Time
Purgeable Halocarbons						
Bromodichloromethane	EPA 601	2	3 x 40 ml	Glass; Teflon Lined Septum	Cool to 4 C	14 Days
Bromoform		5				
Bromomethane		2				
Carbon Tetrachloride		2				
Chlorobenzene		2				
Chloroethane		2				
2-Chloroethylvinyl ether		2				
Chloroform		2				
Chloromethane		2				
Dibromochloromethane		2				
1,2-Dichlorobenzene		5				
1,3-Dichlorobenzene		5				
1,4-Dichlorobenzene		5				
Dichlorodifluoromethane		2				
1,1-Dichloroethane		2				
1,2-Dichloroethane		2				
1,1-Dichloroethene		2				
trans-1,2-Dichloroethene		2				
1,2-Dichloropropane		2				
cis-1,3-Dichloropropene		2				
trans-1,3-Dichloropropene		2				
Methylene chloride		5				
1,1,2,2-Tetrachloroethane		2				
Tetrachloroethene		2				
1,1,1-Trichloroethane		2				
1,1,2-Trichloroethane		2				
Trichloroethene		2				
Trichlorofluoromethane		2				
Vinyl chloride		5				
Purgeable Aromatics						
Benzene	EPA 602	2	3 x 40 ml	Glass; Teflon Lined Septum	Cool to 4 C HCl to pH < 2	14 Days
Chlorobenzene		2				
1,2-Dichlorobenzene		5				
1,3-Dichlorobenzene		5				
1,4-Dichlorobenzene		5				
Ethylbenzene		2				
Toluene		2				
Xylene		2				

Table 4-9 (continued)

Pilot-Scale Treatability Testing Analytical Requirements Summary Table

Parameter	Method	Practical Quantitation Limit (ug/l)	Sample Volume Requirement	Container Type	Sample Preservation	Holding Time
Target Analyte List Metals						
Aluminum	EPA 200.7	40	500 ml	Plastic	Cool to 4 C HNO3 to pH < 2	180 Days Except Mercury at 28 Days
Antimony	EPA 204.2	2				
Arsenic	EPA 206.2	5				
Barium	EPA 200.7	2				
Beryllium	EPA 200.7	2				
Cadmium	EPA 213.2	1				
Calcium	EPA 200.7 EPA 215.1	5				
Chromium	EPA 218.2	5				
Cobalt	EPA 200.7	5				
Copper	EPA 200.7	7				
Iron	EPA 200.7	6				
Lead	EPA 239.2	5				
Magnesium	EPA 200.7	100				
Manganese	EPA 200.7	1				
Mercury	EPA 245.1	0.2				
Nickel	EPA 200.7	20				
Potassium	EPA 200.7	200				
Selenium	EPA 270.2	2				
Silver	EPA 200.7	20				
Sodium	EPA 200.7	100				
Thallium	EPA 279.2	5				
Vanadium	EPA 200.7	7				
Zinc	EPA 200.7	50				
Engineering Parameters						
Ammonia	EPA 350.2	100	500 ml	Plastic	Cool to 4 C H2SO4 to pH < 2	28 Days
Bicarbonate	SM 403/40	1000	500 ml	Plastic	None Required	14 Days
Carbonate	SM 403/40	1000	500 ml	Plastic	None Required	14 Days
Chloride	EPA 325.2	1000	250 ml	Plastic	None Required	28 Days
Hardness	EPA 130.2	1000	150 ml	Plastic	HNO3 to pH < 2	180 Days
Nitrate/Nitrite	EPA 353.2	10	250 ml	Plastic	Cool to 4 C H2SO4 to pH < 2	28 Days
Oil and Grease	EPA 413.1	2000	1000 ml	Glass	Cool 4 C H2SO4 to pH < 2	28 Days
Total Dissolved Solids	EPA 160.1	1000	250 ml	Plastic	Cool to 4 C	7 Days
Total Suspended Solids	EPA 160.2	1000	250 ml	Plastic	Cool to 4 C	7 Days
Aquatic Toxicity Bioassays						
Multi-Concentration Acute Toxicity	EPA/600/ 4-90-027	NA	2000 ml	Plastic	Cool to 4 C	36 Hours

Samples from these three locations were analyzed for volatile organics (EPA Method 601/602) and inorganic using CLP protocol, Level III data quality.

Samples were also collected at start-up and completion of the aquifer pump test from the influent and effluent from the oil/water separator and analyzed for oil and grease. Additional samples were taken at this time from the influent to the air stripper and analyzed for engineering parameters, including ammonia, carbonate, bicarbonate, chlorides, total dissolved solids, total suspended solids, hardness, nitrate, nitrite, and pH.

One of the seven rounds of samples taken from the influent and effluent to the carbon adsorption unit also underwent a 48 hour test for multi-concentration acute toxicity using fathead minnows (*Pimephales promelas*) as the test organism.

4.4 Data Management

Due to the quantity of data to be collected during the treatability study, the way the data was documented was vital. The following guidelines were used in the documentation of samples and general observations.

Five types of documentation were used in tracking and shipping analytical samples:

- Field logbook;
- Sample labels;
- Chain-of-custody records;
- Custody seals; and
- Commercial carrier air bills.

The label for each sample bottle contained the following information:

- Site name;
- Sample number;
- Monitoring well I.D. number;
- Date and time of collection;
- Sample type (grab or composite);
- Preservatives;

- Sample matrix; and,
- Samplers initials.

Additionally, the following items also were entered:

- Date and time;
- Name of field personnel on site;
- Names of visitors on site;
- Field conditions;
- Description of activities;
- Sampling remarks and observations;
- QA/QC samples collected; and,
- Sketch of sample location and site conditions.

Custody of the samples were maintained by field personnel from the time of sampling until the time they were forwarded to the analytical laboratory, Halliburton NUS Environmental Corporation. The sample custody was documented using Chain-of-Custody (COC) records which were completed by field personnel. These were complete in waterproof ink and accompanied each cooler forwarded from the site to the laboratory. Any errors in the COC record were not erased. Instead, a line was drawn through the error and initialed by the person completing the form. The original COC was placed in a sealable plastic bag, placed in the appropriate cooler, and secured to the cooler's lid.

Two sample coolers were shipped by commercial air carrier and secured with custody seals so that the seals would be broken if the cooler was opened. The commercial air carrier did not sign the COC record because the custody seals remained intact and the COC record stayed in the cooler. Prior to shipping the completed air bill was secured to lid of the cooler.

The laboratory maintained internal logbooks and records that provide a custody record during sample preparation and analysis.

4.5 Deviations from the Work Plan

4.5.1 Bench-Scale Study

Based on the sample characterization results (presented in Section 5.0), it was determined that chemical treatment (metals precipitation jar tests) would not be necessary as proposed in the Work Plan because the metals of concern were primarily associated with the suspended solids. However, because addition of appropriate polymers can enhance the coagulation and flocculation of solid particles, agglomeration of smaller particles and subsequent settling of solids, evaluation of cationic/anionic polymer addition was included in the treatability study.

4.5.2 Pilot-Scale Study

Based on the results of the step-drawdown test (Section 4.3.1.1.2), a flow rate of 1.5 gpm was selected for the constant rate aquifer test, which was less than the anticipated production of 5 gpm projected in the Work Plan. The treatment equipment proposed in the Work Plan (Oil/Water Separator, Air Stripper, Carbon Adsorption Unit) were provided, and the Sampling and Analysis Plan was followed. Due to the low flow rate, retention time through the stripper was 333 percent greater than anticipated in the Work Plan.

5.0 RESULTS AND DISCUSSION

5.1 Bench-Scale Studies

The results of the bench-scale studies performed to determine the pretreatment requirements (oil and grease, suspended solids, and metals removal) for the HPIA groundwater are presented and discussed in the sections below. Raw analytical data for all of the bench-scale tests is included in Appendices E, F, and G. Recommendations for pretreatment equipment of the HPIA groundwater prior to organics removal are also discussed.

5.1.1 HPIA Groundwater Characteristics

The groundwater sample from the HPIA was analyzed for metals and other engineering parameters in order to define contamination levels and determine pretreatment requirements. Engineering parameter analyses including TSS, TDS, hardness, and alkalinity are presented on Table 5-1. Total and dissolved metals analyses for groundwater characterization are presented on Table 5-2. For comparison purposes, North Carolina criteria for groundwater and surface water as well as Federal Drinking Water Primary and Secondary Maximum Contaminant Levels (MCLs) also are presented on Table 5-2.

Of the engineering parameters, only TSS appears to be of potential concern. The groundwater characterization sample showed 910 mg/L TSS which would rapidly foul treatment system piping and equipment. Other subsequent treatability samples showed lower levels of TSS, however even at these 60 to 100 mg/L levels significant system fouling would result. Therefore, it is necessary to remove the suspended solids up-front via some form of physical treatment (e.g., flocculation, settling, filtration).

Analyses showed that a significant proportion of the metals concentrations are associated with the suspended solids. The following metals exceeded at least one of the discharge criteria listed on Table 5-2 on a total constituent basis: aluminum, chromium, iron, lead, manganese, and zinc. However, once the suspended material is removed, the resulting dissolved metals are likely to be acceptable for discharge. Although dissolved zinc levels slightly exceeded the NC surface water discharge criteria, it is believed that this criteria would not apply as long as the groundwater is discharged to the HPIA STP, as anticipated. Therefore, Baker believes that pretreatment to remove metal-laden particles and not dissolved metals would be required.

Table 5-1
HPIA Groundwater Sample Characterization Analyses: Engineering Parameters

Parameter	Concentration (mg/l)
Ammonia (as N)	0.8
Alkalinity, Bicarbonate (as CaCO3)	35
Alkalinity, Carbonate (as CaCO3)	0
Alkalinity, Total (as CaCO3)	35
Chloride (as Cl)	22
Hardness, Total (as CaCO3)	65
Nitrate/Nitrite	<0.1
Nitrite (as N)	<0.02
Total Dissolved Solids	110
Total Suspended Solids	910
Oil and Grease	6

Table 5-2
HPIA Groundwater Sample Characterization Analyses:
Total and Dissolved Metals

Parameter	Total Metals (ug/L)	Dissolved Metals (ug/L)	Primary/Secondary Drinking Water MCLs (ug/L)	NC Ground-Water Criteria (ug/L)	NC Surface Water Criteria (3) (ug/L)
Aluminum	25900	35.0 B	50 to 200	— (2)	—
Antimony	20 U (1)	20.0 U	6	—	—
Arsenic	9.7 B (1)	2.0 U	50	50	50
Barium	78.0 B	146 B	2000	1000	—
Beryllium	1.0 B	1.0 U	4	—	65
Cadmium	5.0 U	5.0 U	5	5	2
Calcium	18600	15000	—	—	—
Chromium	32.0	10.0 U	100	50	50
Cobalt	8.0 U	8.0 U	—	—	—
Copper	14.0 B	2.0 U	1300	1000	7
Iron	26400	31.0 B	300	300	1000
Lead	22.4	1.0 U	15 (4)	50	25
Magnesium	3100 B	1530 B	—	—	—
Manganese	84.0	24.0	50	50	—
Mercury	0.20 U	0.20 U	2	1.1	0.012
Nickel	22.0 B	20.0 U	100	150	88
Potassium	2330 B	830 B	—	—	—
Selenium	1.5 B	1.0 U	50	10	5
Silver	3.0 U	3.0 U	100	50	0.06
Sodium	8620	9910	—	—	—
Thallium	2.0 U	2.0 U	2	—	—
Vanadium	73.0	4.0 U	—	—	—
Zinc	40.0	57.0	5000	5000	50

NOTES:

(1) CONCENTRATION QUALIFIERS:
B = entered if the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL) but greater than or equal to the Instrument Detection Limit (IDL).
U = entered if the analyte was analyzed for but not detected, quantitation limit reported.
(2) "—" = No standard established.
(3) Protection of Aquatic Life.
(4) MCL is action level for public water supply systems.

5.1.2 Oil/Water Separation Tests

Free phase oil was visible in the treatability study samples. Although the characterization analyses showed O&G to be only 6 mg/L (less than the 10 mg/L specified in the Work Plan), visible oil sheens are not typically acceptable for discharge and, consequently, an oil/water separation test was performed. Analytical results of test samples are presented in Table 5-3.

The oil/water separation test indicated that at 28°C (82°F) most of the oil in the groundwater was free phase and not emulsified. Removal of this oil to below detection limits within a reasonable time frame (less than sixty minutes) appears to be possible in a conventional oil/water separator. In addition, an oil water separator could be used to remove some of the suspended material from the groundwater.

The data in Table 5-3 is not extensive or diverse enough to be able to determine an actual rate of oil removal. However, enough information has been generated to be able to conceptually design an oil/water separator.

5.1.3 Solids Settling

Generally sand and multi-media filters are designed for the anticipated hydraulic capacity and a suspended solids concentration of 30 to 50 mg/L in the influent. The levels of suspended solids in the HPIA groundwater samples taken to date appear to be excessive for cost-effective direct filtration of the groundwater.

Settling of some of the suspended material may serve to reduce much of the load to a filter, possibly even eliminating the need for the filter itself. Therefore, bench-scale settling tests discussed in Section 4.2 were performed to investigate the extent of physical treatment required. Qualitative tests to determine an adequate polymer and optimum polymer dosage rate were performed. Subsequently, settling tests using both raw groundwater and groundwater flocculated with polymers were performed.

Qualitative polymer addition tests using both a cationic and an anionic polymer showed good results in each case. However, the anionic polymer (Armstrong APS) appeared to perform slightly better than the cationic polymer (Calgon Pol-E-Z 692). For the settling tests, the anionic polymer at an optimum dosage level of 2 mg/L was selected.

TABLE 5-3

OIL/WATER SEPARATION BENCH-SCALE TEST
ANALYTICAL RESULTS

Time (minutes)	Oil and Grease (mg/L)	Sample Temp. (°C)
0	6	NA
15	<3	28
30	4	28
60	<3	28

The TSS results associated with the settling tests for the raw and polymer enhanced groundwater are presented on Table 5-4. Clearly, polymer addition had a significant impact on the settling rate of the suspended particles. The residual suspended solids concentration of the raw sample following 60 minutes of quiescent settling was roughly equivalent to the residual suspended solids concentration of the polymer enhanced sample after only 5 to 10 minutes (about 25 mg/L), even with a 50 percent higher initial TSS reading in the initial polymer aliquot. After 30 minutes of settling, the polymer enhanced sample TSS concentration fell below 20 mg/L.

Samples of water were extracted for metals analyses (aluminum, arsenic, chromium, iron and lead) after 60 minutes of settling for the raw sample and 30 minutes for the polymer enhanced sample. These analyses are presented on Table 5-5. Comparing these values to water quality criteria presented previously (Table 5-2) one can see that aluminum and iron levels were not reduced. However, these levels probably reflect naturally-occurring levels for the site. In this case, settling alone does not appear to be adequate, and a combination of flocculation, settling and filtration will be required.

Once the on site treatment plant is in place and the groundwater extraction wells are developed (i.e., operating), much of the suspended material that was present in the treatability study samples may not be present in treatment plant influent. In fact, this phenomenon was apparent in the pilot-scale testing, when TSS levels were measured to be less than 10 ppm.

5.1.4 QA/QC

Quality Assurance/Quality Control samples were taken during the bench-scale treatability testing to ensure that analytical results are reliable for design purposes. Duplicate raw and filtered groundwater samples for the characterization study were taken. Also, a duplicate oil/water separation study sample was collected at the 60 minute mark in the test and a duplicate initial sample for the settling tests was analyzed for TSS, aluminum, arsenic, chromium, iron, and lead. In addition, two trip blanks prepared by the laboratory were analyzed. No unusual variances were observed in any of the QA/QC samples. The QA/QC results are included in Appendix H.

TABLE 5-4

SOLIDS SETTLING TESTS: SUSPENDED SOLIDS CONCENTRATION AS A FUNCTION OF TIME

Settling Time (minutes)	Total Suspended Solids (mg/L)	
	Raw Sample	Sample with Polymer at 2 mg/L
0	62	62
5	--	28
10	48	27
15	--	20
20	35	--
30	32	16
60	25	--

Table 5-5
Solids Settling Tests: Total Metals and TSS Concentrations

Parameter	Units	Concentration		
		Raw Initial Sample	Raw Sample After 60 Min. Settling	Sample with Polymer at 2 mg/l After 30 Min. Settling
Aluminum	ug/l	2780	2290	282
Arsenic	ug/l	< 4.0	< 4.0	< 4.0
Chromium	ug/l	20	14	< 10.0
Iron	ug/l	8930	6400	2310
Lead	ug/l	4.4	3.2	11
TSS	mg/l	62	25	16

5.2 Pilot-Scale Study

5.2.1 Data Analysis and Interpretation

5.2.1.1 Analysis of Waste Stream Characteristics

Previous studies indicate that the shallow groundwater is contaminated primarily with fuel-related compounds, benzene, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), solvents and metals, such as antimony, arsenic, beryllium, chromium, iron, lead, manganese, mercury, and nickel. Prior to this study, the most recent shallow groundwater data was collected in January 1991 by ESE. This data is similar to the results of earlier studies with the exception that the compound concentrations from the January data were generally lower than the concentrations identified in the earlier studies. Table 5-6 presents the summary of the 1991 shallow aquifer groundwater data with respect to the contaminants of concern.

Groundwater samples taken for the bench-scale study were analyzed for metals and other engineering parameters. The results of these analyses are discussed in Section 5.1.1 of this report. Based on the sample characterization results, it was determined that the metals of concern were primarily associated with the suspended solids.

Groundwater samples were taken for the pilot-scale treatability study from the influent to the air stripper. Based on the analytical results (presented in Section 5.2.1.2), the characteristics of the waste stream flowing into the pilot-scale treatment system were similar to the results of earlier studies, with the exception of the presence of vinyl chloride in the groundwater. The presence of vinyl chloride, which had not been detected in previous investigations, was unexpected and may possibly be the result of the microbial decomposition of the chlorinated compounds of concern.

5.2.1.2 Analysis of Treatability Study Data

This section of the report presents the results of the chemical analysis and toxicity testing from the pilot-scale treatability study. A discussion of the results in relation to the test objectives is also provided. Laboratory data from the pilot-scale study is attached to this report in Appendix I. The results are presented by parameter in Tables 5-7 through 5-21, organized to show the change in contaminant level across the air stripper and carbon adsorption unit.

TABLE 5-6
SUMMARY OF CONTAMINANTS OF CONCERN DETECTED IN THE SHALLOW GROUNDWATER AQUIFER, JANUARY 1991

Potential Contaminants of Concern	HPGW1	HPGW2	HPGW3	HPGW4-1	HPGW5	HPGW6	HPGW7	HPGW8	HPGW9-1	HPGW10	HPGW11	HPGW12	HPGW13	HPGW14	HPGW15
VOC (µg/L)															
Benzene	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <	5 <
1,2-Dichloroethene	73	10 <	10 <	5 <	5 <	5 <	5 <	5 <	1200	5 <	5 <	5 <	5 <	5 <	7
Trichloroethene	91	5 <	5 <	0.9 J	5 <	5 <	5 <	2 J	14000	5 <	5 <	5 <	5 <	5 <	4 J
Inorganics (µg/L)															
Chromium	87	64.3	16.7	187	3.6 B	1590	313	91.8	66.4	310	140	25.5	48.9	127	21.4
Iron	64100	34800	10400	100000	3100	265000	65700	40900	19800	119000	31800	5600	33500	87200	4800
Lead	16.6	29.4	11.4	66.6	13.6	60.7	112	54.1	128	186	45.2	15.7	9	66.5	16.6
Manganese	168	77	53.9	425	162	487	136	46.5	45	255	103	18.3	30.3	80	18.3
Antimony	13.3 <	15.6 B	46.5 B	21.9 B	13.3 <	13.3 <	22 <	22	17.6 B	22 <	22 <	22 <	13.3 <	13.3 <	22 <
Arsenic	8 B	24.1	15.6	15.5	1.5 <	31.5	18.3	28.4	3 B	39.9	9.1 B	1.8 <	47	45.6	1.8 <
Beryllium	6	1.7 BG	1.2 B	6.7	0.86 B	20	4.8 B	2.1	0.79 B	5.6	2.1 <	2.1 <	0.59 B	2.7 B	2.1 <
Mercury	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	1.4	0.25	0.13	0.1 <	0.82	0.1 B	0.1 <	0.1 <	0.26	0.1 <
Nickel	31.3 B	16.9 B	12.1 B	57	5.2 <	161	50.7	25.2	15.1 B	92.2	23.6 B	11 <	21.2 B	41.6	11 <

Potential Contaminants of Concern	HPGW16	HPGW17-1	HPGW18	HPGW19	HPGW20	HPGW21	HPGW22	HPGW23	HPGW24-1	HPGW25	HPGW26	HPGW29	22GW1	22GW2
VOC (µg/L)														
Benzene	5 <	5 <	N/A	5 <	5 <	5 <	5 <	24	3 J	5 <	5 <	5 <	7900	5 <
1,2-Dichloroethene	5 <	5 <	N/A	0.8 J	5 <	5 <	5 <	8900	42000 D	5 <	5 <	5 <	5 <	5 <
Trichloroethene	5 <	5 <	N/A	2 J	5 <	3 J	5 <	3700	180	5 <	5 <	5 <	5 J	5 <
Inorganics (µg/L)														
Chromium	209	37	N/A	13.8	424	45	79.8	76.3	26.3	205	13	179	457	26.3
Iron	47200	10500	N/A	36200	2E+05	56600	24400	23300	19200	46600	19000	76200	1E+05	16200
Lead	100	23.7	N/A	31.7	20	49.4	39.4	45	21.4	71.6	9	29.1	307	16.2
Manganese	98.3	31.3	N/A	79	217	136	94.1	68.8	54.8	118	10.6 B	236	284	763
Antimony	22 <	22 <	N/A	13.3	21.9B	13.3 <	24.6 B	24.6 <	22 <	13.3 <	13.3 <	13.3 <	20.9 B	13.3
Arsenic	17.3	1.8 <	N/A	5 B	49.4	12.1	7.2 B	6.6 B	4.2 B	13.2	1.5 <	25.6	50.3	11
Beryllium	5.3	2.1 <	N/A	2.3 B	9.5	3.7 B	0.6 B	1 B	2.1 <	2.8 B	0.5 <	8.7	5.8	0.5
Mercury	0.13 B	0.1 <	N/A	N/A	0.5	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.1 <	0.35	0.1
Nickel	41	11.9 B	N/A	7.3 B	168	30.8 B	23.2 B	33.2 B	14 <	39.2 B	5.2 <	93.5	186	17

Notes: < = Compound was analyzed, but not detected at the listed detection limit
J = Value is estimated
B = Reported value is < contract required detection limit (CRDL), but > instrument detection limit (IDL)
D = Compound identified in an analysis at a secondary dilution factor

N/A = Not Analyzed

Table 5-7
Summary of Analytical Results
Benzene
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	4	5	<2
2	3	3	<2
3	3	3	<2
4	3	<2	<2
5	3	<2	<2
6	3	<2	<2
7	3	<2	<2
Duplicate	3	2	<2

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-8
Summary of Analytical Results
Trans-1-2,Dichloroethene (DCE)
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	<40 D	6	<2
2	40	<2	<2
3	<40 D	<2	<2
4	<40 D	<2	<2
5	<40 D	<2	<2
6	<40 D	<2	<2
7	<40 D	<2	<2
Duplicate	<40 D	<2	<2

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-9
Summary of Analytical Results
Ethylbenzene
CTO-017

Sampling Interval	Location/Sample Name: After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	4	17	<2
2	<2	14	3
3	2	14	<2
4	<2	<2	<2
5	<2	<2	<2
6	<2	<2	<2
7	<2	<2	<2
Duplicate	<2	13	3

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-10
Summary of Analytical Results
Trichloroethene (TCE)
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	<2	<2	<2
2	160 D	<2	<2
3	180 D	<2	<2
4	190 D	<2	<2
5	180 D	<2	<2
6	180 D	<2	<2
7	120 D	<2	<2
8	180 D	<2	<2

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-11
Summary of Analytical Results
Tolulene
CTO-017

Sampling Interval	Location/Sample Name After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	5	25	<2
2	5	10	2
3	5	9	<2
4	5	8	<2
5	6	10	3
6	10	10	4
7	12	11	10
8	9	13	4

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-12
Summary of Analytical Results
Vinyl Chloride
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	270 D	<5	<5
2	290 D	<5	<5
3	320 D	<5	<5
4	330 D	<5	<5
5	350 D	<5	<5
6	360 D	<5	<5
7	336 D	<5	<5
8	340 D	<5	<5

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-13
Summary of Analytical Results
Antimony
CTO-017

	Location/Sample Name		
Sampling Interval	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	10 U	10 U	26.5 B
2	10 U	10 U	10 U
3	10 U	10 U	10 U
4	10 U	10 U	10 U
5	10 U	10 U	10 U
6	10 U	10 U	10 U
7	10 U	10 U	10 U
Duplicate	10 U	10 U	10 U

g

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.
(2) Samples were collected during the first 4 hours of a sampling interval.
(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.
(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).
(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-14
Summary of Analytical Results
Arsenic
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	2 U	15.4	137
2	2 U	2 U	11.1
3	2 U	2 U	9.1 B
4	2 U	2 U	7.9 B
5	2 U	2 U	2
6	2 U	2 U	5.9 B
7	2 U	2 U	2 B
8	2 U	2 U	7 B

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-15
Summary of Analytical Results
Beryllium
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	1 B	1 U	1 B
2	1	1 B	1 U
3	1 U	1 U	1 B
4	1 U	1 U	1 B
5	1 U	1 U	1 U
6	1 U	1 U	1 U
7	1 U	1 U	1 U
Duplicate	1 U	1 U	1 U

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-16
Summary of Analytical Results
Chromium
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	10 U	10 U	19
2	10	10 U	18
3	10 U	10 U	23
4	10 U	10 U	10 U
5	10 U	10 U	10 U
6	10 U	10 U	10 U
7	10 U	10 U	10 U
8	10 U	10 U	10 U

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-17
Summary of Analytical Results
Iron
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	8,618	39,000	17,200
2	7,740	8,340	13,200
3	7,270	6,910	19,200
4	7,390	6,590	2,730
5	7,700	7,150	1,140
6	7,570	6,790	4,760
7	7,580	6,870	1,580
Duplicate	7,540	6,690	3,140

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-18
Summary of Analytical Results
Lead
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	52.0	80.0	13.4
2	34.6	89.5	14.1
3	25.2	45.0	23.6
4	13.2	27.2	10.3
5	17.6	11.6	3.7
6	12.7	10.8	9.7
7	9.4	18.2	5.0
Duplicate	13.0	20.8	5.3

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-19
Summary of Analytical Results
Manganese
CTO-017

Sampling Interval	Location/Sample Name: After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	56	199	191
2	51	65	149
3	46	57	193
4	45	51	19
5	46	51	83
6	48	54	28
7	46	51	7 B
Duplicate	46	51	23

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-20
Summary of Analytical Results
Mercury
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	.2 U	.2 U	.2 U
2	.2 U	.2 U	.2 U
3	.2 U	.2 U	.2 U
4	.2 U	.2 U	.2 U
5	.2 U	.2 U	.2 U
6	.2 U	.2 U	.2 U
7	.2 U	.2 U	.2 U
Duplicate	.2 U	.2 U	.2 U

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

Table 5-21
Summary of Analytical Results
Nickel
CTO-017

Sampling Interval	Location/Sample Name		
	After Oil/Water Separator Sample OW ug/L	After Air Stripper Sample AS ug/L	After Carbon Filter Sample CF ug/L
1	20 U	23	28
2	20 U	20 U	186
3	20 U	20 U	33
4	20 U	20 U	20 U
5	20 U	20 U	20 U
6	20 U	20 U	20 U
7	20 U	20 U	20 U
Duplicate	20 U	20 U	20 U

Notes:

(1) A sample interval was a 12 hour period. This test consisted of seven consecutive 12 hour sampling intervals.

(2) Samples were collected during the first 4 hours of a sampling interval.

(3) If the qualifier "U" is present, the analyte was analyzed for but not detected.

(4) If the qualifier "B" is present, the reported value was obtained from a reading that was less than the Contract Required Detection Limit (CRDL), but, greater than or equal to the Instrument Detection Limit (IDL).

(5) If the qualifier "D" is present, the result was obtained from an analysis performed at a secondary dilution.

The results of the chemical analysis indicate that trans-1,2-dichloroethene (DCE), trichloroethene (TCE), and vinyl chloride were consistently removed from the waste stream to non-detectable levels by the air stripper. Benzene, and to a lesser extent, toluene and ethylbenzene, remained in the waste stream after the air stripper at levels roughly equivalent to the influent levels to the air stripper until the fourth sampling interval, when the levels consistently dropped to non-detectable levels. The initial levels may be attributable to equipment start-up inefficiencies.

A review of the results of the inorganic analyses reveal that the air stripper and carbon adsorption unit did not have a substantial effect on the removal of the metal contaminants. The first three sampling intervals revealed inconsistencies in the analytical results, including apparent increases in chromium, iron, lead, nickel, and manganese levels across the treatment units. These apparent increases can be accounted for by noting that samples were taken from the influent to the treatment equipment at the same time as samples were collected from the effluent, and noting varying flow-through times in the equipment. For example, with a 400-gallon capacity air stripper and a flow rate of 1.5 gpm, there was a 4.44 hour time difference between influent and effluent to the air stripper. Therefore, increases across equipment may not be caused by equipment but rather are most likely due to fluctuations in influent concentrations. Subsequent sampling intervals revealed these metals to be at non-detectable levels before and after both major treatment units (air stripper and carbon adsorption). Iron, lead, and manganese showed little decline across the air stripper; however, there was a notable decline in the levels of these metals with time, possibly due to the decreased turbidity of the waste stream as the pump test progressed and the recovery well and aquifer become better developed. After the second sampling interval, lead levels after the air stripper were consistently below the NCWQCG levels of 50 µg/L.

The results of the analyses for engineering parameters are presented in Table 5-22. A review of the results indicate that the concentrations of oil and grease and total suspended solids were significantly lower than the groundwater characterization samples taken for the bench-scale study. The low levels, even at start-up of the study, may possibly be due to the extended pumping during the step-drawdown test causing a similar drop in the levels of oil and grease and total suspended solids as was detected in the reduced levels of organics and metals with time.

Samples from the fourth sampling interval, approximately midway through the 72-hour study, underwent multi-concentration acute toxicity testing. These samples were drawn from

Table 5-22
HPIA Pilot Scale Treatability Study
Engineering Parameters

Parameter	Concentration @ Start Up (mg/l)	Concentration @ 72 hours (mg/l)
Oil and Grease, Gravimetric	<3	<3
Nitrate/Nitrite	<0.1	<0.1
Hardness, Total (as CaCO3)	46	44
Ammonia (N), Direct		
Ammonia (as N), Direct	0.4	0.5
Alkalinity, Pht (as CaCO3)	0	0
Alkalinity, Total (as CaCO3)	30	26
Alkalinity, Bicarbonate (as CaCO3)	30	26
Alkalinity, Carbonate (as CaCO3)	0	0
Chloride (as Cl)	23	24
Nitrite (as N)	<0.02	<0.02
Solids, Dissolved at 180C	110	87
Solids, Suspended at 103C	<10	<10

the air stripper effluent as well as the carbon adsorption unit effluent. The raw data from this test is included in Appendix I, Pilot-Scale Treatability Study Analytical Results. A review of the results indicates that neither the unfinished effluent from the air stripper nor the carbon-polished effluent resulted in a LC50, or lethal concentration to 50 percent of the test organisms (fathead minnow) at any dilution volume from 0 to 100 percent. The fact that the air stripper effluent passed the toxicity test, combined with chemical analytical results showing removal of organic contaminants by air stripping alone to non-detectable levels, will be used in the design of the full-scale treatment system.

5.2.1.3 Analysis of Constant Rate Aquifer Test

The aquifer characteristics derived from an analysis of aquifer test data are transmissivity, storativity or specific yield, and hydraulic conductivity. These characteristics can be subsequently used to derive an estimate of the representative shallow groundwater flow rate.

Transmissivity (T) is defined as the rate of flow under a unit hydraulic gradient through a cross-section unit width over the whole thickness of the aquifer (Kruseman and deRidder, 1989). This parameter is designated as T and has the dimensions of length^2/time.

Storativity or specific yield (S) is defined as the volume of water released per unit surface area of the aquifer per unit decline in the component of head normal to that surface (Kruseman and deRidder, 1976). This aquifer characteristic is dimensionless. In unconfined or semi-confined aquifers, the effects of the elasticity and compressibility of the aquifer material and the fluid are generally negligible. Storativity generally refers to confined aquifers, while specific yield refers to unconfined.

Hydraulic conductivity (K) is defined as the capacity of a porous medium to transmit water (Driscoll, 1986). This aquifer characteristic has the dimensions of length/time.

T, K, and S values were calculated using a computer software program designed by Groundwater Graphics of Oceanside, California. This program is called the "Graphical Well Analysis Package" (GWAP). The Neuman Method for unconfined aquifers with an elastic response was selected for use in this program based on the site conditions. The program generated log-log graphs for each monitoring well to calculate these values. Only data that indicated adequate drawdown curves were used for evaluation of aquifer characteristics. A printout of all graphs and data generated using GWAP is provided in Appendix J.

Table 5-23 summarizes of all the aquifer characteristics. The estimated, average T and S values are 5.61×10^{-2} gal/day/ft and 1.55×10^{-2}, respectively. Aside from the values obtained from piezometer P-2, these values are representative of the materials underlying the site (Kruseman and deRidder, 1989). Values obtained from the pumping wells was not used to calculate the average values since they may not be representative of the aquifer. In addition, estimates of K were calculated using the following formula:

$$K = T/b$$

Where: K = hydraulic conductivity

T = transmissivity

b = estimated aquifer thickness

An approximate aquifer thickness of 25 feet was used, based on the total depth of the recovery wells. The estimated, average K value for the site is 22.45 gal/day/sq. ft. These values are representative of a fine-grained or silty sand (Fetter, 1988). This material is consistent with those present underlying the site. The values calculated are also consistent with values obtained during previous reports.

5.2.2 QA/QC

Quality assurance/quality control samples were taken during the pilot-scale treatability testing to ensure that analytical results are reliable for remedial technology selection and design purposes. Field duplicates were collected for the VOC and metals analyses, as well as for oil and grease. In addition, trip blanks were analyzed for VOCs for each cooler, and matrix spike/matrix spike duplicates were run by the laboratory. No unusual variances were observed in any of the QA/QC samples. The QA/QC results are included in Appendix K.

TABLE 5-23

AQUIFER CHARACTERISTICS FOR THE SHALLOW AQUIFER AT THE HPIA

Well Number	Transmissivity (gal/day/ft)	Hydraulic Conductivity (gal/day/sq. ft.)	Storativity
RW-1	1.30×10^{2}	5.215	6.87×10^{-2}
P-1	8.04×10^{2}	32.15	4.06×10^{-2}
P-2	3.85×10^{2}	15.39	8.67×10^{-4}
24-1	4.96×10^{2}	19.83	4.89×10^{-3}

(1) Values from RW-1 may not be representative of aquifer conditions And were not included in average.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This Treatability Study Report presented the results of the bench-scale and pilot-scale treatability study and aquifer pump test for the shallow aquifer at the HPIA Operable Unit. The objectives of this study were to provide remedy selection testing to evaluate the performance of metals removal, oil separation, air stripping and carbon adsorption in meeting the site-specific clean-up goals for the HPIA Operable Unit. The purpose of the aquifer pump test was to provide aquifer characteristics necessary for the design of the groundwater extraction system.

6.1 Conclusions

6.1.1 Bench-Scale Testing

Groundwater characterization and bench-scale studies for oil and grease removal and suspended solids removal were conducted to determine the pretreatment requirements for the HPIA shallow groundwater. Based on the sample characterization results, it was determined that the metals of concern were primarily associated with the suspended solids. Based on the settling rates witnessed during the bench-scale testing, it is recommended that polymer addition with adequate settling time via a settling tank be incorporated into the full-scale treatment system.

The oil/water separation test indicated that most of the oil in the groundwater was free phase and not emulsified. Removal of this oil appears to be possible using a conventional oil/water separator. Suspended solids removal tests showed that physical treatment with an anionic polymer at an optimum dosage of 2 mg/L accelerated the settling rate of the suspended particles. The raw groundwater used in the bench-scale study had a much higher suspended solids content than was present after prolonged groundwater pumping during the pilot-scale study.

6.1.2 Pilot-Scale Study

6.1.2.1 Aquifer Pump Test

A 6-inch diameter recovery well and two 2-inch diameter piezometers were installed at the location of the contaminated groundwater plume at the HPIA in the vicinity of the 900 series

buildings for the purpose of conducting a 72-hour constant rate aquifer pump test. Based on the results of a step-drawdown test, a flow rate of 1.5 gpm was chosen for the constant rate aquifer test, which varied from the anticipated flow rate of 5 gpm proposed in the Work Plan, but is not unusual for the shallow aquifer at the Hadnot Point Industrial Area judging from previous studies (Appendix O). Existing monitoring wells and the new piezometers were continuously monitored for water level throughout the duration of the 72-hour test. A maximum drawdown of one foot was observed in piezometer P-2 located 60 feet from the recovery well. Drawdown in the other monitoring wells varied with distance from the recovery well.

The aquifer characteristics derived from the analysis of test data are transmissivity, storativity, and hydraulic conductivity. These values were calculated using a computer software package based on the Newman Method for unconfined aquifers with an elastic response based on site conditions. The estimated average transmissivity and storativity values are 5.61×10^{2} gal/day/ft and 1.55×10^{-2}, respectively, which are representative of the materials underlying the site. Using a estimated aquifer thickness of 25 feet, the estimated, average hydraulic conductivity for the site is 22.45 gal/day/sq. ft. These values are consistent with values obtained from previous reports. These results will be utilized in the Remedial Design of the Interim Remedial Action to determine zones of influence needed for the design of the groundwater extraction system.

Based on EPA and State concerns over the low flow rate obtained during the aquifer test and the applicability of the results for use in the design of the extraction system, Baker recommends that the design specifications require an aquifer test be conducted as part of the recovery well installation and that an option to install a limited quantity of additional recovery wells based on the results of the aquifer test be provided.

6.1.2.2 Pilot-Scale Treatability Study

The Pilot-Scale Treatability Study evaluated the performance of oil/water separation, air stripping, and carbon adsorption in meeting the site-specific clean-up goals for the HPIA Operable Unit. Raw groundwater pumped during the 72-hour aquifer pump test was treated by the pilot-scale system and discharged to the HPIA sanitary sewer system. Samples of the groundwater were collected before and after the air stripper and carbon adsorption unit and analyzed for the contaminants of concern.

The waste characteristics of the pumped groundwater were similar to the results of earlier studies, with the exception of the presence of vinyl chloride. The results of the chemical analysis indicate that the DCE, TCE, and vinyl chloride were consistently removed from the waste stream to non-detectable levels by the air stripper. After initially low efficiencies at start-up, the air stripper was effective in reducing benzene, toluene, and ethylbenzene to non-detectable levels. Effluent from both the air stripper and carbon adsorption unit passed the multi-concentration acute toxicity test.

The results of the inorganic analyses showed a decline in the levels of metal in the influent to the air stripper with time. The air stripper and carbon adsorption unit were ineffective in reducing the levels of metals. Total suspended solids were much lower during the pump test and pilot-scale study than were evident during the bench-scale study, possible because the recovery well and aquifer became better developed as the pump test progressed.

6.2 Recommendations

The results of this Treatability Study provide information to be used in the design of the full-scale treatment system for the Interim Remedial Action for the HPIA Operable Unit. Based on these results, the following recommendations are made:

- Air stripping as the primary treatment technology is effective in meeting the site-specific clean-up goals for the HPIA Operable Unit. Because the contaminant levels witnessed during the treatability study were lower than previous monitoring results, carbon adsorption as a finishing process is recommended at start-up until monitoring results show that air stripping is effective in removing the organics.

- Pretreatment prior to air stripping should include a conventional oil/water separator to remove the low levels of oil and grease and a metals removal system including flocculation by polymer addition, settling, and filtration.

- During installation of the recovery wells, aquifer tests should be conducted to determine well yield. A limited quantity of additional wells should be installed should results similar to the treatability study's aquifer test be encountered.

APPENDIX A
STEP-DRAWDOWN TEST DATA

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
0.0000	7.247	4.509
0.0033	7.177	4.509
0.0066	6.924	4.509
0.0100	7.108	4.516
0.0133	7.184	4.509
0.0166	7.000	4.509
0.0200	7.070	4.509
0.0233	7.387	4.516
0.0266	7.380	4.509
0.0300	6.956	4.516
0.0333	7.070	4.516
0.0500	7.507	4.509
0.0666	7.234	4.516
0.0833	7.215	4.516
0.1000	7.291	4.516
0.1166	7.285	4.516
0.1333	7.285	4.516
0.1500	7.285	4.516
0.1666	7.298	4.522
0.1833	7.304	4.516
0.2000	7.304	4.516
0.2166	7.317	4.516
0.2333	7.323	4.516
0.2500	7.330	4.516
0.2666	7.330	4.516
0.2833	7.342	4.516
0.3000	7.349	4.516
0.3166	7.361	4.516
0.3333	7.380	4.509
0.4166	7.399	4.516
0.5000	7.431	4.509
0.5833	7.475	4.509
0.6666	7.501	4.509
0.7500	7.539	4.522
0.8333	7.564	4.516
0.9166	7.596	4.516
1.0000	7.627	4.516
1.0833	7.665	4.516
1.1666	7.684	4.516
1.2500	7.710	4.516
1.3333	7.741	4.516

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
1.4166	7.760	4.516
1.5000	7.792	4.516
1.5833	7.811	4.522
1.6666	7.830	4.522
1.7500	7.843	4.516
1.8333	7.868	4.516
1.9166	7.893	4.516
2.0000	7.912	4.516
2.5000	8.160	4.516
3.0000	8.388	4.516
3.5000	8.597	4.516
4.0000	8.793	4.522
4.5000	8.971	4.522
5.0000	9.142	4.516
5.5000	9.300	4.528
6.0000	9.439	4.522
6.5000	9.572	4.528
7.0000	9.705	4.535
7.5000	9.807	4.528
8.0000	9.914	4.535
8.5000	10.016	4.535
9.0000	10.111	4.535
9.5000	10.193	4.541
10.0000	10.263	4.535
12.0000	10.535	4.547
14.0000	10.725	4.554
16.0000	10.870	4.560
18.0000	10.991	4.566
20.0000	11.079	4.573
22.0000	11.155	4.585
24.0000	11.219	4.598
26.0000	11.276	4.604
28.0000	11.326	4.611
30.0000	11.358	4.617
32.0000	11.409	4.636
34.0000	11.440	4.642
36.0000	11.466	4.649
38.0000	11.510	4.668
40.0000	11.554	4.674
42.0000	11.586	4.680
44.0000	11.624	4.687

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
46.0000	11.643	4.693
48.0000	11.681	4.712
50.0000	11.706	4.718
52.0000	11.725	4.725
54.0000	11.738	4.731
56.0000	11.750	4.744
58.0000	11.725	4.750
60.0000	11.706	4.763
62.0000	11.719	4.782

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.0000	6.804	6.780	12.704	11.610
0.0083	6.804	6.780	12.704	11.610
0.0166	6.798	6.780	12.704	11.610
0.0250	6.798	6.774	12.704	11.610
0.0333	6.798	6.774	12.704	11.610
0.0416	6.804	6.780	12.704	11.610
0.0500	6.798	6.780	12.704	11.594
0.0583	6.804	6.780	12.704	11.610
0.0666	6.804	6.780	12.704	11.610
0.0750	6.804	6.780	12.720	11.610
0.0833	6.804	6.780	12.720	11.610
0.0916	6.804	6.780	12.704	11.610
0.1000	6.804	6.780	12.704	11.610
0.1083	6.804	6.780	12.704	11.594
0.1166	6.804	6.774	12.704	11.610
0.1250	6.804	6.774	12.720	11.610
0.1333	6.804	6.780	12.704	11.610
0.1416	6.804	6.780	12.704	11.594
0.1500	6.804	6.780	12.704	11.594
0.1583	6.804	6.780	12.704	11.610
0.1666	6.804	6.780	12.704	11.610
0.1750	6.804	6.780	12.704	11.610
0.1833	6.804	6.780	12.704	11.610
0.1916	6.804	6.780	12.704	11.610
0.2000	6.804	6.780	12.720	11.594
0.2083	6.804	6.780	12.704	11.610
0.2166	6.804	6.780	12.704	11.610
0.2250	6.804	6.780	12.720	11.610
0.2333	6.811	6.774	12.704	11.610
0.2416	6.804	6.780	12.704	11.610
0.2500	6.804	6.780	12.704	11.610
0.2583	6.804	6.780	12.704	11.610
0.2666	6.804	6.780	12.704	11.610
0.2750	6.811	6.780	12.720	11.610
0.2833	6.804	6.780	12.704	11.610
0.2916	6.811	6.780	12.704	11.610
0.3000	6.804	6.780	12.704	11.610
0.3083	6.811	6.780	12.704	11.594
0.3166	6.804	6.780	12.720	11.594
0.3250	6.804	6.774	12.704	11.610
0.3333	6.804	6.780	12.704	11.610

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
0.3500	6.804	6.780	12.704	11.610
0.3666	6.804	6.774	12.704	11.610
0.3833	6.804	6.774	12.704	11.610
0.4000	6.804	6.774	12.704	11.610
0.4166	6.804	6.774	12.704	11.610
0.4333	6.804	6.774	12.704	11.610
0.4500	6.804	6.774	12.704	11.610
0.4666	6.804	6.774	12.704	11.610
0.4833	6.798	6.774	12.704	11.610
0.5000	6.798	6.774	12.704	11.610
0.5166	6.798	6.774	12.704	11.610
0.5333	6.798	6.774	12.704	11.610
0.5500	6.804	6.774	12.704	11.610
0.5666	6.798	6.774	12.704	11.610
0.5833	6.804	6.780	12.704	11.594
0.6000	6.804	6.774	12.704	11.610
0.6166	6.804	6.780	12.704	11.610
0.6333	6.798	6.774	12.704	11.594
0.6500	6.798	6.774	12.704	11.594
0.6666	6.798	6.774	12.704	11.610
0.6833	6.804	6.774	12.704	11.594
0.7000	6.798	6.774	12.704	11.594
0.7166	6.798	6.774	12.704	11.594
0.7333	6.804	6.780	12.704	11.610
0.7500	6.804	6.774	12.704	11.610
0.7666	6.804	6.780	12.704	11.610
0.7833	6.804	6.780	12.720	11.610
0.8000	6.811	6.780	12.720	11.610
0.8166	6.811	6.780	12.720	11.610
0.8333	6.811	6.780	12.720	11.610
0.8500	6.811	6.780	12.720	11.610
0.8666	6.811	6.780	12.704	11.610
0.8833	6.811	6.780	12.704	11.610
0.9000	6.804	6.780	12.704	11.610
0.9166	6.804	6.774	12.704	11.594
0.9333	6.804	6.774	12.704	11.594
0.9500	6.804	6.780	12.704	11.594
0.9666	6.804	6.780	12.688	11.594
0.9833	6.804	6.780	12.704	11.594
1.0000	6.804	6.774	12.704	11.594
1.2000	6.804	6.774	12.704	11.610

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1.4000	6.804	6.774	12.704	11.594
1.6000	6.811	6.780	12.720	11.610
1.8000	6.798	6.774	12.704	11.594
2.0000	6.804	6.774	12.704	11.594
2.2000	6.817	6.768	12.704	11.594
2.4000	6.804	6.787	12.704	11.594
2.6000	6.804	6.774	12.688	11.610
2.8000	6.804	6.780	12.704	11.594
3.0000	6.804	6.774	12.704	11.610
3.2000	6.804	6.774	12.704	11.594
3.4000	6.804	6.780	12.704	11.594
3.6000	6.804	6.774	12.704	11.594
3.8000	6.798	6.774	12.704	11.594
4.0000	6.804	6.780	12.704	11.610
4.2000	6.804	6.774	12.688	11.610
4.4000	6.804	6.780	12.704	11.610
4.6000	6.811	6.780	12.704	11.610
4.8000	6.811	6.780	12.704	11.610
5.0000	6.811	6.780	12.704	11.594
5.2000	6.804	6.780	12.704	11.610
5.4000	6.804	6.780	12.704	11.610
5.6000	6.804	6.780	12.704	11.594
5.8000	6.804	6.780	12.704	11.610
6.0000	6.811	6.780	12.704	11.610
6.2000	6.804	6.780	12.688	11.594
6.4000	6.811	6.780	12.704	11.594
6.6000	6.804	6.780	12.704	11.594
6.8000	6.811	6.780	12.704	11.594
7.0000	6.811	6.787	12.704	11.610
7.2000	6.804	6.780	12.704	11.594
7.4000	6.811	6.780	12.704	11.594
7.6000	6.804	6.787	12.704	11.594
7.8000	6.811	6.787	12.704	11.610
8.0000	6.811	6.780	12.704	11.610
8.2000	6.811	6.780	12.704	11.610
8.4000	6.804	6.780	12.704	11.610
8.6000	6.804	6.780	12.704	11.594
8.8000	6.804	6.774	12.704	11.594
9.0000	6.804	6.780	12.704	11.610
9.2000	6.804	6.780	12.704	11.594
9.4000	6.804	6.780	12.704	11.610

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 1
FLOW RATE: 1 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
9.6000	6.811	6.787	12.704	11.594
9.8000	6.811	6.787	12.704	11.594
10.0000	6.811	6.787	12.704	11.610
12.0000	6.811	6.787	12.720	11.625
14.0000	6.811	6.793	12.720	11.610
16.0000	6.817	6.793	12.720	11.625
18.0000	6.817	6.793	12.720	11.625
20.0000	6.817	6.793	12.720	11.610
22.0000	6.817	6.799	12.720	11.625
24.0000	6.817	6.793	12.720	11.610
26.0000	6.817	6.793	12.720	11.610
28.0000	6.817	6.793	12.720	11.610
30.0000	6.824	6.806	12.720	11.625
32.0000	6.824	6.806	12.720	11.625
34.0000	6.824	6.806	12.735	11.610
36.0000	6.824	6.812	12.720	11.610
38.0000	6.830	6.812	12.720	11.610
40.0000	6.830	6.812	12.751	11.625
42.0000	6.830	6.825	12.720	11.625
44.0000	6.836	6.818	12.720	11.625
46.0000	6.830	6.825	12.735	11.625
48.0000	6.836	6.825	12.735	11.625
50.0000	6.836	6.825	12.720	11.610
52.0000	6.836	6.825	12.720	11.625
54.0000	6.843	6.831	12.720	11.625
56.0000	6.843	6.831	12.735	11.625
58.0000	6.843	6.837	12.720	11.625
60.0000	6.849	6.837	12.720	11.625
62.0000	6.849	6.837	12.735	11.625

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
0.0000	11.706	4.782
0.0033	11.706	4.782
0.0066	11.712	4.782
0.0100	11.719	4.782
0.0133	11.712	4.788
0.0166	11.706	4.788
0.0200	11.706	4.782
0.0233	11.719	4.788
0.0266	11.712	4.788
0.0300	11.712	4.788
0.0333	11.706	4.788
0.0500	11.712	4.782
0.0666	11.712	4.788
0.0833	11.719	4.788
0.1000	11.712	4.788
0.1166	11.712	4.788
0.1333	11.706	4.788
0.1500	11.712	4.788
0.1666	11.719	4.788
0.1833	11.706	4.788
0.2000	11.719	4.788
0.2166	11.706	4.788
0.2333	11.719	4.788
0.2500	11.712	4.788
0.2666	11.712	4.788
0.2833	11.712	4.795
0.3000	11.719	4.795
0.3166	11.712	4.788
0.3333	11.712	4.795
0.4166	11.712	4.788
0.5000	11.719	4.795
0.5833	11.719	4.795
0.6666	11.719	4.795
0.7500	11.706	4.788
0.8333	11.719	4.788
0.9166	11.719	4.795
1.0000	11.719	4.795
1.0833	11.712	4.795
1.1666	11.712	4.795
1.2500	11.719	4.795
1.3333	11.719	4.795

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
1.4166	11.719	4.795
1.5000	11.706	4.795
1.5833	11.719	4.795
1.6666	11.719	4.795
1.7500	11.725	4.795
1.8333	11.706	4.795
1.9166	11.712	4.801
2.0000	11.725	4.788
2.5000	11.719	4.795
3.0000	11.725	4.801
3.5000	11.725	4.795
4.0000	11.731	4.795
4.5000	11.744	4.801
5.0000	11.833	4.807
5.5000	11.896	4.807
6.0000	11.959	4.814
6.5000	12.048	4.814
7.0000	12.181	4.814
7.5000	12.295	4.814
8.0000	12.618	4.820
8.5000	12.966	4.820
9.0000	13.061	4.826
9.5000	13.130	4.826
10.0000	13.250	4.826
12.0000	13.333	4.839
14.0000	13.820	4.852
16.0000	14.218	4.858
18.0000	14.554	4.871
20.0000	14.807	4.877
22.0000	15.047	4.896
24.0000	15.262	4.909
26.0000	15.433	4.921
28.0000	15.604	4.934
30.0000	15.762	4.940
32.0000	15.914	4.953
34.0000	16.046	4.972
36.0000	16.179	4.985
38.0000	16.306	4.997
40.0000	16.413	5.004
42.0000	16.521	5.023
44.0000	16.748	5.035

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
46.0000	17.058	5.042
48.0000	17.368	5.054
50.0000	17.703	5.067
52.0000	18.031	5.080
54.0000	18.341	5.093
56.0000	18.644	5.105
58.0000	18.979	5.124
60.0000	19.301	5.124
62.0000	19.668	5.131
64.0000	19.996	5.150
66.0000	20.249	5.162
68.0000	20.211	5.169
70.0000	20.205	5.181
72.0000	20.179	5.194
74.0000	20.293	5.200
76.0000	20.811	5.213
78.0000	21.253	5.226
80.0000	21.234	5.238
82.0000	21.234	5.245
84.0000	21.253	5.257
86.0000	21.234	5.264
88.0000	21.234	5.270
90.0000	21.228	5.283
92.0000	21.253	5.289
94.0000	21.259	5.302
95.0000	21.234	5.308
96.0000	21.234	5.308
97.0000	21.234	5.321
98.0000	21.240	5.321
99.0000	21.234	5.321
100.0000	21.234	5.327
101.0000	21.234	5.333
102.0000	21.234	5.333
103.0000	21.234	5.346
104.0000	21.240	5.346
106.0000	21.253	5.352
108.0000	21.234	5.365
110.0000	21.259	5.371
112.0000	21.234	5.378
114.0000	21.259	5.384
116.0000	21.259	5.390

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
118.0000	21.234	5.403
120.0000	21.253	5.409
122.0000	21.234	5.416
124.0000	21.259	5.422

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.0000	6.843	6.837	12.720	11.61
0.0083	6.843	6.837	12.720	11.61
0.0166	6.849	6.837	12.720	11.61
0.0250	6.849	6.837	12.720	11.61
0.0333	6.843	6.837	12.720	11.61
0.0416	6.849	6.837	12.720	11.61
0.0500	6.843	6.837	12.720	11.61
0.0583	6.843	6.837	12.720	11.61
0.0666	6.849	6.837	12.720	11.61
0.0750	6.843	6.837	12.720	11.61
0.0833	6.843	6.837	12.720	11.61
0.0916	6.843	6.837	12.720	11.61
0.1000	6.849	6.837	12.720	11.61
0.1083	6.849	6.837	12.720	11.61
0.1166	6.849	6.837	12.720	11.61
0.1250	6.849	6.837	12.720	11.61
0.1333	6.843	6.837	12.720	11.61
0.1416	6.849	6.837	12.720	11.61
0.1500	6.849	6.844	12.720	11.61
0.1583	6.849	6.837	12.720	11.61
0.1666	6.849	6.837	12.720	11.61
0.1750	6.849	6.837	12.720	11.61
0.1833	6.849	6.837	12.720	11.61
0.1916	6.849	6.837	12.720	11.61
0.2000	6.849	6.837	12.720	11.61
0.2083	6.849	6.837	12.720	11.61
0.2166	6.849	6.837	12.720	11.61
0.2250	6.849	6.837	12.720	11.61
0.2333	6.849	6.837	12.720	11.61
0.2416	6.849	6.837	12.720	11.61
0.2500	6.849	6.837	12.720	11.61
0.2583	6.849	6.837	12.720	11.61
0.2666	6.849	6.837	12.720	11.61
0.2750	6.849	6.837	12.720	11.61
0.2833	6.849	6.837	12.720	11.61
0.2916	6.849	6.837	12.720	11.61
0.3000	6.849	6.837	12.720	11.61
0.3083	6.849	6.837	12.720	11.61
0.3166	6.849	6.844	12.720	11.61
0.3250	6.849	6.837	12.720	11.61
0.3333	6.849	6.837	12.720	11.61

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
0.3500	6.849	6.844	12.720	11.61
0.3666	6.849	6.837	12.720	11.61
0.3833	6.849	6.837	12.720	11.61
0.4000	6.849	6.837	12.720	11.61
0.4166	6.849	6.837	12.720	11.61
0.4333	6.849	6.844	12.720	11.61
0.4500	6.849	6.837	12.720	11.61
0.4666	6.849	6.837	12.720	11.61
0.4833	6.849	6.837	12.720	11.61
0.5000	6.849	6.837	12.720	11.61
0.5166	6.849	6.837	12.720	11.625
0.5333	6.849	6.837	12.720	11.61
0.5500	6.849	6.837	12.720	11.61
0.5666	6.849	6.837	12.720	11.61
0.5833	6.849	6.837	12.720	11.61
0.6000	6.849	6.837	12.720	11.61
0.6166	6.849	6.837	12.720	11.61
0.6333	6.843	6.837	12.720	11.61
0.6500	6.843	6.837	12.720	11.61
0.6666	6.849	6.837	12.720	11.61
0.6833	6.849	6.837	12.720	11.61
0.7000	6.843	6.837	12.720	11.61
0.7166	6.843	6.837	12.720	11.61
0.7333	6.843	6.844	12.720	11.61
0.7500	6.843	6.837	12.720	11.61
0.7666	6.843	6.844	12.720	11.625
0.7833	6.843	6.837	12.720	11.61
0.8000	6.843	6.837	12.720	11.625
0.8166	6.849	6.837	12.720	11.61
0.8333	6.843	6.837	12.720	11.61
0.8500	6.849	6.837	12.720	11.61
0.8666	6.849	6.837	12.720	11.61
0.8833	6.843	6.844	12.720	11.61
0.9000	6.843	6.837	12.720	11.61
0.9166	6.849	6.837	12.720	11.61
0.9333	6.849	6.837	12.720	11.625
0.9500	6.849	6.837	12.720	11.61
0.9666	6.849	6.844	12.720	11.625
0.9833	6.849	6.837	12.720	11.61
1.0000	6.849	6.844	12.720	11.61
1.2000	6.849	6.837	12.720	11.61

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
1.4000	6.849	6.837	12.720	11.61
1.6000	6.849	6.837	12.720	11.61
1.8000	6.849	6.837	12.720	11.61
2.0000	6.849	6.837	12.720	11.61
2.2000	6.849	6.837	12.720	11.61
2.4000	6.849	6.837	12.720	11.61
2.6000	6.849	6.837	12.720	11.61
2.8000	6.849	6.844	12.720	11.61
3.0000	6.849	6.844	12.720	11.61
3.2000	6.849	6.837	12.720	11.61
3.4000	6.849	6.844	12.720	11.61
3.6000	6.849	6.837	12.720	11.61
3.8000	6.849	6.837	12.704	11.61
4.0000	6.849	6.844	12.720	11.61
4.2000	6.849	6.837	12.720	11.61
4.4000	6.849	6.844	12.704	11.61
4.6000	6.849	6.844	12.704	11.61
4.8000	6.849	6.837	12.720	11.61
5.0000	6.849	6.844	12.720	11.61
5.2000	6.849	6.844	12.720	11.61
5.4000	6.849	6.837	12.720	11.61
5.6000	6.849	6.844	12.720	11.61
5.8000	6.856	6.844	12.704	11.61
6.0000	6.856	6.844	12.720	11.61
6.2000	6.849	6.844	12.720	11.61
6.4000	6.849	6.844	12.720	11.61
6.6000	6.856	6.844	12.720	11.61
6.8000	6.856	6.844	12.704	11.61
7.0000	6.849	6.844	12.720	11.61
7.2000	6.849	6.844	12.704	11.61
7.4000	6.856	6.844	12.704	11.61
7.6000	6.849	6.844	12.720	11.61
7.8000	6.856	6.844	12.720	11.61
8.0000	6.856	6.844	12.704	11.61
8.2000	6.856	6.844	12.720	11.61
8.4000	6.856	6.850	12.720	11.61
8.6000	6.856	6.844	12.720	11.61
8.8000	6.856	6.850	12.720	11.61
9.0000	6.856	6.844	12.720	11.61
9.2000	6.849	6.844	12.720	11.61
9.4000	6.856	6.850	12.720	11.61

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
9.6000	6.856	6.850	12.720	11.61
9.8000	6.856	6.850	12.704	11.61
10.0000	6.856	6.850	12.720	11.625
12.0000	6.856	6.856	12.735	11.625
14.0000	6.862	6.862	12.735	11.625
16.0000	6.862	6.869	12.735	11.625
18.0000	6.868	6.869	12.720	11.625
20.0000	6.868	6.875	12.735	11.625
22.0000	6.875	6.875	12.735	11.625
24.0000	6.875	6.881	12.735	11.625
26.0000	6.875	6.881	12.735	11.625
28.0000	6.875	6.881	12.735	11.625
30.0000	6.875	6.888	12.735	11.625
32.0000	6.881	6.894	12.735	11.625
34.0000	6.881	6.894	12.735	11.625
36.0000	6.888	6.900	12.751	11.641
38.0000	6.888	6.900	12.735	11.641
40.0000	6.894	6.907	12.735	11.641
42.0000	6.894	6.913	12.735	11.625
44.0000	6.900	6.913	12.751	11.641
46.0000	6.900	6.913	12.735	11.641
48.0000	6.907	6.919	12.751	11.625
50.0000	6.907	6.926	12.751	11.641
52.0000	6.907	6.932	12.735	11.641
54.0000	6.907	6.926	12.751	11.641
56.0000	6.907	6.932	12.735	11.625
58.0000	6.920	6.944	12.751	11.641
60.0000	6.920	6.944	12.735	11.641
62.0000	6.920	6.944	12.735	11.641
64.0000	6.920	6.951	12.751	11.641
66.0000	6.920	6.951	12.751	11.641
68.0000	6.926	6.957	12.735	11.641
70.0000	6.926	6.957	12.751	11.641
72.0000	6.932	6.963	12.735	11.641
74.0000	6.932	6.970	12.751	11.641
76.0000	6.939	6.970	12.751	11.641
78.0000	6.939	6.976	12.735	11.641
80.0000	6.945	6.976	12.751	11.641
82.0000	6.945	6.982	12.751	11.641
84.0000	6.952	6.989	12.751	11.656
86.0000	6.945	6.989	12.751	11.641

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: STEP 2
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
88.0000	6.952	6.989	12.751	11.656
90.0000	6.952	6.995	12.751	11.641
92.0000	6.958	6.995	12.751	11.641
94.0000	6.958	7.008	12.751	11.641
96.0000	6.958	7.001	12.751	11.656
98.0000	6.964	7.008	12.751	11.641
100.0000	6.964	7.008	12.751	11.641
105.0000	6.971	7.020	12.751	11.656
110.0000	6.977	7.026	12.751	11.656
115.0000	6.984	7.033	12.751	11.656
120.0000	6.990	7.039	12.751	11.656
125.0000	6.996	7.052	12.766	11.656

APPENDIX B
FLOW RATE MEASUREMENTS

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FLOW LEVEL MEASUREMENTS

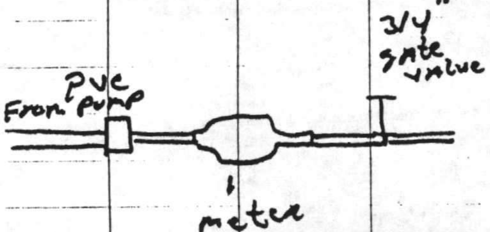
Project HPIA CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2/2/93	INITIAL		326.2		Pump on at 10:05
2/2/93	10:09	4.0	333.6	1.85	Flow Adjusted until
↓	10:12	3.0	338.1	1.5	10:09. - Flowing Fast
	10:16	4.0	343.8	1.4	
	10:26	10.0	358.3	1.45	
	10:38	12	375.1	1.4	
	10:45	7	384.8	1.39	
	11:00	15	405.6	1.39	
	11:17	17	429.1	1.38	
	11:30	13	447.1	1.38	
	11:41 ~~11:40~~	11	462.3	1.38	Attempted to Adjust ~~ed~~ meter at 11:48
	12:08	27	499.7	1.38	
	13:09	61	584.7	1.39	Adjusted meter increased
	13:15	6	594.1	1.57	
	13:49	34	642.0	1.41	
	14:28	39	695.4	1.37	
2/2/93					14:44 - 16:06 in DJM Log
	16:46	-	888.2	-	
	16:50	4	892.0	.95	
	16:58	8	903.9	1.48	
	17:17	19	931.1	1.43	incremental up adjustment
	17:30	11	948.1	1.54	
	17:52	21	974.1	1.23	incremental up -
	18:18	34	1007.0	.97	

Flow meter
MASter meter # 1430645

The AIR stripper is the same 2 TRAY system that was used at OCEANA NAS Aquifer Test.

Flow meter set-up.



The pump test was initiated at 10:05 AM on 2/2/93

The flowrate after one hr of pumping seems to be decreasing. it may be necessary to adjust the flow rate

10:30 DABAL and Bednar go to get vehicle pass.

11:00 M. Smith went to call EAB.

meter Readings

TIME	elapsed TIME	FLOW meas	ΔQ	Avg Q
14:44	—	719.8	-	—
Adjusted	Flow	at 14:38.		
14:54	10	734.2	14.4	14.4
15:09	15	754.6	20.4	1.36
15:11	Again adjusted	Flow rate		
13:14	5	763.2	8.6	1.72
13:17	3	768.3	5.1	1.7
15:22	5	776.1	7.8	1.56
15:33	11	793.2	17.1	1.55
15:47	Going to	fast throttled	Back	
15:51	18	819.2	26	1.44
16:00	9	831.2	12	1.33
16:06	6	840.1	8.7	1.48

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FLOW LEVEL MEASUREMENTS

Project: Hadnot Point Industrial Area CTO Number: 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-2-93	18:24	—	1023.3	—	Adjusted Flow Rate
	18:30	6	1031.7	1.4	
	18:36	6	1040.1	1.4	
	18:45	9	1051.8	1.3	
	18:49	4	1058.5		Adjusted
	19:04	15	1079.3	1.38	
	19:17	13	1094.7	1.18	Adjusted
	19:22	5	1102.2	1.5	
	19:36	14	1122.0	1.43	
	19:47	11	1136.5	1.3	
	19:53	6	1144.5	1.33	
	19:56	3	1149.1	1.53	Adjusted
	20:24	39	1220.5 ~~1141.0~~	1.57	
	20:53	29	1235.0	0.84	ADJUSTED
	20:56	3	1238.5	1.16	Adjusted
	21:04	8	1249.0	1.31	
	21:14	10	1262.5	1.35	
	21:24	10	1274.0	1.15	Adjusted
	21:30	6	1281.0	1.17	
	21:34	4	1287.5	1.62	Adjust
	21:43	9	1300.0	1.38	
	22:00	17	1321.0	1.23	Adjust
	22:07	7	1330.0 ~~1322.0~~	1.28	
	22:12	5	1337.5	1.50	

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FLOW LEVEL MEASUREMENTS

Project HADNOT POINT INDUSTRIAL SITE CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-2-93	22:20	8	1348.0	1.31	
	22:39	19	1371.5	1.23	Adjust
	22:43	4	1377.3	1.45	
	23:00	17	1400.0	1.33	
	23:09	9	1420.0	2.2	Adjust
	23:37	28	1447.5	1.0	Adjust
	23:48	11	1461.0	1.23	Adjust
	23:55	7	1470.0	1.28	
2/3/93	0:05	10	1484.0	1.40	
	0:25	20	1510.0	1.3	
	0:45	20	1534.5	1.23	Adjust
	0:55	10	1547.0	1.25	Adjust
	1:07	12	1563.5	1.38	
	1:42	35	1610.0	1.32	
	2:04	22	1637.0	1.22	
	2:22	18	1659.3	1.24	Adjust
	2:29	7	1667.5	1.2	
	2:34	5	1674.0	1.3	
	3:00	26	1706.0	1.23	Adjust
	3:07	7	1711.8	0.82	Adjust
	3:15	9	1722.5	1.2	
	3:20	5	1731.5	1.8	
	3:43	23	1757.5	1.13	Adjust
	3:46	3	1760.0	0.83	

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FLOW LEVEL MEASUREMENTS

Project HADNOT POINT I.A   CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-3-93	3:50	4	1765.0	1.25	
2-3-93	0400	10	1781.	1.60	adjustment / top of pump showing
2-3-93	0410	10	~~1789.4~~ 1794	1.30	
2-3-93	0421	11	~~1818~~ 1811	~~2.2~~ 1.5	adjust ~~pump~~
2-3-93	0422				Flow stops
2-3-93	0429				Flow resumes
2-3-93	0434	13	1821	~~1.3~~ .7	
2-3-93	0440	6	1830	1.5	
2-3-93	0455	15	1851	1.4	
2-3-93	~~04~~ 0510	15	1877	1.7	~~(pump)~~ pump showing
2-3-93	0536	26	1901	1.0	
2-3-93	0556	20	1926	1.25	pump showing
2-3-93	0615	19	1950	1.8	
2-3-93	0640	25	1981	1.24	pump showing
	0648	8	1991.5	1.31	
	0713	25	2023.0	1.26	Adjust to slow down ~~submerge~~ pump
	0718	5	2029.0	1.20	
	0743	25	2060.0	1.24	
	08:00	17	2076.5	0.91	
	8:15	15	2096.7	1.41	
	8:30				Pump visible in well Flow Reduced - Reduced to ≈1.2
	8:43		2128.7		
	8:46	3	2132.2	1.17	
	8:53	7	2140.5	1.18	will try to increase flow to 1.4-1.5 gpm
	8:59	6	2148.8	1.38	
	9:06	7	2158.8	1.42	
	9:12	6	2167.3	1.42	
	9:34	22	2196.3	1.38	Pump visible again after pumping at 1.4 gpm will try to operate at 1.2 gpm

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FLOW LEVEL MEASUREMENTS

Project: HAdNot Point Ind. Area   CTO Number: 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-3-93	9:34	—	2196.3	—	Readjusted Pump @ 9:30
	9:40	6	2202.7	1.07	
	9:53	13	2216.7	1.08	
	10:04	11	2230.0	1.21	
	10:27	23	2256.5	1.15	
	10:50	23	2290.2	1.46	
	11:08	13	2318.2	2.15	60s readings indicate operator misread
	11:12	INIT —	2320	-	
	11:22	10	2330.7	1.07	
	11:43	21	2351.0	0.97	
	11:55	12	2363.9	1.08	
	12:10	15	2381.0	1.14	
	12:27	17	2400.0	1.12	
	12:37				
	12:43	6	2418	1.3	
	13:04	2	2440.4	1.08	
	13:12	8	2450.0	1.2	
	13:57	45	2503.7	1.19	
	14:07	10	2516.2	1.25	
	14:18	11	2530.0	1.25	
	14:35	17	2551.0	1.24	
	14:47	12	2565.8	1.23	
	15:09	22	2592.8	1.23	
	15:28	19	2616.1	1.23	

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FLOW LEVEL MEASUREMENTS

Project Hadnot Point Ind. Area CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-3-93	15:48	10	2640.5	1.22	
	16:19	31	2678.3	1.22	
	16:58	39	2726.4	1.23	
	17:25	27	2759.1	1.21	
	17:57	32	2797.1	1.18	1924 ΔT Avg Q = 1.29 gpm
	18:09	12	2811.1	1.17	TOTAL Q 2484.9
	18:23	14	2827.5	1.17	16.17 - SWL IN RW-1
	18:34	11	2840.2	1.15	
	18:42	8	2851.2	1.38	
	1852	10	2864.3	1.31	
	1934	42	2917.5	1.26	
	2010	36	2961.5	1.22	
	2043	33	3000.0	1.16	
	2111	28	3036.0	1.20	
	2137	26	3067.5	1.21	
	2159	22	3094.5	1.22	
	2239	40	3144.0	1.23	
	2306	26	3177.0	1.26	
	2332	26	3209.0	1.23	
	~~2357~~	~~26~~			
2-4-93	0017	45	3264	1.22	
	0042	25	3294.5	1.22	
	0103	21	3320	1.21	
	0130	27	3354	1.25	

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FLOW LEVEL MEASUREMENTS

Project HADNOT POINT IND. AREA CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-4-93	0200	30	3390	1.20	
	0218	18	3413	1.27	
	0305	47	3465	1.11	
	0413	68	3534	1.01	
	0532	79	~~36[illegible]~~	1.00	3614
	0556	24	3640	1.1	
	0631	35	3664	0.7	Adjust
	0707	38	3699	0.9	
	0734	27	3726	1.0	
	0821	47	3772.1	.98	adjust to 1.2
	0910	51	3828.4	1.10	
	0919	9	3839.1	1.18	
	0940	21	3863.9	1.18	
	1015	35	3905.7	1.19	
	1433	258	4215.6	1.2	the large time that elapsed was due to the official time keeping watch was momentarily lost
	1457	24	4244.5	1.2	
	1558	61	4314.5	1.14	adjust to 1.2
	1606	8	4323.7	1.15	
	~~1626~~	~~20~~	~~4346.5~~	~~1.1~~	misread something
	~~1628~~	~~2~~	~~4348.7~~	~~1.1~~	
			4356.8		
	1639	33	4361.3	1.13	
	1646	7	4369.3	1.14	
	1658	12	4386.9	1.47	

11:57 AM
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FLOW LEVEL MEASUREMENTS

Project Hadnot Point Industrial Area CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-4-93	1701	3	4390.1	1.07	
	1703	2	4392.0	.95	tried adjusting flow, turned valve but rate not responding
	17 41	38	4437.0	1.18	after playing with valve for 30 min able to get a proper rate
	1803	22	4464.5	1.25	- flow up to 1.25 with out adjusting valve
	1817	14	4481.9	1.24	
	1833	16	4501.3	1.21	
	1849	16	4521.6	1.26	
	19.16	27	4554.4	1.21	
	19.47	31	4592.9	1.24	water level in RW 20.22 going to try to cut rate back
	20.31	44	4641.3	1.1	tried adjusting SWL rises back to 15.86 attempt
	20.39	8	4647.9	0.825	to re adjust close to 1.2
	20.50	11	4660.2	1.12	
	2122	32	4700	1.24	
	2153	31	4736.5	1.20	
	2230	37	4780	1.17	
	2318	48	4835	1.14	
	2350	32	4870	1.1	
12-5-93	0027	37	4910	1.08	
	0053	26	4940	1.15	
	0141	48	4999	1.22	adjustment
	0211	30	5031	1.06	
	0242	31	5064	1.06	
	0333	51	5117	1.04	
	0433	60	5200	1.38	Adjustment
	0449	16	5228.5	1.78	Adjust
	0603	74	5310	1.1	
	0635	32	5330	0.6	

17.2

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FLOW LEVEL MEASUREMENTS

Project Hadnot Point Industrial Area

CTO Number 0017

Date	Time	Elapsed Time (min.)	Meter Reading (Gal.)	Average GPM	Comments
2-5-93	0713	38	5382.4	1.37	adjust to ≈1.2
	0801	48	5444.1	1.28	
	0827	24	5474.7	1.18	SWL rising 4190 min 21.38 - 4220 min 21.05
	0907	40	5521.2	1.16	4260 min 20.15'
	926	19	5543.9	1.19	adjustment 4280 min 20.10'
	1004	38	5590.4	1.22	4310 min 20.60'
	1044	40	5638.0	1.19	stepped to Recovery

APPENDIX C
AQUIFER TEST DATA - DRAWDOWN PHASE

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
0.0000	7.450	5.093
0.0033	7.443	5.100
0.0066	7.462	5.106
0.0100	7.989	5.106
0.0133	7.735	5.106
0.0166	7.132	5.100
0.0200	7.494	5.106
0.0233	7.881	5.112
0.0266	7.456	5.112
0.0300	7.475	5.112
0.0333	7.799	5.112
0.0500	7.786	5.100
0.0666	7.881	5.106
0.0833	7.995	5.106
0.1000	8.109	5.112
0.1166	8.224	5.106
0.1333	8.306	5.106
0.1500	8.458	5.119
0.1666	8.528	5.106
0.1833	8.477	5.112
0.2000	8.535	5.106
0.2166	8.535	5.112
0.2333	8.573	5.100
0.2500	8.573	5.106
0.2666	8.592	5.112
0.2833	8.611	5.112
0.3000	8.617	5.106
0.3166	8.649	5.112
0.3333	8.693	5.100
0.4166	8.807	5.100
0.5000	8.941	5.093
0.5833	9.048	5.100
0.6666	9.163	5.100
0.7500	9.302	5.106
0.8333	9.410	5.100
0.9166	9.505	5.093
1.0000	9.664	5.106
1.0833	9.822	5.100
1.1666	9.962	5.100
1.2500	10.038	5.100
1.3333	10.127	5.100

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
1.4166	10.215	5.106
1.5000	10.266	5.100
1.5833	10.323	5.100
1.6666	10.355	5.106
1.7500	10.374	5.106
1.8333	10.450	5.112
1.9166	10.495	5.112
2.0000	10.526	5.112
2.5000	10.697	5.100
3.0000	10.862	5.112
3.5000	11.033	5.100
4.0000	11.160	5.112
4.5000	11.293	5.112
5.0000	11.439	5.112
5.5000	11.541	5.112
6.0000	11.661	5.119
6.5000	11.750	5.119
7.0000	11.864	5.119
7.5000	11.959	5.131
8.0000	12.048	5.125
8.5000	12.117	5.131
9.0000	12.206	5.125
9.5000	12.257	5.125
10.0000	12.333	5.119
12.0000	12.612	5.150
14.0000	12.770	5.144
16.0000	12.764	5.163
18.0000	12.764	5.169
20.0000	12.777	5.182
22.0000	12.948	5.182
24.0000	13.144	5.207
26.0000	13.303	5.207
28.0000	13.455	5.214
30.0000	13.594	5.226
32.0000	13.676	5.245
34.0000	13.772	5.252
36.0000	13.867	5.271
38.0000	13.968	5.277
40.0000	14.019	5.283
42.0000	14.101	5.296
44.0000	14.190	5.309

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
46.0000	14.247	5.321
48.0000	14.348	5.334
50.0000	14.373	5.334
52.0000	14.443	5.353
54.0000	14.494	5.359
56.0000	14.544	5.378
58.0000	14.595	5.391
60.0000	14.633	5.391
62.0000	14.684	5.391
64.0000	14.715	5.404
66.0000	14.760	5.423
68.0000	14.798	5.435
70.0000	14.829	5.442
72.0000	14.874	5.454
74.0000	14.912	5.461
76.0000	14.956	5.473
78.0000	14.962	5.480
80.0000	15.026	5.486
82.0000	15.057	5.493
84.0000	15.057	5.486
86.0000	15.083	5.499
88.0000	15.114	5.512
90.0000	15.159	5.531
92.0000	15.165	5.537
94.0000	15.209	5.537
96.0000	15.228	5.543
98.0000	15.285	5.556
100.0000	15.342	5.556
110.0000	15.406	5.600
120.0000	15.494	5.632
130.0000	15.653	5.657
140.0000	15.615	5.683
150.0000	15.710	5.708
160.0000	15.957	5.740
170.0000	16.096	5.765
180.0000	16.102	5.784
190.0000	16.622	5.816
200.0000	16.596	5.835
210.0000	16.514	5.860
220.0000	16.501	5.873
230.0000	16.520	5.904

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
240.0000	16.419	5.917
250.0000	16.349	5.936
260.0000	16.324	5.955
270.0000	16.527	5.968
280.0000	17.704	5.987
290.0000	17.748	6.012
300.0000	17.489	6.031
310.0000	18.653	6.057
320.0000	19.723	6.069
330.0000	20.627	6.088
340.0000	21.266	6.101
350.0000	20.893	6.107
360.0000	20.981	6.126
370.0000	21.456	6.152
380.0000	21.196	6.158
390.0000	21.348	6.177
400.0000	20.621	6.190
410.0000	21.506	6.202
420.0000	21.961	6.221
430.0000	21.829	6.234
440.0000	21.032	6.253
450.0000	20.305	6.266
460.0000	19.526	6.278
470.0000	18.248	6.297
480.0000	18.071	6.310
490.0000	17.660	6.310
500.0000	18.995	6.329
510.0000	19.349	6.335
520.0000	19.286	6.348
530.0000	20.608	6.361
540.0000	20.475	6.373
550.0000	19.761	6.386
560.0000	20.463	6.386
570.0000	20.981	6.399
580.0000	20.975	6.405
590.0000	21.323	6.418
600.0000	21.835	6.430
610.0000	22.669	6.430
620.0000	23.997	6.437
630.0000	24.881	6.449
640.0000	25.747	6.456

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
650.0000	26.176	6.462
660.0000	26.126	6.475
670.0000	26.151	6.487
680.0000	26.157	6.494
690.0000	26.157	6.494
700.0000	26.170	6.500
710.0000	26.163	6.506
720.0000	26.170	6.506
730.0000	26.163	6.513
740.0000	26.145	6.525
750.0000	26.157	6.525
760.0000	26.138	6.532
770.0000	26.170	6.544
780.0000	26.170	6.544
790.0000	26.170	6.551
800.0000	26.151	6.551
810.0000	26.157	6.557
820.0000	26.138	6.557
830.0000	26.145	6.563
840.0000	26.163	6.563
850.0000	26.157	6.563
860.0000	26.157	6.570
870.0000	26.157	6.576
880.0000	26.151	6.576
890.0000	26.157	6.576
900.0000	26.163	6.576
910.0000	26.151	6.582
920.0000	26.145	6.589
930.0000	26.163	6.589
940.0000	26.176	6.595
950.0000	26.157	6.601
960.0000	26.157	6.601
970.0000	26.151	6.601
980.0000	26.050	6.614
990.0000	25.601	6.620
1000.0000	25.987	6.614
1010.0000	26.044	6.620
1020.0000	24.458	6.627
1030.0000	24.521	6.633
1040.0000	25.538	6.633
1050.0000	24.483	6.633

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
1060.0000	24.218	6.633
1070.0000	24.199	6.633
1080.0000	25.980	6.639
1090.0000	26.081	6.639
1100.0000	25.772	6.633
1110.0000	24.098	6.646
1120.0000	25.974	6.646
1130.0000	26.170	6.646
1140.0000	25.450	6.652
1150.0000	25.159	6.652
1160.0000	25.646	6.652
1170.0000	25.684	6.658
1180.0000	24.793	6.658
1190.0000	25.431	6.658
1200.0000	24.925	6.671
1210.0000	25.753	6.671
1220.0000	26.176	6.677
1230.0000	25.892	6.677
1240.0000	25.867	6.684
1250.0000	26.050	6.690
1260.0000	25.627	6.690
1270.0000	25.791	6.696
1280.0000	25.867	6.696
1290.0000	25.816	6.703
1300.0000	25.494	6.709
1310.0000	23.169	6.709
1320.0000	23.984	6.715
1330.0000	24.780	6.715
1340.0000	25.425	6.722
1350.0000	24.407	6.728
1360.0000	23.339	6.722
1370.0000	22.992	6.722
1380.0000	24.054	6.728
1390.0000	24.818	6.734
1400.0000	25.671	6.734
1410.0000	25.235	6.741
1420.0000	24.414	6.734
1430.0000	23.655	6.741
1440.0000	23.535	6.747
1450.0000	23.213	6.753
1460.0000	22.682	6.747

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
1470.0000	23.200	6.753
1480.0000	24.439	6.753
1490.0000	25.519	6.747
1500.0000	26.037	6.747
1510.0000	26.182	6.747
1520.0000	24.856	6.741
1530.0000	23.478	6.741
1540.0000	22.075	6.747
1550.0000	21.266	6.747
1560.0000	20.703	6.734
1570.0000	20.001	6.728
1580.0000	19.381	6.715
1590.0000	18.736	6.722
1600.0000	18.096	6.709
1610.0000	17.375	6.722
1620.0000	16.501	6.715
1630.0000	16.362	6.696
1640.0000	16.590	6.696
1650.0000	16.470	6.696
1660.0000	16.368	6.696
1670.0000	16.286	6.684
1680.0000	16.444	6.684
1690.0000	16.653	6.677
1700.0000	16.748	6.684
1710.0000	16.729	6.677
1720.0000	16.717	6.671
1730.0000	16.710	6.665
1740.0000	16.710	6.658
1750.0000	16.691	6.665
1760.0000	16.641	6.671
1770.0000	16.628	6.665
1780.0000	16.641	6.665
1790.0000	16.628	6.665
1800.0000	16.552	6.665
1810.0000	16.590	6.665
1820.0000	16.653	6.671
1830.0000	16.672	6.665
1840.0000	16.704	6.671
1850.0000	16.723	6.671
1860.0000	16.736	6.671
1870.0000	16.736	6.677

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
1880.0000	16.565	6.677
1890.0000	16.495	6.677
1900.0000	16.432	6.677
1910.0000	16.337	6.684
1920.0000	16.254	6.684
1930.0000	16.210	6.690
1940.0000	16.178	6.690
1950.0000	16.223	6.690
1960.0000	17.027	6.696
1970.0000	17.293	6.703
1980.0000	17.445	6.703
1990.0000	17.603	6.709
2000.0000	17.653	6.709
2010.0000	17.077	6.715
2020.0000	17.109	6.715
2030.0000	17.191	6.715
2040.0000	17.166	6.722
2050.0000	17.153	6.722
2060.0000	17.160	6.728
2070.0000	17.071	6.728
2080.0000	17.001	6.728
2090.0000	16.957	6.734
2100.0000	16.951	6.734
2110.0000	16.944	6.728
2120.0000	16.913	6.734
2130.0000	16.913	6.734
2140.0000	16.938	6.734
2150.0000	16.925	6.722
2160.0000	16.913	6.734
2170.0000	16.938	6.734
2180.0000	16.970	6.734
2190.0000	17.014	6.734
2200.0000	17.014	6.741
2210.0000	17.058	6.728
2220.0000	17.090	6.747
2230.0000	17.027	6.741
2240.0000	16.995	6.734
2250.0000	16.951	6.734
2260.0000	17.052	6.728
2270.0000	17.096	6.734
2280.0000	17.027	6.734

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
2290.0000	16.970	6.734
2300.0000	16.919	6.734
2310.0000	16.900	6.722
2320.0000	16.894	6.734
2330.0000	16.887	6.734
2340.0000	16.970	6.734
2350.0000	17.039	6.734
2360.0000	17.096	6.734
2370.0000	17.134	6.741
2380.0000	17.172	6.728
2390.0000	17.217	6.734
2400.0000	17.261	6.728
2410.0000	17.077	6.728
2420.0000	16.717	6.734
2430.0000	16.286	6.734
2440.0000	16.052	6.734
2450.0000	15.912	6.728
2460.0000	15.849	6.728
2470.0000	15.792	6.728
2480.0000	15.767	6.728
2490.0000	15.748	6.722
2500.0000	15.355	6.722
2510.0000	15.038	6.715
2520.0000	14.848	6.715
2530.0000	14.652	6.703
2540.0000	14.519	6.696
2550.0000	14.462	6.690
2560.0000	14.392	6.684
2570.0000	14.367	6.677
2580.0000	14.335	6.677
2590.0000	14.323	6.677
2600.0000	14.297	6.665
2610.0000	14.285	6.665
2620.0000	14.329	6.658
2630.0000	14.354	6.658
2640.0000	14.361	6.658
2650.0000	14.342	6.652
2660.0000	14.342	6.652
2670.0000	14.361	6.652
2680.0000	14.443	6.652
2690.0000	14.494	6.652

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
2700.0000	14.525	6.652
2710.0000	14.551	6.652
2720.0000	14.544	6.658
2730.0000	14.557	6.652
2740.0000	14.570	6.658
2750.0000	14.608	6.658
2760.0000	14.646	6.665
2770.0000	14.671	6.671
2780.0000	14.671	6.671
2790.0000	14.703	6.677
2800.0000	14.709	6.684
2810.0000	15.995	6.684
2820.0000	16.292	6.696
2830.0000	16.292	6.703
2840.0000	16.210	6.709
2850.0000	16.185	6.728
2860.0000	16.185	6.728
2870.0000	16.223	6.741
2880.0000	16.292	6.747
2890.0000	16.330	6.753
2900.0000	16.375	6.760
2910.0000	16.413	6.779
2920.0000	16.432	6.785
2930.0000	16.463	6.785
2940.0000	16.508	6.791
2950.0000	16.539	6.791
2960.0000	16.546	6.798
2970.0000	16.571	6.791
2980.0000	16.584	6.791
2990.0000	16.552	6.798
3000.0000	16.571	6.804
3010.0000	16.571	6.798
3020.0000	16.571	6.791
3030.0000	16.571	6.811
3040.0000	16.577	6.798
3050.0000	16.577	6.804
3060.0000	16.565	6.791
3070.0000	16.558	6.798
3080.0000	16.546	6.804
3090.0000	16.590	6.791
3100.0000	16.609	6.798

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
3110.0000	16.653	6.804
3120.0000	16.691	6.804
3130.0000	16.729	6.804
3140.0000	16.729	6.811
3150.0000	16.729	6.791
3160.0000	16.723	6.804
3170.0000	16.742	6.817
3180.0000	16.641	6.811
3190.0000	16.419	6.817
3200.0000	16.292	6.811
3210.0000	16.229	6.817
3220.0000	16.178	6.817
3230.0000	16.147	6.823
3240.0000	16.140	6.830
3250.0000	16.128	6.830
3260.0000	16.128	6.823
3270.0000	16.147	6.830
3280.0000	16.159	6.836
3290.0000	17.995	6.842
3300.0000	17.128	6.849
3310.0000	16.641	6.855
3320.0000	16.736	6.861
3330.0000	16.995	6.861
3340.0000	17.413	6.868
3350.0000	17.666	6.874
3360.0000	17.983	6.887
3370.0000	18.305	6.893
3380.0000	18.634	6.899
3390.0000	18.818	6.906
3400.0000	19.096	6.912
3410.0000	19.198	6.912
3420.0000	19.254	6.918
3430.0000	19.444	6.918
3440.0000	19.710	6.925
3450.0000	19.944	6.931
3460.0000	20.229	6.931
3470.0000	20.463	6.931
3480.0000	20.659	6.937
3490.0000	21.449	6.937
3500.0000	19.134	6.937
3510.0000	16.919	6.944

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
3520.0000	16.083	6.937
3530.0000	16.596	6.937
3540.0000	16.780	6.944
3550.0000	16.868	6.944
3560.0000	16.938	6.944
3570.0000	17.027	6.944
3580.0000	17.096	6.950
3590.0000	17.166	6.950
3600.0000	17.248	6.950
3610.0000	17.305	6.956
3620.0000	17.305	6.956
3630.0000	17.001	6.956
3640.0000	16.849	6.963
3650.0000	16.736	6.963
3660.0000	16.647	6.963
3670.0000	16.470	6.963
3680.0000	16.330	6.963
3690.0000	16.223	6.963
3700.0000	16.153	6.956
3710.0000	16.096	6.956
3720.0000	16.077	6.950
3730.0000	16.064	6.944
3740.0000	16.058	6.944
3750.0000	16.039	6.937
3760.0000	16.330	6.937
3770.0000	17.533	6.937
3780.0000	18.388	6.931
3790.0000	18.337	6.925
3800.0000	17.679	6.925
3810.0000	17.065	6.931
3820.0000	16.590	6.931
3830.0000	16.210	6.925
3840.0000	15.976	6.925
3850.0000	15.862	6.918
3860.0000	15.811	6.912
3870.0000	15.741	6.912
3880.0000	15.722	6.912
3890.0000	15.634	6.906
3900.0000	15.539	6.899
3910.0000	15.488	6.899
3920.0000	15.456	6.899

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
3930.0000	15.437	6.893
3940.0000	18.831	6.887
3950.0000	22.353	6.893
3960.0000	24.022	6.893
3970.0000	25.582	6.893
3980.0000	26.044	6.899
3990.0000	26.094	6.899
4000.0000	26.163	6.899
4010.0000	25.949	6.906
4020.0000	25.980	6.906
4030.0000	25.873	6.912
4040.0000	25.804	6.912
4050.0000	25.677	6.918
4060.0000	25.513	6.912
4070.0000	24.685	6.918
4080.0000	21.108	6.918
4090.0000	17.128	6.925
4100.0000	15.171	6.925
4110.0000	14.253	6.918
4120.0000	16.324	6.912
4130.0000	17.748	6.912
4140.0000	18.565	6.912
4150.0000	19.406	6.912
4160.0000	20.001	6.912
4170.0000	20.678	6.918
4180.0000	21.114	6.925
4190.0000	21.386	6.931
4200.0000	21.304	6.925
4210.0000	21.266	6.937
4220.0000	21.057	6.937
4230.0000	20.785	6.944
4240.0000	20.488	6.950
4250.0000	20.248	6.956
4260.0000	20.153	6.950
4270.0000	20.482	6.950
4280.0000	20.108	6.956
4290.0000	20.279	6.956
4300.0000	20.501	6.950
4310.0000	20.608	6.963
4320.0000	20.741	6.950
4330.0000	20.899	6.956

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
4340.0000	20.912	6.963
4350.0000	20.874	6.956

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.0000	7.343	7.281	12.734	12.968
0.0083	7.343	7.281	12.734	12.968
0.0166	7.343	7.281	12.734	12.968
0.0250	7.350	7.281	12.734	12.968
0.0333	7.343	7.281	12.734	12.968
0.0416	7.343	7.281	12.734	12.968
0.0500	7.343	7.281	12.734	12.968
0.0583	7.343	7.281	12.734	12.968
0.0666	7.350	7.281	12.734	12.968
0.0750	7.350	7.281	12.734	12.968
0.0833	7.343	7.287	12.734	12.968
0.0916	7.343	7.281	12.734	12.968
0.1000	7.350	7.281	12.734	12.968
0.1083	7.343	7.281	12.734	12.968
0.1166	7.343	7.281	12.734	12.968
0.1250	7.343	7.281	12.734	12.968
0.1333	7.350	7.287	12.734	12.968
0.1416	7.343	7.281	12.750	12.968
0.1500	7.343	7.281	12.734	12.968
0.1583	7.350	7.287	12.734	12.968
0.1666	7.350	7.281	12.734	12.984
0.1750	7.350	7.287	12.734	12.968
0.1833	7.350	7.281	12.734	12.968
0.1916	7.350	7.287	12.734	12.968
0.2000	7.343	7.287	12.734	12.968
0.2083	7.350	7.281	12.750	12.984
0.2166	7.350	7.287	12.734	12.968
0.2250	7.350	7.287	12.750	12.968
0.2333	7.350	7.287	12.734	12.968
0.2416	7.350	7.287	12.750	12.984
0.2500	7.350	7.281	12.734	12.968
0.2583	7.350	7.287	12.750	12.968
0.2666	7.350	7.287	12.750	12.968
0.2750	7.350	7.287	12.734	12.968
0.2833	7.350	7.287	12.734	12.968
0.2916	7.350	7.287	12.734	12.968
0.3000	7.343	7.287	12.734	12.968
0.3083	7.343	7.287	12.750	12.968
0.3166	7.350	7.287	12.750	12.968
0.3250	7.350	7.287	12.750	12.968
0.3333	7.343	7.287	12.734	12.984

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.3500	7.343	7.281	12.750	12.968
0.3666	7.337	7.281	12.750	12.968
0.3833	7.343	7.281	12.750	12.968
0.4000	7.337	7.281	12.734	12.984
0.4166	7.343	7.281	12.734	12.968
0.4333	7.343	7.287	12.734	12.968
0.4500	7.343	7.287	12.734	12.984
0.4666	7.343	7.287	12.734	12.968
0.4833	7.343	7.281	12.750	12.968
0.5000	7.343	7.287	12.734	12.984
0.5166	7.343	7.274	12.734	12.968
0.5333	7.343	7.281	12.734	12.968
0.5500	7.343	7.281	12.734	12.984
0.5666	7.343	7.281	12.734	12.968
0.5833	7.343	7.287	12.734	12.984
0.6000	7.343	7.287	12.734	12.968
0.6166	7.350	7.287	12.734	12.984
0.6333	7.343	7.287	12.734	12.968
0.6500	7.350	7.287	12.750	12.984
0.6666	7.350	7.287	12.750	12.984
0.6833	7.350	7.287	12.750	12.984
0.7000	7.350	7.287	12.750	12.984
0.7166	7.350	7.287	12.750	12.984
0.7333	7.350	7.287	12.750	12.984
0.7500	7.350	7.287	12.750	12.984
0.7666	7.343	7.287	12.750	12.984
0.7833	7.350	7.287	12.750	12.984
0.8000	7.343	7.287	12.734	12.984
0.8166	7.350	7.287	12.750	12.984
0.8333	7.350	7.287	12.750	12.968
0.8500	7.350	7.287	12.750	12.968
0.8666	7.350	7.287	12.734	12.984
0.8833	7.350	7.287	12.734	12.984
0.9000	7.343	7.287	12.734	12.984
0.9166	7.350	7.287	12.734	12.968
0.9333	7.343	7.287	12.750	12.968
0.9500	7.350	7.287	12.750	12.968
0.9666	7.343	7.287	12.750	12.968
0.9833	7.343	7.287	12.734	12.968
1.0000	7.343	7.281	12.734	12.968
1.2000	7.343	7.281	12.734	12.968

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1.4000	7.343	7.287	12.734	12.968
1.6000	7.343	7.281	12.718	12.968
1.8000	7.343	7.287	12.734	12.968
2.0000	7.350	7.287	12.734	12.968
2.2000	7.343	7.281	12.718	12.968
2.4000	7.350	7.281	12.734	12.968
2.6000	7.337	7.281	12.718	12.968
2.8000	7.350	7.293	12.734	12.968
3.0000	7.350	7.281	12.734	12.968
3.2000	7.350	7.293	12.734	12.968
3.4000	7.350	7.287	12.734	12.984
3.6000	7.343	7.287	12.734	12.968
3.8000	7.350	7.287	12.750	12.968
4.0000	7.343	7.287	12.734	12.968
4.2000	7.350	7.281	12.734	12.968
4.4000	7.350	7.287	12.734	12.968
4.6000	7.343	7.287	12.734	12.968
4.8000	7.343	7.281	12.734	12.968
5.0000	7.343	7.287	12.734	12.984
5.2000	7.350	7.287	12.750	12.984
5.4000	7.350	7.287	12.734	12.968
5.6000	7.343	7.287	12.734	12.968
5.8000	7.350	7.287	12.734	12.968
6.0000	7.343	7.287	12.734	12.968
6.2000	7.350	7.287	12.734	12.968
6.4000	7.343	7.287	12.734	12.968
6.6000	7.343	7.281	12.734	12.968
6.8000	7.350	7.287	12.734	12.968
7.0000	7.350	7.287	12.734	12.968
7.2000	7.350	7.287	12.734	12.968
7.4000	7.350	7.287	12.734	12.968
7.6000	7.350	7.287	12.734	12.968
7.8000	7.343	7.287	12.734	12.968
8.0000	7.343	7.287	12.734	12.968
8.2000	7.350	7.287	12.734	12.968
8.4000	7.350	7.293	12.750	12.968
8.6000	7.350	7.287	12.734	12.984
8.8000	7.350	7.287	12.734	12.984
9.0000	7.350	7.293	12.734	12.968
9.2000	7.343	7.287	12.734	12.968
9.4000	7.343	7.287	12.734	12.968

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
9.6000	7.350	7.287	12.734	12.984
9.8000	7.356	7.293	12.734	12.968
10.0000	7.343	7.293	12.750	12.984
12.0000	7.350	7.293	12.750	12.984
14.0000	7.350	7.287	12.750	12.984
16.0000	7.350	7.287	12.750	13.000
18.0000	7.356	7.293	12.750	12.984
20.0000	7.356	7.300	12.750	12.984
22.0000	7.356	7.293	12.750	13.000
24.0000	7.356	7.293	12.734	12.984
26.0000	7.356	7.300	12.750	12.984
28.0000	7.356	7.300	12.750	12.984
30.0000	7.356	7.300	12.734	12.968
32.0000	7.356	7.300	12.750	12.984
34.0000	7.362	7.300	12.750	12.984
36.0000	7.356	7.300	12.750	13.000
38.0000	7.362	7.300	12.750	12.984
40.0000	7.369	7.312	12.750	12.984
42.0000	7.362	7.306	12.750	12.984
44.0000	7.356	7.306	12.734	12.984
46.0000	7.362	7.306	12.765	13.000
48.0000	7.369	7.306	12.750	12.984
50.0000	7.356	7.306	12.750	12.984
52.0000	7.362	7.306	12.750	12.984
54.0000	7.362	7.312	12.750	12.984
56.0000	7.369	7.312	12.750	13.000
58.0000	7.375	7.312	12.750	12.984
60.0000	7.375	7.318	12.750	13.000
62.0000	7.369	7.312	12.750	12.984
64.0000	7.382	7.318	12.750	13.000
66.0000	7.375	7.312	12.750	13.000
68.0000	7.382	7.318	12.750	12.984
70.0000	7.382	7.312	12.750	13.000
72.0000	7.375	7.312	12.750	12.984
74.0000	7.388	7.325	12.750	13.000
76.0000	7.382	7.318	12.750	13.000
78.0000	7.375	7.325	12.750	12.984
80.0000	7.382	7.318	12.750	13.000
82.0000	7.382	7.318	12.750	13.000
84.0000	7.382	7.318	12.750	13.000
86.0000	7.388	7.331	12.750	13.015

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
88.0000	7.388	7.331	12.750	13.000
90.0000	7.388	7.331	12.750	13.000
92.0000	7.394	7.331	12.765	13.000
94.0000	7.388	7.337	12.765	13.000
96.0000	7.394	7.331	12.765	13.000
98.0000	7.394	7.337	12.750	13.000
100.0000	7.394	7.331	12.750	13.000
105.0000	7.407	7.344	12.750	13.000
110.0000	7.401	7.337	12.750	13.000
115.0000	7.401	7.331	12.750	13.015
120.0000	7.407	7.337	12.750	13.000
125.0000	7.407	7.344	12.750	12.984
130.0000	7.407	7.344	12.750	13.000
135.0000	7.407	7.350	12.750	13.000
140.0000	7.414	7.356	12.750	13.015
145.0000	7.414	7.350	12.750	13.000
150.0000	7.414	7.356	12.750	13.000
155.0000	7.420	7.356	12.750	13.000
160.0000	7.426	7.356	12.750	13.000
165.0000	7.426	7.363	12.750	13.000
170.0000	7.426	7.369	12.750	13.000
175.0000	7.433	7.369	12.750	13.015
180.0000	7.433	7.381	12.750	13.000
185.0000	7.439	7.381	12.734	12.984
190.0000	7.433	7.381	12.750	13.015
195.0000	7.439	7.388	12.765	13.000
200.0000	7.439	7.394	12.765	13.000
205.0000	7.446	7.394	12.765	13.000
210.0000	7.452	7.400	12.765	13.015
215.0000	7.452	7.407	12.750	13.015
220.0000	7.458	7.413	12.750	13.015
225.0000	7.452	7.407	12.750	13.000
230.0000	7.452	7.407	12.765	13.015
235.0000	7.458	7.413	12.750	13.000
240.0000	7.465	7.419	12.765	13.000
245.0000	7.465	7.426	12.765	13.000
250.0000	7.465	7.438	12.750	13.015
255.0000	7.465	7.445	12.765	13.015
260.0000	7.471	7.438	12.765	13.015
265.0000	7.471	7.445	12.765	13.015
270.0000	7.478	7.457	12.765	13.015

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
275.0000	7.478	7.457	12.765	13.015
280.0000	7.484	7.463	12.765	13.031
285.0000	7.484	7.463	12.765	13.031
290.0000	7.490	7.470	12.750	13.031
295.0000	7.497	7.470	12.781	13.000
300.0000	7.490	7.482	12.765	13.031
305.0000	7.497	7.482	12.765	13.015
310.0000	7.497	7.482	12.750	13.015
315.0000	7.497	7.482	12.765	13.015
320.0000	7.510	7.495	12.765	13.015
325.0000	7.503	7.495	12.765	13.015
330.0000	7.516	7.501	12.765	13.015
335.0000	7.516	7.508	12.765	13.031
340.0000	7.516	7.514	12.765	13.031
345.0000	7.522	7.520	12.765	13.031
350.0000	7.522	7.520	12.781	13.031
355.0000	7.529	7.533	12.781	13.031
360.0000	7.529	7.533	12.765	13.031
365.0000	7.529	7.533	12.781	13.031
370.0000	7.535	7.539	12.781	13.031
375.0000	7.535	7.545	12.765	13.031
380.0000	7.542	7.552	12.781	13.031
385.0000	7.548	7.558	12.781	13.031
390.0000	7.548	7.564	12.781	13.031
395.0000	7.554	7.571	12.781	13.046
400.0000	7.554	7.577	12.781	13.046
405.0000	7.554	7.577	12.781	13.031
410.0000	7.561	7.583	12.781	13.031
415.0000	7.567	7.583	12.781	13.046
420.0000	7.567	7.596	12.781	13.046
425.0000	7.567	7.602	12.796	13.046
430.0000	7.574	7.602	12.781	13.046
435.0000	7.586	7.615	12.781	13.046
440.0000	7.580	7.615	12.796	13.046
445.0000	7.586	7.621	12.796	13.046
450.0000	7.586	7.621	12.781	13.046
455.0000	7.593	7.627	12.796	13.046
460.0000	7.599	7.634	12.781	13.046
465.0000	7.599	7.640	12.781	13.046
470.0000	7.599	7.646	12.796	13.046
475.0000	7.606	7.646	12.781	13.046

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
480.0000	7.606	7.646	12.781	13.062
485.0000	7.606	7.653	12.796	13.046
490.0000	7.612	7.659	12.796	13.062
495.0000	7.618	7.659	12.796	13.046
500.0000	7.618	7.659	12.796	13.046
505.0000	7.618	7.659	12.781	13.046
510.0000	7.625	7.665	12.796	13.046
515.0000	7.625	7.672	12.796	13.046
520.0000	7.625	7.672	12.796	13.046
525.0000	7.631	7.684	12.796	13.062
530.0000	7.631	7.691	12.796	13.062
535.0000	7.638	7.697	12.796	13.062
540.0000	7.638	7.697	12.796	13.062
545.0000	7.644	7.703	12.796	13.046
550.0000	7.644	7.697	12.796	13.062
555.0000	7.644	7.703	12.796	13.062
560.0000	7.650	7.709	12.796	13.062
565.0000	7.650	7.716	12.812	13.046
570.0000	7.650	7.716	12.796	13.062
575.0000	7.657	7.722	12.796	13.062
580.0000	7.650	7.722	12.796	13.062
585.0000	7.657	7.722	12.796	13.046
590.0000	7.657	7.728	12.796	13.062
595.0000	7.663	7.728	12.812	13.062
600.0000	7.663	7.728	12.796	13.062
605.0000	7.670	7.735	12.796	13.062
610.0000	7.670	7.735	12.796	13.062
615.0000	7.670	7.741	12.796	13.062
620.0000	7.670	7.741	12.796	13.062
625.0000	7.676	7.747	12.796	13.062
630.0000	7.676	7.747	12.796	13.062
635.0000	7.676	7.754	12.812	13.062
640.0000	7.676	7.754	12.796	13.062
645.0000	7.683	7.760	12.812	13.046
650.0000	7.683	7.760	12.812	13.062
655.0000	7.689	7.766	12.812	13.062
660.0000	7.689	7.772	12.812	13.062
665.0000	7.689	7.772	12.812	13.062
670.0000	7.689	7.779	12.812	13.062
675.0000	7.695	7.772	12.812	13.062
680.0000	7.695	7.772	12.812	13.062

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
685.0000	7.695	7.772	12.812	13.078
690.0000	7.702	7.779	12.812	13.062
695.0000	7.695	7.779	12.812	13.062
700.0000	7.702	7.785	12.812	13.078
705.0000	7.702	7.785	12.812	13.062
710.0000	7.695	7.791	12.812	13.062
715.0000	7.708	7.785	12.812	13.062
720.0000	7.708	7.785	12.812	13.078
725.0000	7.702	7.791	12.812	13.078
730.0000	7.708	7.791	12.812	13.078
735.0000	7.708	7.798	12.812	13.078
740.0000	7.715	7.798	12.828	13.078
745.0000	7.715	7.798	12.812	13.078
750.0000	7.715	7.804	12.812	13.078
755.0000	7.721	7.804	12.812	13.078
760.0000	7.721	7.810	12.812	13.078
765.0000	7.715	7.810	12.812	13.078
770.0000	7.721	7.810	12.828	13.078
775.0000	7.721	7.810	12.828	13.078
780.0000	7.721	7.810	12.812	13.078
785.0000	7.721	7.810	12.812	13.078
790.0000	7.727	7.810	12.812	13.078
795.0000	7.727	7.817	12.812	13.078
800.0000	7.727	7.817	12.812	13.078
805.0000	7.721	7.817	12.812	13.078
810.0000	7.727	7.817	12.812	13.078
815.0000	7.727	7.817	12.812	13.078
820.0000	7.727	7.817	12.828	13.078
825.0000	7.727	7.817	12.812	13.078
830.0000	7.727	7.817	12.828	13.078
835.0000	7.727	7.817	12.828	13.078
840.0000	7.727	7.823	12.828	13.078
845.0000	7.727	7.823	12.828	13.078
850.0000	7.727	7.823	12.812	13.078
855.0000	7.734	7.823	12.828	13.078
860.0000	7.734	7.823	12.828	13.078
865.0000	7.727	7.823	12.812	13.078
870.0000	7.734	7.823	12.812	13.078
875.0000	7.734	7.823	12.812	13.078
880.0000	7.734	7.823	12.812	13.078
885.0000	7.734	7.823	12.812	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
890.0000	7.734	7.823	12.812	13.078
895.0000	7.734	7.823	12.812	13.078
900.0000	7.734	7.823	12.828	13.078
905.0000	7.734	7.829	12.812	13.078
910.0000	7.734	7.829	12.812	13.062
915.0000	7.734	7.836	12.812	13.078
920.0000	7.734	7.836	12.828	13.078
925.0000	7.740	7.836	12.828	13.062
930.0000	7.740	7.836	12.812	13.078
935.0000	7.740	7.836	12.812	13.078
940.0000	7.740	7.842	12.812	13.078
945.0000	7.740	7.842	12.812	13.078
950.0000	7.740	7.836	12.812	13.078
955.0000	7.740	7.848	12.812	13.078
960.0000	7.740	7.842	12.812	13.078
965.0000	7.747	7.848	12.812	13.078
970.0000	7.747	7.848	12.828	13.078
975.0000	7.747	7.848	12.828	13.078
980.0000	7.747	7.861	12.812	13.078
985.0000	7.747	7.854	12.828	13.078
990.0000	7.747	7.854	12.812	13.078
995.0000	7.747	7.861	12.812	13.078
1000.0000	7.747	7.861	12.828	13.078
1005.0000	7.753	7.861	12.828	13.078
1010.0000	7.753	7.854	12.812	13.078
1015.0000	7.753	7.867	12.812	13.078
1020.0000	7.753	7.867	12.812	13.078
1025.0000	7.753	7.867	12.812	13.078
1030.0000	7.753	7.873	12.828	13.078
1035.0000	7.759	7.867	12.828	13.078
1040.0000	7.759	7.867	12.828	13.078
1045.0000	7.759	7.867	12.812	13.078
1050.0000	7.753	7.867	12.812	13.078
1055.0000	7.759	7.867	12.812	13.078
1060.0000	7.753	7.861	12.812	13.078
1065.0000	7.753	7.861	12.812	13.078
1070.0000	7.753	7.861	12.812	13.078
1075.0000	7.759	7.867	12.812	13.078
1080.0000	7.759	7.867	12.812	13.078
1085.0000	7.759	7.861	12.812	13.062
1090.0000	7.759	7.861	12.812	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1095.0000	7.759	7.861	12.812	13.078
1100.0000	7.759	7.867	12.828	13.078
1105.0000	7.759	7.867	12.812	13.078
1110.0000	7.753	7.867	12.812	13.078
1115.0000	7.759	7.861	12.828	13.078
1120.0000	7.759	7.867	12.828	13.078
1125.0000	7.759	7.867	12.812	13.078
1130.0000	7.759	7.867	12.812	13.078
1135.0000	7.759	7.873	12.812	13.078
1140.0000	7.759	7.873	12.812	13.078
1145.0000	7.759	7.873	12.812	13.078
1150.0000	7.759	7.873	12.812	13.078
1155.0000	7.759	7.873	12.828	13.078
1160.0000	7.766	7.873	12.828	13.078
1165.0000	7.766	7.880	12.812	13.078
1170.0000	7.759	7.880	12.812	13.093
1175.0000	7.766	7.886	12.812	13.078
1180.0000	7.766	7.886	12.812	13.078
1185.0000	7.766	7.880	12.812	13.078
1190.0000	7.766	7.880	12.812	13.078
1195.0000	7.766	7.886	12.812	13.078
1200.0000	7.766	7.892	12.812	13.078
1205.0000	7.766	7.892	12.828	13.078
1210.0000	7.766	7.892	12.812	13.078
1215.0000	7.772	7.892	12.812	13.078
1220.0000	7.772	7.892	12.812	13.078
1225.0000	7.772	7.899	12.828	13.078
1230.0000	7.772	7.899	12.812	13.078
1235.0000	7.772	7.899	12.812	13.078
1240.0000	7.772	7.905	12.812	13.078
1245.0000	7.779	7.905	12.828	13.078
1250.0000	7.779	7.905	12.812	13.078
1255.0000	7.779	7.911	12.812	13.078
1260.0000	7.779	7.911	12.812	13.078
1265.0000	7.779	7.911	12.828	13.093
1270.0000	7.779	7.911	12.828	13.093
1275.0000	7.779	7.918	12.812	13.078
1280.0000	7.779	7.918	12.828	13.078
1285.0000	7.779	7.918	12.828	13.078
1290.0000	7.785	7.918	12.828	13.093
1295.0000	7.785	7.918	12.828	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1300.0000	7.785	7.924	12.812	13.093
1305.0000	7.785	7.924	12.828	13.078
1310.0000	7.785	7.924	12.812	13.093
1315.0000	7.785	7.924	12.828	13.093
1320.0000	7.785	7.924	12.812	13.078
1325.0000	7.791	7.930	12.828	13.078
1330.0000	7.779	7.930	12.828	13.093
1335.0000	7.785	7.930	12.828	13.093
1340.0000	7.785	7.930	12.828	13.078
1345.0000	7.785	7.936	12.828	13.093
1350.0000	7.785	7.930	12.828	13.093
1355.0000	7.785	7.930	12.828	13.093
1360.0000	7.785	7.930	12.828	13.093
1365.0000	7.785	7.930	12.828	13.093
1370.0000	7.785	7.930	12.828	13.093
1375.0000	7.779	7.930	12.828	13.093
1380.0000	7.785	7.936	12.828	13.093
1385.0000	7.785	7.936	12.828	13.093
1390.0000	7.785	7.936	12.828	13.093
1395.0000	7.785	7.936	12.828	13.093
1400.0000	7.785	7.943	12.843	13.109
1405.0000	7.785	7.943	12.828	13.093
1410.0000	7.785	7.943	12.828	13.093
1415.0000	7.785	7.943	12.828	13.109
1420.0000	7.785	7.943	12.843	13.093
1425.0000	7.785	7.949	12.843	13.109
1430.0000	7.785	7.943	12.828	13.093
1435.0000	7.785	7.943	12.828	13.093
1440.0000	7.785	7.943	12.843	13.093
1445.0000	7.785	7.949	12.843	13.093
1450.0000	7.785	7.949	12.843	13.093
1455.0000	7.785	7.949	12.843	13.093
1460.0000	7.785	7.949	12.843	13.093
1465.0000	7.785	7.949	12.828	13.093
1470.0000	7.785	7.949	12.843	13.093
1475.0000	7.785	7.943	12.843	13.093
1480.0000	7.785	7.943	12.843	13.093
1485.0000	7.785	7.943	12.843	13.109
1490.0000	7.785	7.943	12.843	13.109
1495.0000	7.785	7.949	12.843	13.109
1500.0000	7.785	7.943	12.843	13.093

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
1505.0000	7.785	7.943	12.828	13.109
1510.0000	7.785	7.943	12.843	13.109
1515.0000	7.785	7.943	12.843	13.109
1520.0000	7.785	7.943	12.843	13.109
1525.0000	7.785	7.936	12.843	13.093
1530.0000	7.779	7.943	12.843	13.109
1535.0000	7.785	7.936	12.843	13.109
1540.0000	7.779	7.930	12.843	13.109
1545.0000	7.779	7.936	12.843	13.109
1550.0000	7.779	7.924	12.843	13.109
1555.0000	7.772	7.924	12.843	13.109
1560.0000	7.772	7.924	12.828	13.109
1565.0000	7.772	7.924	12.843	13.093
1570.0000	7.779	7.918	12.843	13.109
1575.0000	7.772	7.924	12.843	13.109
1580.0000	7.772	7.911	12.843	13.109
1585.0000	7.772	7.918	12.843	13.109
1590.0000	7.766	7.911	12.843	13.109
1595.0000	7.766	7.911	12.843	13.109
1600.0000	7.766	7.905	12.843	13.093
1605.0000	7.766	7.899	12.828	13.093
1610.0000	7.766	7.899	12.828	13.093
1615.0000	7.759	7.899	12.828	13.093
1620.0000	7.759	7.892	12.828	13.093
1625.0000	7.753	7.886	12.828	13.093
1630.0000	7.759	7.886	12.828	13.093
1635.0000	7.753	7.886	12.828	13.093
1640.0000	7.753	7.886	12.828	13.109
1645.0000	7.753	7.886	12.828	13.109
1650.0000	7.747	7.880	12.828	13.093
1655.0000	7.747	7.880	12.828	13.093
1660.0000	7.747	7.880	12.828	13.093
1665.0000	7.747	7.880	12.828	13.093
1670.0000	7.740	7.873	12.828	13.093
1675.0000	7.747	7.873	12.828	13.093
1680.0000	7.740	7.873	12.828	13.093
1685.0000	7.740	7.873	12.828	13.093
1690.0000	7.734	7.867	12.812	13.093
1695.0000	7.740	7.867	12.828	13.093
1700.0000	7.740	7.867	12.828	13.093
1705.0000	7.734	7.861	12.812	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1710.0000	7.734	7.861	12.828	13.093
1715.0000	7.734	7.861	12.828	13.093
1720.0000	7.734	7.861	12.812	13.093
1725.0000	7.727	7.854	12.812	13.078
1730.0000	7.727	7.854	12.812	13.078
1735.0000	7.727	7.854	12.812	13.078
1740.0000	7.727	7.854	12.812	13.093
1745.0000	7.727	7.854	12.812	13.078
1750.0000	7.727	7.854	12.812	13.093
1755.0000	7.727	7.854	12.812	13.093
1760.0000	7.727	7.861	12.812	13.093
1765.0000	7.727	7.861	12.812	13.093
1770.0000	7.727	7.861	12.812	13.093
1775.0000	7.727	7.861	12.812	13.093
1780.0000	7.727	7.861	12.828	13.078
1785.0000	7.727	7.861	12.812	13.093
1790.0000	7.727	7.861	12.812	13.078
1795.0000	7.727	7.861	12.812	13.078
1800.0000	7.727	7.861	12.828	13.093
1805.0000	7.727	7.867	12.828	13.093
1810.0000	7.727	7.867	12.812	13.093
1815.0000	7.727	7.867	12.812	13.093
1820.0000	7.727	7.861	12.812	13.093
1825.0000	7.727	7.867	12.812	13.093
1830.0000	7.727	7.867	12.812	13.093
1835.0000	7.727	7.867	12.812	13.093
1840.0000	7.734	7.873	12.828	13.093
1845.0000	7.727	7.873	12.828	13.093
1850.0000	7.727	7.873	12.812	13.093
1855.0000	7.727	7.873	12.812	13.093
1860.0000	7.734	7.880	12.828	13.093
1865.0000	7.734	7.880	12.812	13.093
1870.0000	7.734	7.880	12.812	13.078
1875.0000	7.734	7.880	12.828	13.093
1880.0000	7.734	7.880	12.812	13.093
1885.0000	7.734	7.880	12.812	13.093
1890.0000	7.734	7.886	12.812	13.093
1895.0000	7.734	7.880	12.796	13.078
1900.0000	7.734	7.880	12.812	13.093
1905.0000	7.734	7.886	12.812	13.078
1910.0000	7.740	7.886	12.812	13.093

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1915.0000	7.740	7.892	12.812	13.093
1920.0000	7.740	7.892	12.812	13.078
1925.0000	7.740	7.899	12.812	13.093
1930.0000	7.747	7.899	12.812	13.093
1935.0000	7.747	7.899	12.812	13.078
1940.0000	7.747	7.905	12.812	13.093
1945.0000	7.747	7.905	12.812	13.093
1950.0000	7.747	7.911	12.812	13.093
1955.0000	7.747	7.905	12.812	13.093
1960.0000	7.747	7.911	12.812	13.093
1965.0000	7.747	7.911	12.812	13.093
1970.0000	7.753	7.911	12.812	13.093
1975.0000	7.753	7.911	12.812	13.093
1980.0000	7.753	7.911	12.812	13.078
1985.0000	7.753	7.911	12.812	13.078
1990.0000	7.753	7.918	12.812	13.093
1995.0000	7.753	7.911	12.812	13.078
2000.0000	7.753	7.918	12.812	13.078
2005.0000	7.753	7.918	12.812	13.078
2010.0000	7.753	7.924	12.812	13.093
2015.0000	7.753	7.918	12.812	13.078
2020.0000	7.759	7.918	12.812	13.078
2025.0000	7.759	7.918	12.812	13.078
2030.0000	7.759	7.918	12.812	13.093
2035.0000	7.759	7.924	12.812	13.093
2040.0000	7.759	7.918	12.812	13.093
2045.0000	7.759	7.924	12.812	13.093
2050.0000	7.759	7.924	12.812	13.078
2055.0000	7.766	7.924	12.812	13.078
2060.0000	7.759	7.924	12.812	13.078
2065.0000	7.766	7.924	12.812	13.078
2070.0000	7.766	7.924	12.812	13.093
2075.0000	7.766	7.924	12.812	13.093
2080.0000	7.766	7.924	12.812	13.093
2085.0000	7.766	7.924	12.812	13.078
2090.0000	7.766	7.924	12.812	13.078
2095.0000	7.766	7.930	12.812	13.078
2100.0000	7.766	7.924	12.812	13.078
2105.0000	7.766	7.924	12.812	13.078
2110.0000	7.766	7.924	12.812	13.078
2115.0000	7.766	7.924	12.812	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
2120.0000	7.766	7.924	12.812	13.093
2125.0000	7.766	7.924	12.812	13.078
2130.0000	7.766	7.924	12.812	13.078
2135.0000	7.766	7.930	12.812	13.093
2140.0000	7.766	7.924	12.796	13.078
2145.0000	7.766	7.930	12.812	13.078
2150.0000	7.766	7.924	12.796	13.078
2155.0000	7.766	7.924	12.796	13.078
2160.0000	7.766	7.930	12.812	13.078
2165.0000	7.766	7.930	12.812	13.078
2170.0000	7.766	7.924	12.812	13.078
2175.0000	7.766	7.930	12.812	13.078
2180.0000	7.772	7.930	12.796	13.078
2185.0000	7.766	7.930	12.812	13.078
2190.0000	7.766	7.930	12.812	13.078
2195.0000	7.766	7.930	12.796	13.078
2200.0000	7.766	7.930	12.812	13.078
2205.0000	7.772	7.930	12.812	13.078
2210.0000	7.772	7.930	12.812	13.078
2215.0000	7.772	7.930	12.812	13.078
2220.0000	7.772	7.930	12.812	13.078
2225.0000	7.772	7.930	12.812	13.078
2230.0000	7.772	7.930	12.812	13.078
2235.0000	7.766	7.930	12.812	13.078
2240.0000	7.766	7.924	12.812	13.078
2245.0000	7.766	7.924	12.796	13.078
2250.0000	7.766	7.924	12.812	13.078
2255.0000	7.766	7.924	12.796	13.078
2260.0000	7.766	7.924	12.796	13.078
2265.0000	7.766	7.924	12.796	13.078
2270.0000	7.766	7.924	12.796	13.062
2275.0000	7.766	7.924	12.796	13.062
2280.0000	7.766	7.924	12.796	13.062
2285.0000	7.766	7.924	12.796	13.078
2290.0000	7.766	7.930	12.796	13.078
2295.0000	7.766	7.924	12.796	13.078
2300.0000	7.766	7.924	12.796	13.078
2305.0000	7.766	7.924	12.796	13.062
2310.0000	7.766	7.924	12.796	13.078
2315.0000	7.766	7.930	12.796	13.062
2320.0000	7.766	7.930	12.796	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
2325.0000	7.766	7.924	12.796	13.078
2330.0000	7.766	7.930	12.796	13.062
2335.0000	7.766	7.930	12.796	13.062
2340.0000	7.766	7.930	12.796	13.078
2345.0000	7.766	7.924	12.796	13.078
2350.0000	7.766	7.924	12.796	13.062
2355.0000	7.766	7.924	12.796	13.078
2360.0000	7.766	7.924	12.796	13.062
2365.0000	7.766	7.924	12.781	13.062
2370.0000	7.759	7.918	12.781	13.062
2375.0000	7.759	7.918	12.796	13.062
2380.0000	7.759	7.918	12.781	13.062
2385.0000	7.759	7.918	12.781	13.062
2390.0000	7.759	7.918	12.781	13.062
2395.0000	7.759	7.918	12.781	13.062
2400.0000	7.759	7.918	12.781	13.062
2405.0000	7.766	7.924	12.796	13.062
2410.0000	7.759	7.918	12.781	13.046
2415.0000	7.759	7.918	12.796	13.062
2420.0000	7.759	7.924	12.781	13.062
2425.0000	7.759	7.924	12.796	13.062
2430.0000	7.759	7.924	12.796	13.062
2435.0000	7.766	7.930	12.796	13.062
2440.0000	7.759	7.930	12.781	13.062
2445.0000	7.759	7.924	12.781	13.062
2450.0000	7.759	7.930	12.781	13.062
2455.0000	7.759	7.930	12.781	13.062
2460.0000	7.759	7.930	12.781	13.046
2465.0000	7.759	7.930	12.781	13.062
2470.0000	7.759	7.936	12.781	13.062
2475.0000	7.759	7.930	12.781	13.062
2480.0000	7.759	7.930	12.781	13.046
2485.0000	7.759	7.936	12.781	13.046
2490.0000	7.766	7.936	12.781	13.062
2495.0000	7.759	7.936	12.781	13.062
2500.0000	7.766	7.936	12.781	13.046
2505.0000	7.759	7.936	12.781	13.046
2510.0000	7.766	7.936	12.781	13.046
2515.0000	7.766	7.943	12.781	13.062
2520.0000	7.766	7.943	12.781	13.046
2525.0000	7.766	7.936	12.781	13.062

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
2530.0000	7.766	7.936	12.781	13.046
2535.0000	7.759	7.936	12.781	13.062
2540.0000	7.759	7.936	12.781	13.062
2545.0000	7.759	7.936	12.781	13.046
2550.0000	7.759	7.943	12.781	13.046
2555.0000	7.766	7.943	12.781	13.046
2560.0000	7.759	7.943	12.781	13.046
2565.0000	7.759	7.943	12.781	13.046
2570.0000	7.759	7.943	12.781	13.046
2575.0000	7.759	7.943	12.781	13.046
2580.0000	7.759	7.943	12.765	13.046
2585.0000	7.759	7.949	12.781	13.046
2590.0000	7.766	7.955	12.781	13.046
2595.0000	7.766	7.949	12.781	13.062
2600.0000	7.766	7.949	12.781	13.046
2605.0000	7.766	7.949	12.781	13.046
2610.0000	7.766	7.949	12.781	13.046
2615.0000	7.766	7.955	12.781	13.046
2620.0000	7.759	7.955	12.781	13.046
2625.0000	7.766	7.955	12.781	13.046
2630.0000	7.759	7.955	12.765	13.046
2635.0000	7.766	7.955	12.781	13.046
2640.0000	7.766	7.955	12.781	13.046
2645.0000	7.766	7.955	12.781	13.046
2650.0000	7.766	7.955	12.781	13.046
2655.0000	7.759	7.949	12.781	13.046
2660.0000	7.766	7.949	12.781	13.046
2665.0000	7.766	7.955	12.781	13.046
2670.0000	7.759	7.949	12.781	13.046
2675.0000	7.766	7.955	12.781	13.046
2680.0000	7.766	7.962	12.781	13.046
2685.0000	7.766	7.962	12.781	13.046
2690.0000	7.766	7.962	12.765	13.046
2695.0000	7.766	7.968	12.781	13.046
2700.0000	7.766	7.968	12.781	13.046
2705.0000	7.766	7.968	12.781	13.046
2710.0000	7.766	7.968	12.781	13.046
2715.0000	7.766	7.968	12.781	13.046
2720.0000	7.766	7.968	12.781	13.046
2725.0000	7.766	7.968	12.781	13.046
2730.0000	7.772	7.968	12.781	13.046

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
2735.0000	7.766	7.968	12.781	13.046
2740.0000	7.772	7.974	12.781	13.046
2745.0000	7.772	7.974	12.781	13.046
2750.0000	7.772	7.981	12.781	13.046
2755.0000	7.772	7.981	12.781	13.046
2760.0000	7.772	7.987	12.781	13.062
2765.0000	7.772	7.987	12.781	13.046
2770.0000	7.779	7.987	12.781	13.062
2775.0000	7.772	7.987	12.781	13.062
2780.0000	7.779	7.987	12.781	13.062
2785.0000	7.772	7.987	12.781	13.046
2790.0000	7.772	7.987	12.781	13.046
2795.0000	7.779	7.993	12.781	13.062
2800.0000	7.779	7.987	12.781	13.046
2805.0000	7.772	7.993	12.781	13.046
2810.0000	7.779	8.000	12.781	13.062
2815.0000	7.779	7.993	12.796	13.062
2820.0000	7.779	7.993	12.781	13.062
2825.0000	7.779	8.000	12.796	13.062
2830.0000	7.779	7.993	12.796	13.062
2835.0000	7.779	7.993	12.796	13.062
2840.0000	7.779	8.000	12.796	13.062
2845.0000	7.779	8.000	12.796	13.062
2850.0000	7.779	8.000	12.796	13.062
2855.0000	7.779	8.000	12.796	13.062
2860.0000	7.779	8.000	12.796	13.062
2865.0000	7.779	8.006	12.796	13.062
2870.0000	7.779	8.012	12.796	13.062
2875.0000	7.785	8.012	12.796	13.078
2880.0000	7.785	8.025	12.796	13.078
2885.0000	7.791	8.018	12.796	13.078
2890.0000	7.791	8.025	12.796	13.062
2895.0000	7.791	8.025	12.812	13.078
2900.0000	7.791	8.025	12.812	13.078
2905.0000	7.791	8.031	12.796	13.078
2910.0000	7.791	8.031	12.812	13.078
2915.0000	7.791	8.031	12.812	13.062
2920.0000	7.798	8.025	12.812	13.078
2925.0000	7.798	8.031	12.812	13.078
2930.0000	7.798	8.031	12.812	13.078
2935.0000	7.798	8.031	12.812	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
2940.0000	7.791	8.025	12.796	13.078
2945.0000	7.798	8.031	12.812	13.078
2950.0000	7.798	8.037	12.812	13.078
2955.0000	7.798	8.031	12.796	13.062
2960.0000	7.798	8.025	12.796	13.062
2965.0000	7.798	8.031	12.796	13.062
2970.0000	7.798	8.031	12.796	13.078
2975.0000	7.798	8.031	12.796	13.062
2980.0000	7.791	8.018	12.796	13.062
2985.0000	7.798	8.025	12.796	13.062
2990.0000	7.791	8.025	12.796	13.062
2995.0000	7.798	8.025	12.796	13.062
3000.0000	7.798	8.025	12.796	13.062
3005.0000	7.798	8.025	12.796	13.062
3010.0000	7.798	8.031	12.812	13.062
3015.0000	7.798	8.025	12.796	13.062
3020.0000	7.798	8.025	12.812	13.062
3025.0000	7.791	8.025	12.796	13.078
3030.0000	7.791	8.018	12.796	13.062
3035.0000	7.791	8.018	12.812	13.062
3040.0000	7.791	8.018	12.812	13.062
3045.0000	7.798	8.025	12.812	13.062
3050.0000	7.791	8.018	12.796	13.062
3055.0000	7.785	8.012	12.796	13.062
3060.0000	7.791	8.018	12.796	13.062
3065.0000	7.791	8.012	12.796	13.078
3070.0000	7.785	8.012	12.796	13.046
3075.0000	7.785	8.012	12.796	13.062
3080.0000	7.785	8.012	12.796	13.062
3085.0000	7.785	8.000	12.796	13.031
3090.0000	7.785	8.018	12.765	13.046
3095.0000	7.785	8.012	12.796	13.046
3100.0000	7.785	8.018	12.796	13.062
3105.0000	7.785	8.012	12.796	13.062
3110.0000	7.785	8.012	12.796	13.062
3115.0000	7.785	8.000	12.796	13.046
3120.0000	7.791	8.018	12.796	13.062
3125.0000	7.785	8.012	12.796	13.062
3130.0000	7.785	8.000	12.843	13.062
3135.0000	7.791	8.025	12.796	13.078
3140.0000	7.785	8.018	12.796	13.062

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
3145.0000	7.791	8.018	12.812	13.062
3150.0000	7.798	8.018	12.781	13.062
3155.0000	7.785	8.018	12.781	13.062
3160.0000	7.791	8.025	12.812	13.062
3165.0000	7.791	8.025	12.812	13.062
3170.0000	7.785	8.025	12.796	13.062
3175.0000	7.798	8.031	12.796	13.062
3180.0000	7.798	8.031	12.812	13.078
3185.0000	7.798	8.031	12.812	13.078
3190.0000	7.791	8.031	12.796	13.078
3195.0000	7.798	8.037	12.812	13.078
3200.0000	7.798	8.037	12.812	13.078
3205.0000	7.798	8.031	12.812	13.078
3210.0000	7.798	8.037	12.812	13.078
3215.0000	7.798	8.044	12.812	13.078
3220.0000	7.798	8.044	12.812	13.078
3225.0000	7.798	8.044	12.812	13.078
3230.0000	7.804	8.044	12.812	13.078
3235.0000	7.804	8.050	12.812	13.078
3240.0000	7.804	8.050	12.812	13.078
3245.0000	7.804	8.056	12.812	13.078
3250.0000	7.804	8.056	12.812	13.078
3255.0000	7.811	8.056	12.812	13.093
3260.0000	7.811	8.063	12.812	13.078
3265.0000	7.811	8.063	12.812	13.078
3270.0000	7.811	8.069	12.812	13.078
3275.0000	7.817	8.069	12.812	13.078
3280.0000	7.817	8.075	12.828	13.093
3285.0000	7.823	8.075	12.828	13.093
3290.0000	7.823	8.075	12.812	13.093
3295.0000	7.823	8.075	12.828	13.093
3300.0000	7.823	8.081	12.828	13.078
3305.0000	7.823	8.081	12.828	13.093
3310.0000	7.823	8.088	12.828	13.093
3315.0000	7.830	8.088	12.828	13.093
3320.0000	7.830	8.088	12.828	13.093
3325.0000	7.830	8.088	12.828	13.078
3330.0000	7.830	8.094	12.828	13.078
3335.0000	7.836	8.094	12.828	13.093
3340.0000	7.836	8.100	12.828	13.078
3345.0000	7.836	8.100	12.828	13.093

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
3350.0000	7.836	8.100	12.828	13.093
3355.0000	7.843	8.107	12.828	13.093
3360.0000	7.843	8.113	12.828	13.093
3365.0000	7.843	8.113	12.828	13.093
3370.0000	7.843	8.119	12.828	13.093
3375.0000	7.849	8.119	12.828	13.093
3380.0000	7.849	8.119	12.828	13.093
3385.0000	7.855	8.126	12.828	13.093
3390.0000	7.855	8.126	12.828	13.093
3395.0000	7.855	8.132	12.843	13.093
3400.0000	7.862	8.138	12.828	13.093
3405.0000	7.862	8.132	12.828	13.093
3410.0000	7.868	8.138	12.843	13.093
3415.0000	7.862	8.138	12.828	13.093
3420.0000	7.862	8.138	12.828	13.093
3425.0000	7.868	8.138	12.843	13.093
3430.0000	7.868	8.138	12.843	13.093
3435.0000	7.875	8.145	12.828	13.093
3440.0000	7.875	8.145	12.843	13.093
3445.0000	7.875	8.138	12.843	13.093
3450.0000	7.875	8.145	12.843	13.093
3455.0000	7.875	8.145	12.843	13.093
3460.0000	7.875	8.145	12.843	13.093
3465.0000	7.881	8.145	12.843	13.109
3470.0000	7.881	8.151	12.828	13.093
3475.0000	7.881	8.151	12.843	13.109
3480.0000	7.887	8.157	12.843	13.109
3485.0000	7.887	8.157	12.843	13.093
3490.0000	7.887	8.157	12.843	13.109
3495.0000	7.887	8.157	12.843	13.093
3500.0000	7.887	8.157	12.843	13.109
3505.0000	7.887	8.157	12.843	13.109
3510.0000	7.887	8.157	12.843	13.093
3515.0000	7.887	8.157	12.843	13.109
3520.0000	7.894	8.157	12.843	13.109
3525.0000	7.894	8.157	12.843	13.109
3530.0000	7.894	8.163	12.843	13.093
3535.0000	7.894	8.157	12.843	13.109
3540.0000	7.894	8.163	12.843	13.109
3545.0000	7.894	8.157	12.843	13.109
3550.0000	7.894	8.157	12.843	13.109

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
3555.0000	7.894	8.157	12.843	13.109
3560.0000	7.900	8.163	12.843	13.109
3565.0000	7.900	8.163	12.843	13.109
3570.0000	7.900	8.163	12.843	13.109
3575.0000	7.900	8.163	12.859	13.109
3580.0000	7.900	8.163	12.859	13.109
3585.0000	7.907	8.157	12.843	13.109
3590.0000	7.907	8.170	12.859	13.109
3595.0000	7.907	8.163	12.859	13.109
3600.0000	7.907	8.163	12.859	13.109
3605.0000	7.907	8.163	12.859	13.109
3610.0000	7.907	8.170	12.859	13.124
3615.0000	7.907	8.163	12.859	13.109
3620.0000	7.907	8.163	12.859	13.109
3625.0000	7.913	8.170	12.859	13.124
3630.0000	7.913	8.170	12.859	13.109
3635.0000	7.913	8.170	12.859	13.109
3640.0000	7.913	8.170	12.859	13.124
3645.0000	7.913	8.170	12.859	13.124
3650.0000	7.913	8.170	12.859	13.109
3655.0000	7.913	8.170	12.859	13.109
3660.0000	7.913	8.170	12.875	13.109
3665.0000	7.919	8.170	12.859	13.124
3670.0000	7.919	8.170	12.859	13.124
3675.0000	7.919	8.170	12.859	13.124
3680.0000	7.919	8.170	12.859	13.124
3685.0000	7.919	8.170	12.859	13.124
3690.0000	7.919	8.170	12.875	13.124
3695.0000	7.919	8.170	12.875	13.124
3700.0000	7.919	8.170	12.859	13.124
3705.0000	7.919	8.170	12.859	13.124
3710.0000	7.919	8.170	12.875	13.124
3715.0000	7.919	8.170	12.875	13.124
3720.0000	7.919	8.170	12.859	13.124
3725.0000	7.926	8.170	12.859	13.124
3730.0000	7.919	8.170	12.859	13.124
3735.0000	7.919	8.170	12.875	13.124
3740.0000	7.919	8.170	12.859	13.124
3745.0000	7.919	8.163	12.859	13.124
3750.0000	7.919	8.163	12.859	13.124
3755.0000	7.919	8.170	12.875	13.124

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
3760.0000	7.919	8.170	12.875	13.109
3765.0000	7.919	8.170	12.859	13.124
3770.0000	7.919	8.163	12.859	13.124
3775.0000	7.913	8.170	12.859	13.124
3780.0000	7.913	8.170	12.859	13.124
3785.0000	7.913	8.163	12.859	13.124
3790.0000	7.913	8.163	12.859	13.124
3795.0000	7.913	8.170	12.859	13.124
3800.0000	7.913	8.163	12.859	13.124
3805.0000	7.913	8.163	12.859	13.124
3810.0000	7.913	8.170	12.859	13.124
3815.0000	7.913	8.163	12.859	13.124
3820.0000	7.913	8.157	12.859	13.109
3825.0000	7.907	8.151	12.859	13.124
3830.0000	7.913	8.151	12.859	13.109
3835.0000	7.907	8.163	12.875	13.124
3840.0000	7.907	8.163	12.859	13.109
3845.0000	7.907	8.163	12.859	13.109
3850.0000	7.907	8.163	12.859	13.109
3855.0000	7.913	8.163	12.859	13.109
3860.0000	7.907	8.163	12.859	13.124
3865.0000	7.907	8.163	12.859	13.124
3870.0000	7.913	8.163	12.859	13.124
3875.0000	7.907	8.163	12.875	13.124
3880.0000	7.907	8.170	12.859	13.109
3885.0000	7.907	8.170	12.859	13.109
3890.0000	7.907	8.176	12.859	13.124
3895.0000	7.907	8.170	12.859	13.109
3900.0000	7.907	8.176	12.859	13.124
3905.0000	7.907	8.170	12.859	13.124
3910.0000	7.907	8.170	12.859	13.124
3915.0000	7.907	8.163	12.859	13.124
3920.0000	7.907	8.163	12.859	13.124
3925.0000	7.907	8.163	12.859	13.109
3930.0000	7.907	8.157	12.859	13.109
3935.0000	7.907	8.151	12.859	13.109
3940.0000	7.900	8.151	12.859	13.109
3945.0000	7.900	8.151	12.859	13.124
3950.0000	7.900	8.138	12.859	13.124
3955.0000	7.900	8.138	12.859	13.109
3960.0000	7.900	8.138	12.859	13.109

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
3965.0000	7.900	8.138	12.859	13.109
3970.0000	7.900	8.138	12.859	13.109
3975.0000	7.900	8.132	12.859	13.109
3980.0000	7.900	8.138	12.859	13.109
3985.0000	7.900	8.138	12.859	13.109
3990.0000	7.900	8.138	12.859	13.124
3995.0000	7.900	8.138	12.859	13.124
4000.0000	7.900	8.145	12.859	13.109
4005.0000	7.900	8.138	12.875	13.109
4010.0000	7.900	8.138	12.859	13.109
4015.0000	7.907	8.138	12.859	13.109
4020.0000	7.900	8.145	12.859	13.124
4025.0000	7.900	8.138	12.859	13.124
4030.0000	7.900	8.138	12.859	13.124
4035.0000	7.900	8.138	12.859	13.124
4040.0000	7.907	8.138	12.843	13.124
4045.0000	7.900	8.138	12.859	13.124
4050.0000	7.907	8.138	12.859	13.124
4055.0000	7.907	8.145	12.859	13.124
4060.0000	7.907	8.145	12.859	13.109
4065.0000	7.907	8.145	12.859	13.109
4070.0000	7.907	8.145	12.859	13.109
4075.0000	7.900	8.145	12.859	13.109
4080.0000	7.907	8.151	12.859	13.109
4085.0000	7.907	8.151	12.859	13.109
4090.0000	7.907	8.151	12.859	13.109
4095.0000	7.907	8.157	12.859	13.124
4100.0000	7.907	8.157	12.859	13.124
4105.0000	7.907	8.157	12.859	13.109
4110.0000	7.907	8.157	12.859	13.124
4115.0000	7.907	8.151	12.875	13.124
4120.0000	7.907	8.151	12.859	13.124
4125.0000	7.907	8.151	12.859	13.124
4130.0000	7.907	8.151	12.859	13.109
4135.0000	7.907	8.151	12.843	13.124
4140.0000	7.907	8.151	12.859	13.109
4145.0000	7.907	8.145	12.859	13.109
4150.0000	7.900	8.145	12.859	13.109
4155.0000	7.907	8.145	12.859	13.109
4160.0000	7.907	8.151	12.859	13.109
4165.0000	7.907	8.151	12.859	13.124

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: CONSTANT RATE DRAWDOWN
FLOW RATE: 1.5 GPM

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
4170.0000	7.907	8.151	12.859	13.109
4175.0000	7.907	8.157	12.859	13.124
4180.0000	7.913	8.157	12.859	13.124
4185.0000	7.907	8.151	12.859	13.124
4190.0000	7.907	8.157	12.859	13.124
4195.0000	7.907	8.163	12.859	13.124
4200.0000	7.907	8.163	12.859	13.124
4205.0000	7.907	8.163	12.859	13.124
4210.0000	7.907	8.163	12.859	13.124
4215.0000	7.913	8.163	12.859	13.124
4220.0000	7.907	8.163	12.859	13.124
4225.0000	7.913	8.163	12.875	13.124
4230.0000	7.913	8.170	12.875	13.124
4235.0000	7.913	8.170	12.875	13.140
4240.0000	7.913	8.170	12.875	13.140
4245.0000	7.913	8.176	12.875	13.140
4250.0000	7.919	8.170	12.875	13.140
4255.0000	7.919	8.176	12.875	13.140
4260.0000	7.913	8.176	12.890	13.140
4265.0000	7.913	8.176	12.875	13.140
4270.0000	7.919	8.176	12.890	13.140
4275.0000	7.913	8.176	12.890	13.156
4280.0000	7.919	8.176	12.875	13.156
4285.0000	7.913	8.176	12.890	13.156
4290.0000	7.919	8.176	12.875	13.140
4295.0000	7.919	8.176	12.890	13.140
4300.0000	7.919	8.176	12.875	13.140
4305.0000	7.919	8.176	12.875	13.140
4310.0000	7.919	8.176	12.890	13.140
4315.0000	7.919	8.176	12.890	13.156
4320.0000	7.919	8.176	12.890	13.140
4325.0000	7.919	8.176	12.890	13.156
4330.0000	7.919	8.176	12.890	13.156
4335.0000	7.919	8.176	12.890	13.140
4340.0000	7.919	8.176	12.890	13.140
4345.0000	7.919	8.176	12.890	13.140
4350.0000	7.919	8.176	12.890	13.140
4355.0000	7.919	8.170	12.890	13.156

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WATER LEVEL DATA

Phase: Drawdown x

Recovery

Initial Static W.L. Below M.P. (ft.) 10.7

Project

M.P. Elevation (ft., NGVD)

Well Number 21 (HPGW21)

Initial W.L. Elevation (ft., NGVD)

Distance to Pumped Well ft.

Test Start Date/Time 2-2-93/10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	9:20 ~~Initial~~	Initial			10.7		--	DABAL
2-2-93	15:31	328			10.7			MDS
2-3-93	8:48	1363			10.7			MDS
2-3-93	15:50	1785			10.64			DJM
2/4/93	0650	2685			10.68			RPD
2-4-93	11:12	1			10.70			MDS
2-4-93	18:55				10.72			MDS
~~0658~~ 2-5-93	0658				10.70			RPD
2-6-93	10:01				10.66			MDS

Comments:

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Baker Environmental, Inc

WATER LEVEL DATA

Phase: Drawdown X

Recovery ____

Initial Static W.L. Below M.P. (ft.) 7.00

Project ____

M.P. Elevation (ft., NGVD) ____

Well Number 22

Initial W.L. Elevation (ft., NGVD) ____

Distance to Pumped Well ____ ft.

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	9:07	INITIAL			7.00		--	DABAL
2-2-93	15:18	313			7.10			MDS
2-3-93	8:42	1357			7.16			MDS
2-3-93	15:40	1775			7.12			DJM
2/4/93	0655	2750			7.18			RPD
2-4-93	11:07				7.22			MDS
2-4-93	18:48				7.27			MDS
2-5-93	0700				7.30			RPD
2-5-6	0946				7.16'			MDS

Comments: ____

Baker

Baker Environmental, Inc

WATER LEVEL DATA

Phase: Drawdown X

Recovery ________

Initial Static W.L. Below M.P. (ft.) 9.57

Project ________

M.P. Elevation (ft., NGVD) ________

Well Number 22-1 (HPGW22-1)

Initial W.L. Elevation (ft., NGVD) ________

Distance to Pumped Well ________ ft.

Test Start Date/Time 2-2-93 /10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	9:31	INITIAL			9.57		--	DABAL
2-2-93	15:49	344			9.56			MDS
2-3-93	8:57	1372			9.60			MDS
2-3-93	15:56	1791			9.46			DJM
2/4/93	0645	2672			9.44			RPD
2-4-93	11:19	19			9.56			MDS
2-4-93	19:07				9 MDS 2/4/93 8.58			MDS
2-5-93	06 53				9.56			RPD
2-5-93	10:08				9.42			MDS

Comments: ________

Page 1 of ___

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WATER LEVEL DATA

Phase: Drawdown X

Recovery ___

Initial Static W.L. Below M.P. (ft.) 8.47

Project ___

M.P. Elevation (ft., NGVD) ___

Well Number 22-2 (HPGMW 22-2)

Initial W.L. Elevation (ft., NGVD) ___

Distance to Pumped Well ___ ft.

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	9:40	Initial			8.47		--	DABAL
2-2-93	15:56	351			8.52			MDS
2-3-93	9:03	1378			8.52			MDS
2-3-93	15:58	1793			8.42			DJM
2/4/93	0640	2665			8.46			RYP
2/4/93	11:23				8.50			MDS
2/4/93	1906				8.56			MDS
2-5-93	0650				8.56			RPD
2-5-93	1012				8.46			MPS

Comments: ___

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WATER LEVEL DATA

Phase: Drawdown X

Recovery

Project

Well Number 23

Distance to Pumped Well ft.

Initial Static W.L. Below M.P. (ft.) 9.75

M.P. Elevation (ft., NGVD)

Initial W.L. Elevation (ft., NGVD)

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	8:55	INITIAL			9.75'		--	DABAL
2-2-93	16:06	361			9.70'			MDS
2-3-93	9:10	1385			9.84'			MDS
2-3-93	15:43	1778			9.71'			DJM
2-4-93	0700	2695			9.73'			RFD
2-4-93	10:52				9.79'			MDS
2-4-93	18:19				9.82			MDS
2-5-93	0706				9.86			RAD
2-5-93	9:38				9.72			MDS

Comments:

Baker
Baker Environmental, Inc

WATER LEVEL DATA

Phase: Drawdown X

Recovery

Project Hadnot Point Ind. Area

Well Number 25

Distance to Pumped Well ____ ft.

Initial Static W.L. Below M.P. (ft.) 7.08'

M.P. Elevation (ft., NGVD) ____

Initial W.L. Elevation (ft., NGVD) ____

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	15:04	initial			7.08'			MDS
2-3-93	8:29	1344			7.20'			MDS
2-3-93	15:35	1770			7.12'			DJM
2-3-93	2225	2180			7.15'			RPO
2-4-93	00235	2430			7.15			RPO
2/4-93	0725	3020			7.2			RPO
2/4/93	10:58	3233 ~~10:58~~			7.26			MDS
2/4/93	18:25				7.30			MDS
2-5-93	0030							
2-5-93	0710				7.34			RPO
2-6-93	0908				9.6			MDS

Comments:

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WATER LEVEL DATA

Phase: Drawdown X

Recovery ________

Initial Static W.L. Below M.P. (ft.) 9.55

Project Hadnot Point Ind. Area

M.P. Elevation (ft., NGVD) ________

Well Number 30-2

Initial W.L. Elevation (ft., NGVD) ________

Distance to Pumped Well ________ ft.

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	10:05	INITIAL			9.55		--	DABAL
2-2-93	12:30	145			9.68			MDS
2-2-93	14:43	278			9.60			MDS
2-2-93	18:03	478			9.61			DJM
2-3-93	9:24	1399			9.68			MDS
2-3-93	12:38	1593			9.68			MDS
2-3-93	15:30	1765			9.64			MAMrose
2-3-93	18:03	1918			~~9.70~~ 9.64			MAMrose
2-3-93	2215	2330			9.64			RPD
2-4-93	0235	2590			9.6			RPD
2-4-93	0720	3175			9.6			RPD
2-4-93	10:44	3379			9.62			MDS
2-4-93	18:11	3826			9.64			MDS
2-5-93	0027	4202			9.70			RPD
2-5-93	0715	4610			9.68			RPD
2-5-93	0930	4745			9.60			MDS

Comments:

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WATER LEVEL DATA

Phase: Drawdown X

Recovery ___

Initial Static W.L. Below M.P. (ft.) 9.60

Project Hadnot Point Ind. Area

M.P. Elevation (ft., NGVD) ___

Well Number 30-3

Initial W.L. Elevation (ft., NGVD) ___

Distance to Pumped Well ___ ft.

Test Start Date/Time 2-2-93 / 10:05

Date	Time	Elapsed Time (min.)	Foot Mark Held at M.P. (ft.)	Wetted Tape (ft.)	Water Level Below M.P. (ft.)	Elev. of Water Surface (ft.)	Draw-down	Obtained By
2-2-93	8:39	Initial			9.60		--	DABAL
2-2-93	12:27	142			~~9.64~~ 9.58			MDS
2-2-93	14:47	282			9.66			MDS
2-2-93	18:00	475			9.67			D.Mamrose
2-3-93	09:20	1395			9.74			MDS
2-3-93	12:36	1591			9.72			MDS
2-3-93	15:28	1763			9.70			D.Mamrose
2-3-93	18:00	1915			9.70			D.Mamrose
2-3-93	2210	2165			9.70			RPD
2-4-93	0235	2370			9.66			RPD
2/4/93	0715	2850			9.66			RPD
2/4/93	1041	3056			9.66			MDS
2/4/93	1809	~~4~~ 3504			9.70			MDS
2-5-93	0020	3875			9.74			RPD
2-5-93	0714	4329			9.44			RPD
2-6-93	09~~00~~30	4465			9.64			MDS

Comments: ___

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Baker Environmental, Inc.

FLUID LEVEL MEASUREMENTS

Project Hadnot Point

CTO Number 17

Date	Time	Well Number	Top of Casing Elevation (feet above MSL)	Depth to Product (feet below top of casing)	Depth to Groundwater (feet below top of casing)	Product Thickness (feet)	Product Elevation (feet above MSL)	Depth to Bottom ~~Groundwater Elevation~~ (feet above MSL)	Obtained by
2/2/93	750	RW1			7.45'			27.3'	RPD/MDS
2/2/93	751	P2			5.10'			24.75'	RPD/MDS
2/2/93	755	P1			7.35'			24.65'	RPD/MDS
2/2/93	759	HPGW 24-1			7.30			27.25'	RPD/MDS
2/2/93	807	24-2			12.75'			77.80'	RPD/MDS
2/2/93	812	24-3			13.00'			101.3 + Not Bottom	RPD/MDS
2/2/93	0839	30-3			9.60			101.3 + not bottom	RPD
2/2/93	0845	30-2			9.55			76.15	RPD
2/2/93	0855	23			9.75			27.35	RPD
2/2/93	0907	22			7.09			27.70	RPD
2/2/93	0920	21			10.~~7~~7 RPD			27.60	RPD
2/2/93	0931	~~22~~-1			9.59			12.64	RPD
2/2/93	0940	22.2			8.47			23.15	RPD

APPENDIX D
AQUIFER TEST DATA - RECOVERY PHASE

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
0.0000	20.412	6.956
0.0033	20.399	6.963
0.0066	20.418	6.963
0.0100	20.406	6.963
0.0133	20.399	6.963
0.0166	20.399	6.963
0.0200	20.399	6.963
0.0233	20.393	6.963
0.0266	20.406	6.963
0.0300	20.418	6.963
0.0333	20.393	6.963
0.0500	20.387	6.963
0.0666	20.374	6.963
0.0833	20.362	6.963
0.1000	20.349	6.963
0.1166	20.336	6.963
0.1333	20.324	6.963
0.1500	20.311	6.963
0.1666	20.298	6.963
0.1833	20.286	6.963
0.2000	20.273	6.963
0.2166	20.260	6.963
0.2333	20.248	6.963
0.2500	20.235	6.963
0.2666	20.222	6.963
0.2833	20.210	6.969
0.3000	20.197	6.969
0.3166	20.191	6.969
0.3333	20.178	6.969
0.4166	20.115	6.963
0.5000	20.058	6.963
0.5833	19.995	6.969
0.6666	19.938	6.969
0.7500	19.881	6.969
0.8333	19.817	6.969
0.9166	19.754	6.969
1.0000	19.691	6.969
1.0833	19.628	6.963
1.1666	19.577	6.969
1.2500	19.520	6.969
1.3333	19.470	6.969
1.4166	19.413	6.969

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
1.5000	19.356	6.969
1.5833	19.292	6.963
1.6666	19.229	6.969
1.7500	19.172	6.969
1.8333	19.109	6.969
1.9166	19.046	6.969
2.0000	18.982	6.969
2.5000	18.622	6.975
3.0000	18.248	6.969
3.5000	17.881	6.963
4.0000	17.514	6.956
4.5000	17.153	6.963
5.0000	16.818	6.963
5.5000	16.495	6.969
6.0000	16.197	6.975
6.5000	15.919	6.975
7.0000	15.640	6.969
7.5000	15.387	6.969
8.0000	15.152	6.969
8.5000	14.937	6.963
9.0000	14.722	6.963
9.5000	14.506	6.956
10.0000	14.304	6.956
12.0000	13.581	6.956
14.0000	12.910	6.956
16.0000	12.301	6.95
18.0000	11.832	6.944
20.0000	11.484	6.937
22.0000	11.211	6.937
24.0000	10.983	6.931
26.0000	10.793	6.918
28.0000	10.628	6.912
30.0000	10.482	6.899
32.0000	10.380	6.893
34.0000	10.279	6.887
36.0000	10.203	6.88
38.0000	10.127	6.868
40.0000	10.051	6.861
42.0000	10.006	6.849
44.0000	9.949	6.849
46.0000	9.905	6.836
48.0000	9.860	6.823

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
50.0000	9.816	6.811
52.0000	9.778	6.804
54.0000	9.746	6.798
56.0000	9.714	6.798
58.0000	9.676	6.779
60.0000	9.651	6.772
62.0000	9.619	6.766
64.0000	9.594	6.76
66.0000	9.569	6.747
68.0000	9.537	6.734
70.0000	9.518	6.728
72.0000	9.505	6.722
74.0000	9.473	6.715
76.0000	9.461	6.709
78.0000	9.442	6.703
80.0000	9.423	6.69
82.0000	9.397	6.677
84.0000	9.385	6.671
86.0000	9.372	6.665
88.0000	9.353	6.665
90.0000	9.347	6.658
92.0000	9.328	6.646
94.0000	9.315	6.639
96.0000	9.296	6.627
98.0000	9.277	6.62
100.0000	9.270	6.608
110.0000	9.207	6.57
120.0000	9.150	6.544
130.0000	9.106	6.513
140.0000	9.061	6.487
150.0000	9.010	6.456
160.0000	8.979	6.437
170.0000	8.941	6.405
180.0000	8.903	6.38
190.0000	8.871	6.354
200.0000	8.833	6.335
210.0000	8.807	6.316
220.0000	8.776	6.291
230.0000	8.750	6.272
240.0000	8.719	6.253
250.0000	8.693	6.24
260.0000	8.661	6.221

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME	WELL NUMBER	
	RW-1	P-2
(MIN)	SWL (FEET)	SWL (FEET)
270.0000	8.642	6.202
280.0000	8.617	6.183
290.0000	8.592	6.171
300.0000	8.560	6.152
310.0000	8.541	6.133
320.0000	8.522	6.12
330.0000	8.496	6.107
340.0000	8.477	6.088
350.0000	8.458	6.069
360.0000	8.439	6.057
370.0000	8.414	6.044
380.0000	8.395	6.025
390.0000	8.376	6.012
400.0000	8.357	5.993
410.0000	8.338	5.98
420.0000	8.332	5.974
430.0000	8.313	5.961
440.0000	8.300	5.949
450.0000	8.287	5.936
460.0000	8.274	5.923
470.0000	8.262	5.917
480.0000	8.249	5.904
490.0000	8.236	5.898
500.0000	8.230	5.885
510.0000	8.217	5.879
520.0000	8.205	5.866
530.0000	8.192	5.854
540.0000	8.179	5.847
550.0000	8.173	5.841
560.0000	8.167	5.835
570.0000	8.154	5.822
580.0000	8.148	5.816
590.0000	8.135	5.809
600.0000	8.129	5.803
610.0000	8.122	5.797
620.0000	8.109	5.784
630.0000	8.103	5.778
640.0000	8.097	5.771
650.0000	8.084	5.759
660.0000	8.071	5.746
670.0000	8.065	5.74
680.0000	8.059	5.733

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
690.0000	8.052	5.727
700.0000	8.046	5.721
710.0000	8.033	5.708
720.0000	8.021	5.702
730.0000	8.014	5.702
740.0000	8.008	5.689
750.0000	8.002	5.683
760.0000	8.002	5.676
770.0000	7.995	5.67
780.0000	7.983	5.664
790.0000	7.976	5.657
800.0000	7.970	5.651
810.0000	7.957	5.632
820.0000	7.951	5.632
830.0000	7.945	5.626
840.0000	7.938	5.607
850.0000	7.925	5.613
860.0000	7.925	5.6
870.0000	7.913	5.594
880.0000	7.906	5.588
890.0000	7.900	5.581
900.0000	7.894	5.575
910.0000	7.887	5.569
920.0000	7.881	5.55
930.0000	7.875	5.562
940.0000	7.875	5.556
950.0000	7.868	5.55
960.0000	7.862	5.537
970.0000	7.856	5.537
980.0000	7.849	5.524
990.0000	7.843	5.524
1000.0000	7.837	5.518
1010.0000	7.830	5.518
1020.0000	7.824	5.505
1030.0000	7.818	5.499
1040.0000	7.818	5.499
1050.0000	7.818	5.499
1060.0000	7.818	5.486
1070.0000	7.818	5.493
1080.0000	7.811	5.486
1090.0000	7.805	5.48
1100.0000	7.792	5.48

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER RW-1 SWL (FEET)	P-2 SWL (FEET)
1110.0000	7.792	5.473
1120.0000	7.799	5.473
1130.0000	7.799	5.48
1140.0000	7.805	5.48
1150.0000	7.805	5.48
1160.0000	7.799	5.473
1170.0000	7.799	5.467
1180.0000	7.799	5.48
1190.0000	7.799	5.473
1200.0000	7.799	5.473
1210.0000	7.792	5.473
1220.0000	7.780	5.454
1230.0000	7.786	5.461
1240.0000	7.786	5.454
1250.0000	7.780	5.454

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.0000	7.919	8.163	12.875	13.124
0.0083	7.913	8.163	12.890	13.140
0.0166	7.913	8.163	12.890	13.140
0.0250	7.913	8.163	12.875	13.140
0.0333	7.913	8.163	12.875	13.140
0.0416	7.919	8.163	12.890	13.140
0.0500	7.913	8.163	12.890	13.140
0.0583	7.913	8.170	12.890	13.140
0.0666	7.913	8.163	12.875	13.140
0.0750	7.919	8.163	12.875	13.140
0.0833	7.913	8.170	12.890	13.140
0.0916	7.919	8.163	12.890	13.140
0.1000	7.913	8.163	12.875	13.140
0.1083	7.913	8.163	12.890	13.140
0.1166	7.913	8.170	12.890	13.140
0.1250	7.913	8.163	12.875	13.140
0.1333	7.913	8.170	12.875	13.140
0.1416	7.919	8.170	12.875	13.140
0.1500	7.919	8.163	12.890	13.140
0.1583	7.919	8.163	12.875	13.140
0.1666	7.919	8.163	12.890	13.140
0.1750	7.913	8.163	12.890	13.140
0.1833	7.913	8.163	12.890	13.140
0.1916	7.913	8.170	12.875	13.140
0.2000	7.919	8.170	12.890	13.140
0.2083	7.919	8.170	12.875	13.140
0.2166	7.919	8.170	12.890	13.140
0.2250	7.913	8.163	12.875	13.140
0.2333	7.913	8.163	12.890	13.140
0.2416	7.913	8.163	12.875	13.140
0.2500	7.913	8.163	12.875	13.140
0.2583	7.919	8.170	12.875	13.140
0.2666	7.913	8.163	12.875	13.140
0.2750	7.913	8.170	12.875	13.140
0.2833	7.919	8.170	12.875	13.140
0.2916	7.919	8.170	12.875	13.156
0.3000	7.913	8.170	12.875	13.140
0.3083	7.913	8.170	12.890	13.140
0.3166	7.919	8.170	12.890	13.140
0.3250	7.913	8.170	12.875	13.140
0.3333	7.919	8.163	12.875	13.140
0.3500	7.919	8.170	12.875	13.140

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
0.3666	7.919	8.163	12.890	13.140
0.3833	7.919	8.163	12.890	13.140
0.4000	7.919	8.170	12.890	13.140
0.4166	7.919	8.163	12.875	13.140
0.4333	7.919	8.170	12.875	13.140
0.4500	7.919	8.163	12.875	13.140
0.4666	7.919	8.170	12.875	13.140
0.4833	7.913	8.170	12.875	13.140
0.5000	7.919	8.163	12.875	13.140
0.5166	7.919	8.163	12.890	13.140
0.5333	7.919	8.163	12.875	13.140
0.5500	7.919	8.163	12.875	13.140
0.5666	7.919	8.163	12.875	13.140
0.5833	7.919	8.163	12.875	13.140
0.6000	7.919	8.170	12.875	13.140
0.6166	7.919	8.170	12.890	13.140
0.6333	7.919	8.170	12.890	13.140
0.6500	7.919	8.170	12.890	13.140
0.6666	7.913	8.170	12.875	13.140
0.6833	7.919	8.163	12.890	13.140
0.7000	7.913	8.170	12.875	13.140
0.7166	7.919	8.170	12.890	13.140
0.7333	7.919	8.170	12.875	13.140
0.7500	7.919	8.163	12.875	13.140
0.7666	7.913	8.170	12.890	13.140
0.7833	7.919	8.163	12.875	13.140
0.8000	7.919	8.163	12.890	13.140
0.8166	7.919	8.170	12.875	13.140
0.8333	7.919	8.170	12.875	13.140
0.8500	7.919	8.163	12.875	13.140
0.8666	7.919	8.170	12.890	13.140
0.8833	7.919	8.163	12.875	13.140
0.9000	7.919	8.163	12.890	13.140
0.9166	7.919	8.163	12.890	13.140
0.9333	7.919	8.170	12.875	13.140
0.9500	7.919	8.170	12.875	13.140
0.9666	7.919	8.163	12.890	13.140
0.9833	7.919	8.163	12.875	13.140
1.0000	7.919	8.163	12.890	13.140
1.2000	7.919	8.163	12.875	13.140
1.4000	7.919	8.170	12.875	13.140
1.6000	7.919	8.163	12.875	13.140

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1.8000	7.919	8.163	12.875	13.124
2.0000	7.913	8.163	12.875	13.140
2.2000	7.919	8.170	12.875	13.140
2.4000	7.913	8.163	12.875	13.140
2.6000	7.913	8.163	12.875	13.140
2.8000	7.913	8.163	12.890	13.140
3.0000	7.913	8.163	12.875	13.140
3.2000	7.913	8.163	12.875	13.140
3.4000	7.913	8.163	12.890	13.140
3.6000	7.913	8.163	12.875	13.140
3.8000	7.913	8.163	12.875	13.140
4.0000	7.913	8.163	12.890	13.140
4.2000	7.913	8.163	12.875	13.140
4.4000	7.913	8.163	12.890	13.140
4.6000	7.913	8.163	12.875	13.140
4.8000	7.913	8.163	12.875	13.140
5.0000	7.913	8.163	12.875	13.140
5.2000	7.919	8.163	12.875	13.140
5.4000	7.913	8.163	12.875	13.140
5.6000	7.913	8.163	12.875	13.140
5.8000	7.913	8.163	12.875	13.140
6.0000	7.913	8.163	12.875	13.140
6.2000	7.919	8.163	12.875	13.140
6.4000	7.913	8.163	12.875	13.140
6.6000	7.913	8.163	12.875	13.140
6.8000	7.913	8.163	12.875	13.140
7.0000	7.919	8.163	12.875	13.140
7.2000	7.913	8.163	12.875	13.140
7.4000	7.913	8.170	12.875	13.140
7.6000	7.913	8.163	12.875	13.140
7.8000	7.913	8.163	12.875	13.140
8.0000	7.913	8.163	12.875	13.140
8.2000	7.913	8.163	12.875	13.124
8.4000	7.913	8.170	12.875	13.140
8.6000	7.919	8.170	12.875	13.140
8.8000	7.913	8.163	12.875	13.140
9.0000	7.919	8.163	12.875	13.140
9.2000	7.913	8.163	12.875	13.140
9.4000	7.913	8.163	12.875	13.140
9.6000	7.919	8.170	12.890	13.140
9.8000	7.919	8.170	12.890	13.140
10.0000	7.919	8.170	12.890	13.156

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
12.0000	7.919	8.170	12.890	13.156
14.0000	7.919	8.163	12.890	13.156
16.0000	7.913	8.170	12.890	13.156
18.0000	7.913	8.163	12.890	13.156
20.0000	7.919	8.163	12.890	13.156
22.0000	7.913	8.163	12.890	13.156
24.0000	7.913	8.163	12.890	13.156
26.0000	7.913	8.163	12.890	13.156
28.0000	7.913	8.163	12.890	13.140
30.0000	7.913	8.163	12.890	13.156
32.0000	7.913	8.163	12.890	13.140
34.0000	7.907	8.163	12.890	13.140
36.0000	7.907	8.163	12.890	13.156
38.0000	7.907	8.163	12.890	13.156
40.0000	7.907	8.170	12.890	13.156
42.0000	7.907	8.163	12.890	13.156
44.0000	7.907	8.163	12.890	13.156
46.0000	7.907	8.163	12.890	13.140
48.0000	7.907	8.157	12.890	13.156
50.0000	7.907	8.157	12.890	13.156
52.0000	7.900	8.157	12.890	13.156
54.0000	7.900	8.151	12.890	13.140
56.0000	7.900	8.151	12.890	13.156
58.0000	7.900	8.151	12.890	13.156
60.0000	7.894	8.145	12.890	13.156
62.0000	7.900	8.145	12.890	13.156
64.0000	7.894	8.145	12.890	13.156
66.0000	7.894	8.138	12.890	13.156
68.0000	7.894	8.138	12.890	13.156
70.0000	7.894	8.138	12.890	13.156
72.0000	7.887	8.132	12.890	13.156
74.0000	7.887	8.126	12.890	13.140
76.0000	7.887	8.119	12.890	13.156
78.0000	7.881	8.119	12.890	13.140
80.0000	7.881	8.113	12.875	13.156
82.0000	7.881	8.113	12.890	13.156
84.0000	7.875	8.113	12.890	13.156
86.0000	7.881	8.107	12.890	13.140
88.0000	7.875	8.107	12.890	13.156
90.0000	7.875	8.100	12.890	13.156
92.0000	7.875	8.100	12.890	13.140
94.0000	7.875	8.094	12.890	13.140

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
96.0000	7.868	8.094	12.890	13.140
98.0000	7.868	8.088	12.890	13.140
100.0000	7.862	8.088	12.890	13.140
105.0000	7.862	8.081	12.890	13.140
110.0000	7.855	8.075	12.875	13.140
115.0000	7.849	8.075	12.875	13.140
120.0000	7.849	8.069	12.875	13.140
125.0000	7.843	8.069	12.875	13.140
130.0000	7.836	8.069	12.875	13.140
135.0000	7.836	8.056	12.875	13.140
140.0000	7.830	8.056	12.875	13.140
145.0000	7.823	8.050	12.875	13.124
150.0000	7.823	8.044	12.875	13.124
155.0000	7.817	8.037	12.875	13.124
160.0000	7.817	8.031	12.875	13.140
165.0000	7.811	8.025	12.875	13.140
170.0000	7.811	8.025	12.875	13.140
175.0000	7.804	8.018	12.875	13.140
180.0000	7.798	8.012	12.859	13.140
185.0000	7.798	8.006	12.875	13.140
190.0000	7.791	8.006	12.859	13.124
195.0000	7.791	8.000	12.859	13.140
200.0000	7.791	8.000	12.859	13.140
205.0000	7.785	7.993	12.859	13.140
210.0000	7.785	7.987	12.875	13.140
215.0000	7.779	7.987	12.859	13.124
220.0000	7.779	7.981	12.859	13.124
225.0000	7.772	7.981	12.875	13.124
230.0000	7.766	7.974	12.859	13.124
235.0000	7.766	7.968	12.859	13.140
240.0000	7.766	7.962	12.859	13.124
245.0000	7.759	7.962	12.859	13.140
250.0000	7.759	7.962	12.859	13.140
255.0000	7.753	7.955	12.859	13.140
260.0000	7.753	7.949	12.859	13.140
265.0000	7.747	7.949	12.859	13.124
270.0000	7.747	7.943	12.859	13.124
275.0000	7.740	7.943	12.859	13.124
280.0000	7.740	7.936	12.859	13.140
285.0000	7.740	7.930	12.859	13.124
290.0000	7.734	7.924	12.859	13.124
295.0000	7.734	7.918	12.859	13.124

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
	WELL NUMBER			
300.0000	7.727	7.918	12.859	13.124
305.0000	7.727	7.911	12.859	13.124
310.0000	7.721	7.905	12.859	13.124
315.0000	7.721	7.905	12.859	13.124
320.0000	7.721	7.905	12.859	13.124
325.0000	7.721	7.899	12.859	13.124
330.0000	7.715	7.899	12.843	13.124
335.0000	7.715	7.892	12.859	13.124
340.0000	7.708	7.886	12.859	13.124
345.0000	7.708	7.886	12.859	13.124
350.0000	7.702	7.880	12.843	13.124
355.0000	7.702	7.873	12.843	13.124
360.0000	7.702	7.873	12.843	13.124
365.0000	7.695	7.861	12.843	13.124
370.0000	7.695	7.861	12.843	13.124
375.0000	7.695	7.861	12.843	13.124
380.0000	7.689	7.854	12.843	13.124
385.0000	7.689	7.854	12.843	13.109
390.0000	7.683	7.848	12.843	13.109
395.0000	7.683	7.848	12.843	13.109
400.0000	7.683	7.842	12.843	13.109
405.0000	7.676	7.842	12.843	13.109
410.0000	7.676	7.836	12.843	13.109
415.0000	7.676	7.836	12.843	13.109
420.0000	7.676	7.829	12.843	13.109
425.0000	7.670	7.829	12.843	13.109
430.0000	7.670	7.823	12.843	13.109
435.0000	7.670	7.823	12.843	13.109
440.0000	7.663	7.823	12.843	13.109
445.0000	7.663	7.817	12.828	13.109
450.0000	7.663	7.817	12.828	13.109
455.0000	7.663	7.817	12.828	13.109
460.0000	7.657	7.810	12.828	13.109
465.0000	7.657	7.810	12.843	13.109
470.0000	7.657	7.810	12.843	13.109
475.0000	7.657	7.804	12.828	13.109
480.0000	7.657	7.804	12.828	13.093
485.0000	7.650	7.804	12.828	13.109
490.0000	7.650	7.798	12.828	13.109
495.0000	7.650	7.798	12.828	13.109
500.0000	7.650	7.798	12.828	13.109
505.0000	7.650	7.791	12.828	13.109

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
510.0000	7.644	7.785	12.828	13.109
515.0000	7.644	7.785	12.828	13.109
520.0000	7.644	7.785	12.828	13.093
525.0000	7.638	7.779	12.843	13.109
530.0000	7.638	7.779	12.828	13.093
535.0000	7.638	7.779	12.828	13.093
540.0000	7.638	7.779	12.828	13.109
545.0000	7.638	7.772	12.828	13.109
550.0000	7.631	7.766	12.828	13.093
555.0000	7.631	7.772	12.828	13.109
560.0000	7.631	7.772	12.828	13.109
565.0000	7.631	7.766	12.828	13.109
570.0000	7.631	7.766	12.828	13.109
575.0000	7.625	7.760	12.828	13.109
580.0000	7.625	7.760	12.828	13.109
585.0000	7.631	7.760	12.828	13.093
590.0000	7.625	7.760	12.828	13.109
595.0000	7.625	7.754	12.828	13.109
600.0000	7.625	7.754	12.828	13.109
605.0000	7.618	7.747	12.828	13.109
610.0000	7.618	7.747	12.828	13.093
615.0000	7.618	7.747	12.828	13.109
620.0000	7.618	7.741	12.828	13.109
625.0000	7.612	7.741	12.828	13.093
630.0000	7.612	7.735	12.828	13.109
635.0000	7.612	7.735	12.828	13.093
640.0000	7.612	7.735	12.828	13.109
645.0000	7.612	7.728	12.828	13.109
650.0000	7.612	7.722	12.828	13.093
655.0000	7.606	7.722	12.828	13.093
660.0000	7.606	7.716	12.828	13.093
665.0000	7.599	7.716	12.828	13.093
670.0000	7.599	7.709	12.812	13.093
675.0000	7.606	7.709	12.828	13.093
680.0000	7.599	7.709	12.828	13.109
685.0000	7.599	7.709	12.828	13.093
690.0000	7.599	7.709	12.828	13.093
695.0000	7.599	7.703	12.828	13.093
700.0000	7.593	7.703	12.828	13.093
705.0000	7.593	7.703	12.828	13.093
710.0000	7.593	7.697	12.812	13.093
715.0000	7.593	7.691	12.828	13.093

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME	WELL NUMBER			
	P-1	24-1	24-2	24-3
(MIN)	SWL (FEET)	SWL (FEET)	SWL (FEET)	SWL (FEET)
720.0000	7.586	7.691	12.828	13.093
725.0000	7.586	7.691	12.812	13.093
730.0000	7.586	7.691	12.828	13.093
735.0000	7.586	7.684	12.828	13.093
740.0000	7.586	7.678	12.812	13.093
745.0000	7.586	7.678	12.812	13.093
750.0000	7.580	7.672	12.812	13.093
755.0000	7.580	7.678	12.812	13.093
760.0000	7.580	7.678	12.812	13.093
765.0000	7.580	7.672	12.812	13.093
770.0000	7.574	7.672	12.812	13.093
775.0000	7.574	7.672	12.812	13.093
780.0000	7.574	7.665	12.812	13.093
785.0000	7.574	7.665	12.828	13.093
790.0000	7.574	7.659	12.812	13.093
795.0000	7.567	7.653	12.828	13.093
800.0000	7.567	7.646	12.828	13.093
805.0000	7.567	7.646	12.812	13.093
810.0000	7.561	7.646	12.812	13.078
815.0000	7.561	7.640	12.812	13.093
820.0000	7.561	7.640	12.812	13.093
825.0000	7.561	7.640	12.812	13.093
830.0000	7.554	7.634	12.812	13.093
835.0000	7.554	7.627	12.812	13.093
840.0000	7.554	7.627	12.812	13.078
845.0000	7.548	7.627	12.812	13.093
850.0000	7.548	7.621	12.812	13.078
855.0000	7.548	7.621	12.812	13.078
860.0000	7.548	7.621	12.812	13.078
865.0000	7.548	7.615	12.796	13.093
870.0000	7.542	7.615	12.796	13.078
875.0000	7.542	7.615	12.796	13.078
880.0000	7.542	7.615	12.796	13.078
885.0000	7.542	7.609	12.796	13.078
890.0000	7.535	7.609	12.796	13.093
895.0000	7.535	7.609	12.796	13.078
900.0000	7.535	7.602	12.796	13.078
905.0000	7.535	7.596	12.812	13.078
910.0000	7.529	7.596	12.796	13.078
915.0000	7.529	7.596	12.796	13.078
920.0000	7.529	7.590	12.796	13.078
925.0000	7.529	7.590	12.796	13.078

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
930.0000	7.529	7.596	12.796	13.078
935.0000	7.529	7.596	12.796	13.078
940.0000	7.529	7.590	12.796	13.078
945.0000	7.522	7.590	12.796	13.078
950.0000	7.522	7.583	12.796	13.078
955.0000	7.522	7.583	12.796	13.078
960.0000	7.522	7.583	12.796	13.078
965.0000	7.522	7.583	12.796	13.078
970.0000	7.516	7.577	12.796	13.078
975.0000	7.516	7.577	12.796	13.078
980.0000	7.516	7.571	12.781	13.062
985.0000	7.516	7.571	12.796	13.062
990.0000	7.510	7.564	12.781	13.062
995.0000	7.510	7.571	12.796	13.062
1000.0000	7.510	7.564	12.796	13.062
1005.0000	7.510	7.564	12.796	13.078
1010.0000	7.503	7.558	12.796	13.062
1015.0000	7.503	7.558	12.781	13.062
1020.0000	7.503	7.558	12.781	13.062
1025.0000	7.497	7.552	12.781	13.062
1030.0000	7.497	7.552	12.781	13.062
1035.0000	7.497	7.552	12.781	13.062
1040.0000	7.497	7.552	12.781	13.062
1045.0000	7.497	7.552	12.781	13.046
1050.0000	7.497	7.552	12.781	13.062
1055.0000	7.497	7.558	12.781	13.062
1060.0000	7.497	7.552	12.781	13.062
1065.0000	7.497	7.558	12.781	13.046
1070.0000	7.497	7.558	12.781	13.062
1075.0000	7.497	7.552	12.781	13.062
1080.0000	7.497	7.545	12.781	13.062
1085.0000	7.490	7.539	12.781	13.046
1090.0000	7.490	7.545	12.781	13.062
1095.0000	7.490	7.539	12.781	13.062
1100.0000	7.490	7.539	12.781	13.046
1105.0000	7.490	7.539	12.781	13.046
1110.0000	7.490	7.539	12.781	13.046
1115.0000	7.484	7.539	12.781	13.046
1120.0000	7.490	7.552	12.781	13.046
1125.0000	7.490	7.558	12.781	13.062
1130.0000	7.490	7.552	12.781	13.046
1135.0000	7.490	7.558	12.781	13.062

CONTRACT TASK ORDER: 0017
SITE I.D.: CAMP LEJEUNE, HPIA
TEST: RECOVERY

ELAPSED TIME (MIN)	WELL NUMBER P-1 SWL (FEET)	24-1 SWL (FEET)	24-2 SWL (FEET)	24-3 SWL (FEET)
1140.0000	7.490	7.558	12.781	13.062
1145.0000	7.490	7.558	12.781	13.046
1150.0000	7.490	7.552	12.781	13.062
1155.0000	7.490	7.552	12.781	13.046
1160.0000	7.490	7.552	12.781	13.062
1165.0000	7.490	7.558	12.781	13.062
1170.0000	7.497	7.558	12.781	13.062
1175.0000	7.490	7.558	12.781	13.062
1180.0000	7.490	7.552	12.781	13.046
1185.0000	7.490	7.558	12.781	13.046
1190.0000	7.490	7.552	12.781	13.046
1195.0000	7.490	7.552	12.781	13.046
1200.0000	7.490	7.552	12.781	13.062
1205.0000	7.490	7.552	12.781	13.062
1210.0000	7.490	7.552	12.781	13.046
1215.0000	7.484	7.545	12.781	13.046
1220.0000	7.490	7.545	12.781	13.046
1225.0000	7.484	7.539	12.781	13.046
1230.0000	7.484	7.539	12.781	13.046
1235.0000	7.484	7.545	12.781	13.046
1240.0000	7.484	7.539	12.765	13.046
1245.0000	7.484	7.539	12.781	13.046
1250.0000	7.484	7.539	12.781	13.046
1255.0000	7.484	7.539	12.781	13.046
1260.0000	7.478	7.533	12.765	13.046

APPENDIX E
BENCH-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - GROUNDWATER CHARACTERIZATION

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 20, 1993
Report No.: 00013053
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: HP1A-GW-24-1
NUS SAMPLE NO: P0221928
P.O. NO.:

DATE SAMPLED: 29-DEC-92
DATE RECEIVED: 31-DEC-92
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNIT
1	I030	Ammonia (N), Direct		
		Ammonia (as N), Direct	0.8	mg/L
2	I020	Alkalinity, Pht (as CaCO3)	0	mg/L
3	I023	Alkalinity, Total (as CaCO3)	35	mg/L
4	I024	Alkalinity, Bicarbonate (as CaCO3)	35	mg/L
5	I026	Alkalinity, Carbonate (as CaCO3)	0	mg/L
6	I130	Chloride (as Cl)	22	mg/L
7	I320	Hardness, Total (as CaCO3)	65	mg/L
8	I391	Nitrate/Nitrite	< 0.1	mg/L
9	I410	Nitrite (as N)	< 0.02	mg/L
10	I590	Solids, Dissolved at 180C	110	mg/L
11	I610	Solids, Suspended at 103C	910	mg/L
12	I680	Oil and Grease, Gravimetric	6	mg/L
13	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
14	DPACK	CLP Data Package Deliverable	DONE	

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 20, 1993
Report No.: 00013053

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: HP1A-GW-24-1-D
NUS SAMPLE NO: P0221930
P.O. NO.:

DATE SAMPLED: 29-DEC-92
DATE RECEIVED: 31-DEC-92
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
12	I680	Oil and Grease, Gravimetric	6	mg/L
13	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
14	DPACK	CLP Data Package Deliverable	DONE	

COMMENTS:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

221928

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG1__

Matrix (soil/water): WATER Lab Sample ID: P221928___

Level (low/med): LOW__ Date Received: 12/29/92

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	25900	_		P_
7440-36-0	Antimony_	20.0	U		F_
7440-38-2	Arsenic__	9.7	B		F_
7440-39-3	Barium___	78.0	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	18600	_		P_
7440-47-3	Chromium_	32.0	_	*	P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	14.0	B		P_
7439-89-6	Iron_____	26400	_		P_
7439-92-1	Lead_____	22.4	_		F_
7439-95-4	Magnesium	3100	B		P_
7439-96-5	Manganese	84.0	_		P_
7439-97-6	Mercury__	0.20	U	N	CV
7440-02-0	Nickel___	22.0	B		P_
7440-09-7	Potassium	2330	B		P_
7782-49-2	Selenium_	1.5	B	N	F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	8620	_		P_
7440-28-0	Thallium_	2.0	U		F_
7440-62-2	Vanadium_	73.0	_		P_
7440-66-6	Zinc_____	40.0	_		P_
5955-70-0	Cyanide__		_		NR

Color Before: TAN______ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

HPIA-GW-24-1

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

221929

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG1__

Matrix (soil/water): WATER Lab Sample ID: P221929___

Level (low/med): LOW__ Date Received: 12/29/92

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	35.0	B		P_
7440-36-0	Antimony_	20.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	146	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	15000	_		P_
7440-47-3	Chromium_	10.0	U	*	P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	2.0	U		P_
7439-89-6	Iron_____	31.0	B		P_
7439-92-1	Lead_____	1.0	U		F_
7439-95-4	Magnesium	1530	B		P_
7439-96-5	Manganese	24.0	_		P_
7439-97-6	Mercury__	0.20	U	N	CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	830	B		P_
7782-49-2	Selenium_	1.0	U	N	F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	9910	_		P_
7440-28-0	Thallium_	2.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	57.0	_		P_
5955-70-0	Cyanide__		_		NR

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:
HPIA-GW-24-1_DISSOLVED

FORM I - IN

ILM02.1

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

221930

Lab Name: HALLIBURTON_NUS___________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: FKG1__

Matrix (soil/water): WATER Lab Sample ID: F221930___

Level (low/med): LOW__ Date Received: 12/29/92

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	38200	_		P_
7440-36-0	Antimony_	20.0	U		F_
7440-38-2	Arsenic__	21.6	_		F_
7440-39-3	Barium___	120	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	18100	_		P_
7440-47-3	Chromium_	82.0	_	*	P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	16.0	B		P_
7439-89-6	Iron_____	38500	_		P_
7439-92-1	Lead_____	32.8	_		F_
7439-95-4	Magnesium	3820	B		P_
7439-96-5	Manganese	164	_		P_
7439-97-6	Mercury__	0.20	U	N	CV
7440-02-0	Nickel___	30.0	B		P_
7440-09-7	Potassium	3280	B		P_
7782-49-2	Selenium_	1.6	B	N	F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	9360	_		P_
7440-28-0	Thallium_	2.0	U		F_
7440-62-2	Vanadium_	106	_		P_
7440-66-6	Zinc_____	76.0	_		P_
5955-70-0	Cyanide__		_		NR

Color Before: TAN______ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

HPIA-GW-24-1-D

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

221931

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG1__

Matrix (soil/water): WATER Lab Sample ID: P221931___

Level (low/med): LOW__ Date Received: 12/29/92

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	40.0	B		P_
7440-36-0	Antimony_	20.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	135	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	15300	_		P_
7440-47-3	Chromium_	10.0	U	*	P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	2.0	B		P_
7439-89-6	Iron_____	33.0	B		P_
7439-92-1	Lead_____	1.0	U		F_
7439-95-4	Magnesium	1520	B		P_
7439-96-5	Manganese	26.0	_		P_
7439-97-6	Mercury__	0.20	U	N	CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	820	B		P_
7782-49-2	Selenium_	1.0	U	N	F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	9510	_		P_
7440-28-0	Thallium_	2.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	53.0	_		P_
5955-70-0	Cyanide__		_		NR

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:
HPIA-GW-24-1-D_DISSOLVED

FORM I - IN

ILM02.1

APPENDIX F
BENCH-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - OIL/WATER SEPARATION

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 15, 1993
Report No.: 00012974
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930012
NUS SAMPLE NO: P0222131
P.O. NO.: CTO # 17

DATE SAMPLED: 05-JAN-93
DATE RECEIVED: 06-JAN-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNIT
1	I680	Oil and Grease, Gravimetric	< 3	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 15, 1993
Report No.: 00012974
Section A Page 2

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930013
NUS SAMPLE NO: P0222132
P.O. NO.: CTO # 17

DATE SAMPLED: 05-JAN-93
DATE RECEIVED: 06-JAN-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I680	Oil and Grease, Gravimetric	4	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 15, 1993
Report No.: 00012974
Section A Page 3

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930014
NUS SAMPLE NO: P0222133
P.O. NO.: CTO # 17

DATE SAMPLED: 05-JAN-93
DATE RECEIVED: 06-JAN-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I680	Oil and Grease, Gravimetric	< 3	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

January 15, 1993
Report No.: 00012974

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENCIRONMENTAL, INC./NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

SAMPLE ID: 930015
NUS SAMPLE NO: P0222134
P.O. NO.: CTO # 17

NUS CLIENT NO: 1600 0005
WORK ORDER NO: 55830
VENDOR NO:

DATE SAMPLED: 05-JAN-93
DATE RECEIVED: 06-JAN-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I680	Oil and Grease, Gravimetric	< 3	mg/L

COMMENTS:

APPENDIX G
BENCH-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - SOLIDS SETTLING

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930016
NUS SAMPLE NO: P0225090
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNIT
1	I610	Solids, Suspended at 103C	62	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930018
NUS SAMPLE NO: P0225092
P.O. NO.: CTO * 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	48	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930019
NUS SAMPLE NO: P0225093
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	35	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930020
NUS SAMPLE NO: P0225094
P.O. NO.: CTO * 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	32	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930021
NUS SAMPLE NO: P0225095
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	25	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685
Section A Page 8

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930023
NUS SAMPLE NO: P0225097
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	28	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930024
NUS SAMPLE NO: P0225098
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	27	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930025
NUS SAMPLE NO: P0225099
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	20	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685
Section A Page 11

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930026
NUS SAMPLE NO: P0225100
P.O. NO.: CTO * 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	16	mg/L

COMMENTS:

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013685
Section A Page 13

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 930028
NUS SAMPLE NO: P0225102
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 05-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	I610	Solids, Suspended at 103C	93	mg/L

COMMENTS:

PG

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

930017

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: _____ SDG No.: PKG3__

Matrix (soil/water): WATER Lab Sample ID: P225091___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: ___0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	2780	_		P_
7440-38-2	Arsenic__	4.0	U		F_
7440-47-3	Chromium_	20.0	_		P_
7439-89-6	Iron____	8930	_		P_
7439-92-1	Lead____	4.4	B		F_
7439-97-6	Mercury__	2.0	U		CV

Color Before: GREY_____ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

930022

Lab Name: HALLIBURTON_NUS________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG3__

Matrix (soil/water): WATER Lab Sample ID: P225096___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: ____0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	2290	_		P_
7440-38-2	Arsenic__	4.0	U		F_
7440-47-3	Chromium_	14.0	_		P_
7439-89-6	Iron___	6400	_		P_
7439-92-1	Lead___	3.2	B		F_
7439-97-6	Mercury__	2.0	U		CV

Color Before: GREY___ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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ILM02.1

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U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

930027

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG3__

Matrix (soil/water): WATER Lab Sample ID: P225101___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: ____0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	282	_		P_
7440-38-2	Arsenic__	4.0	U		F_
7440-47-3	Chromium_	10.0	U		P_
7439-89-6	Iron____	2310	_		P_
7439-92-1	Lead____	11.0	_		F_
7439-97-6	Mercury__	2.0	U		CV

Color Before: GREY___ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

FORM I - IN

ILM02.1

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

930029

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG3__

Matrix (soil/water): WATER Lab Sample ID: P225103___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: ____0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	3640	_		P_
7440-38-2	Arsenic__	4.0	U		F_
7440-47-3	Chromium_	19.0	_		P_
7439-89-6	Iron_____	10200	_		P_
7439-92-1	Lead_____	6.2	_		F_
7439-97-6	Mercury__	2.0	U		CV

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

FORM I - IN

ILM02.1

APPENDIX H
BENCH-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - QA/QC

HALLIBURTON NUS Environmental Corporation and Subsidiaries

CHAIN OF CUSTODY RECORD

PROJECT NO.:

SITE NAME: 19017-70-SRN

SAMPLERS (SIGNATURE): Mark E. Kimes

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TAL METALS (TOTAL) HNO_3	TAL METALS (DISSOLVED)	OIL & GREASE H_2SO_4	AMMONIA H_2SO_4	CARBONATE	BICARBONATE	REMARKS
	12/29/92	1515		X	HPIA-GW-24-1	5	*	*	*	*	*	*	TAL METALS (DISSOLVED) SAMPLE NEEDS TO BE ~~PRESERVED &~~ FILTERED & PRESERVED MEK
	12/29	1515		X	HPIA-GW-24-1-D	3	*	*	*				TAL METALS (DISSOLVED) SAMPLE NEEDS TO BE FILTERED & PRESERVED
	12/29	1515		X	HPIA-GW-24-1	1			*				EXTRA VOLUME
	~~12/29~~	~~1515~~ MEK		~~X~~									

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
Mark E. Kimes	30 DEC 92 1200				
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE): M Bartolone	DATE/TIME: 12/31 0900	REMARKS: SAMPLES PACKED ON ICE SAMPLES SHIPPED VIA FEDERAL EXPRESS	

NUS 440 REVISED 0891

HALLIBURTON NUS Environmental
Corporation and Subsidiaries

CHAIN OF CUSTODY RECORD

DEC 30 '92 11:11

PROJECT NO.:

SITE NAME: 19017 - 70 - SRN

SAMPLERS (SIGNATURE): Mark E. Kimes

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	CHLORIDE	HARDNESS	NITRATE / NITRITE (HNO_3) (H_2SO_4)	TDS / TSS	EXTRA VOLUME (HNO_3)	REMARKS
	12/29/92	1515		X	HPIA - GW - 24 - 1	4	*	*	*	*		
	12/29/92	1515		X	HPIA - GW - 24 - 1	1		*				EXTRA VOLUME
	12/29/92	1515		X	HPIA - GW - 24 - 1	3					*	PRESERVED w/ HNO_3

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
Mark E. Kimes	30 Dec 92 1200				

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:
		M. Bartolouc	12/31 1100	SAMPLES PACKED ON ICE SAMPLES SHIPPED VIA FEDERAL EXPRESS

NUS 440 REVISED 0893

P.5

Baker
Baker Environmental, Inc.

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

CHAIN-OF-CUSTODY RECORD

Service Order No.: 19017-57-SRN
Project Name: Camplejeune - Treatability Study
Project Manager: Mr. Steve Kretschman
Field Team: Ms. Amy GAONA - Treatability

Analysis Requested / Preservative Required: Oil and Grease

Sample Number	Date	Time	Sample Location *	Matrix Type (1) GB (2)	Matrix Type (1) COM. (2)	Oil and Grease												Remarks
Type of Container(s) (3)						G												
Number of Container(s)																		
930012	1/5/93	2:15 pm	Treatability	GW		1												* All GW samples collected
930013	1/5/93	2:30 pm	Treatability	GW		1												from Location HPIA-GW-21-1
930014	1/5/93	3:00 pm	Treatability	GW		1												for Treatability Testing
930015	1/5/93	3:00 pm	Treatability	GW		1												(Oil/Water Separation!)

Relinquished By: Amy G. Gaona Date: 1/5/93 Time: 4:48 pm
Received By: T. Carneyo Date: 1/5/93 Time: 4:48
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°C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☐ No ☒ NA
Analysis turnaround: Priority ☒ 14 day ~~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; S - Spring; SO - Soil; SW - Surface water; W - Waste; WP - Wipe; WW - Wastewater

(2) GB - Grab; COM - Composite

(3) P - Plastic; G - Glass

SEND ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY TO PROJECT MANAGER.

Baker

Baker Environmental, Inc.

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

CHAIN-OF-CUSTODY RECORD

Service Order No.: 190017-S6-SRN
Project Name: [illegible]
Project Manager: [illegible]
Field Team: [illegible]

Analysis Requested / Preservative Required: [illegible]

Type of Container(s) (3): G P P [illegible]

Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM. (2)	Number of Container(s)	Remarks
930016	[illegible]	12:45	[illegible]	GW			
930017		12:55	[illegible]	GW			
930018		12:04	[illegible]	GW			
930019		01:14	[illegible]	GW			
930020		01:[illegible]	[illegible]	GW			
930021		01:44	[illegible]	GW			
930022		01:4[illegible]	[illegible]	GW			
930023		01:35	@ [illegible]	GW			
930024		01:38	[illegible]	GW			
930025		01:40	[illegible]	GW			
930026		[illegible]	[illegible]	GW			
930027		[illegible]	[illegible]	GW			
930028		02:15	[illegible]	GW			
930029		[illegible]	@ [illegible]	GW			

Relinquished By: ______ Date: ______ Time: ______
Received By: [illegible] Date: [illegible] Time: [illegible]
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 ☐

SEND ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY TO PROJECT MANAGER.

Sample Stored at 4°C: Yes ☐ No ☐
Chain-of-custody seal on cooler: Yes ☐ No ☒ N/A
Analysis turnaround: Priority ☒ 14 [illegible] 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; S - Spring; SO - Soil; SW - Surface water; W - Waste; WP - Wipe; WW - Wastewater

(2) GB - Grab; COM - Composite

(3) P - Plastic; G - Glass

APPENDIX I
PILOT-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - GROUNDWATER

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686
Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 1-DL
NUS SAMPLE NO: P0225104
P.O. NO.: CTO # 19017

DATE SAMPLED: 02-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Ruth Volk

LN	TEST CODE	DETERMINATION	RESULT	UNIT
3	I680	Oil and Grease, Gravimetric	< 3	mg/L
4	I391	Nitrate/Nitrite	< 0.1	mg/L
5	I320	Hardness, Total (as CaCO3)	46	mg/L
6	I030	Ammonia (N), Direct		
		Ammonia (as N), Direct	0.4	mg/L
7	I020	Alkalinity, Pht (as CaCO3)	0	mg/L
8	I023	Alkalinity, Total (as CaCO3)	30	mg/L
9	I024	Alkalinity, Bicarbonate (as CaCO3)	30	mg/L
10	I026	Alkalinity, Carbonate (as CaCO3)	0	mg/L
11	I130	Chloride (as Cl)	23	mg/L
12	I410	Nitrite (as N)	< 0.02	mg/L
13	I590	Solids, Dissolved at 180C	110	mg/L
14	I610	Solids, Suspended at 103C	< 10	mg/L

COMMENTS:

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Section A Page 2

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

SAMPLE ID: 1-OW
NUS SAMPLE NO: P0225105
P.O. NO.: CTO # 19017

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

DATE SAMPLED: 02-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	3	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	8	ug/L
		benzene	4	ug/L
		ethylbenzene	4	ug/L
		methylbenzene [toluene]	5	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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Section A Page 3

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 1-OW
NUS SAMPLE NO: P0225105

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	150 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	270 D	ug/L
7	I680	Oil and Grease, Gravimetric	< 3	mg/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

Sample number P225105 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported.

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Section A Page 4

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 1-AS
NUS SAMPLE NO: P0225106
P.O. NO.: CTO # 19017

DATE SAMPLED: 02-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	9	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	17	ug/L
		benzene	5	ug/L
		ethylbenzene	17	ug/L
		methylbenzene [toluene]	25	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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Section A Page 5

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 1-AS
NUS SAMPLE NO: P0225106

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	6	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column.
The concentration reported represents the sum of the two isomers.

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February 23, 1993
Report No.: 00013686
Section A Page 6

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 1-AC
NUS SAMPLE NO: P0225107
P.O. NO.: CTO # 19017

DATE SAMPLED: 02-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	< 2	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 1-AC
NUS SAMPLE NO: P0225107

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225107, ethylbenzene was not observed in the confirmational analysis. The ethylbenzene result observed in the primary analysis was not reported. A low surrogate recovery was observed for this sample in both the primary and confirmational analyses. The low surrogate recovery was probably due to the matrix.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
Section A Page 8

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 2-OW
NUS SAMPLE NO: P0225108
P.O. NO.: CTO * 19017

DATE SAMPLED: 02-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene {m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	5	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
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Section A Page 9

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 2-OW
NUS SAMPLE NO: P0225108

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	160 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	290 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

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Sample number P225108 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported. Ethylbenzene was not observed in the confirmational analysis. The ethylbenzene result observed in the primary analysis was not reported.

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"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
Section A Page 10

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 2-AS
NUS SAMPLE NO: P0225109
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	8	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	10	ug/L
		benzene	3	ug/L
		ethylbenzene	14	ug/L
		methylbenzene [toluene]	10	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 2-AS
NUS SAMPLE NO: P0225109

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 2-AC
NUS SAMPLE NO: P0225110
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xyelenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	3	ug/L
		methylbenzene [toluene]	2	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 2-AC
NUS SAMPLE NO: P0225110

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 3-OW
NUS SAMPLE NO: P0225111
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	11	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	2	ug/L
		methylbenzene [toluene]	5	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 3-OW
NUS SAMPLE NO: P0225111

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	180 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	320 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

.
Sample number P225111 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported. Ethylbenzene was not observed in the confirmational analysis. The ethylbenzene result observed in the primary analysis was not reported.

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"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 3-AS
NUS SAMPLE NO: P0225112
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	7	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	9	ug/L
		benzene	3	ug/L
		ethylbenzene	14	ug/L
		methylbenzene [toluene]	9	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 3-AS
NUS SAMPLE NO: P0225112

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 3-AC
NUS SAMPLE NO: P0225113
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene {m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	< 2	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 3-AC
NUS SAMPLE NO: P0225113

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225113, benzene was not observed in the confirmational analysis. The benzene result observed in the primary analysis was not reported. A low surrogate recovery was observed for this sample in both the primary and confirmational analyses. The low surrogate recoveries were probably due to the matrix.

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 7-OW
NUS SAMPLE NO: P0225118
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	12	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 7-OW
NUS SAMPLE NO: P0225118

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	120 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	336 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

.

Sample number P225118 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported.

.

"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 7-AS
NUS SAMPLE NO: P0225119
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	3	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	11	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 7-AS
NUS SAMPLE NO: P0225119

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

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Pittsburgh, PA 15205

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Houston, TX 77058

February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 7-AC
NUS SAMPLE NO: P0225120
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	10	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 7-AC
NUS SAMPLE NO: P0225120

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225120, toluene was not observed in the confirmational analysis. The toluene result observed in the primary analysis was not reported.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 7-DL
NUS SAMPLE NO: P0225121
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Ruth Volk

LN	TEST CODE	DETERMINATION	RESULT	UNITS
3	I680	Oil and Grease, Gravimetric	< 3	mg/L
4	I391	Nitrate/Nitrite	< 0.1	mg/L
5	I320	Hardness, Total (as CaCO3)	44	mg/L
6	I030	Ammonia (N), Direct		
		Ammonia (as N), Direct	0.5	mg/L
7	I020	Alkalinity, Pht (as CaCO3)	0	mg/L
8	I023	Alkalinity, Total (as CaCO3)	26	mg/L
9	I024	Alkalinity, Bicarbonate (as CaCO3)	26	mg/L
10	I026	Alkalinity, Carbonate (as CaCO3)	0	mg/L
11	I130	Chloride (as Cl)	24	mg/L
12	I410	Nitrite (as N)	< 0.02	mg/L
13	I590	Solids, Dissolved at 180C	87	mg/L
14	I610	Solids, Suspended at 103C	< 10	mg/L

COMMENTS:

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 6-OW
NUS SAMPLE NO: P0225122
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene {m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	10	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 6-OW
NUS SAMPLE NO: P0225122

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	180 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	360 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene coelute on the capillary column. The value reported is the total of both isomers.

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Sample number P225122 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported.

.

"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 6-AS
NUS SAMPLE NO: P0225123
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	4	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	10	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 6-AS
NUS SAMPLE NO: P0225123

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 6-AC
NUS SAMPLE NO: P0225124
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	4	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 6-AC
NUS SAMPLE NO: P0225124

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225124, toluene was not observed in the confirmational analysis. The toluene result observed in the primary analysis was not reported.

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 5-OW
NUS SAMPLE NO: P0225125
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	6	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	3	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

CLIENT ORIGINAL

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Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 5-OW
NUS SAMPLE NO: P0225125

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	180 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	350 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

.

Sample number P225125 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported.

.

"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 5-AS
NUS SAMPLE NO: P0225126
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	5	ug/L
		benzene	< 2	ug/L
		ethylbenzene	2	ug/L
		methylbenzene [toluene]	10	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 5-AS
NUS SAMPLE NO: P0225126

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

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Pittsburgh, PA 15205

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 5-AC
NUS SAMPLE NO: P0225127
P.O. NO.: CTO # 19017

DATE SAMPLED: 04-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	3	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 5-AC
NUS SAMPLE NO: P0225127

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225127, toluene was not observed in the confirmational analysis. The toluene result observed in the primary analysis was not reported.

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Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 4-OW
NUS SAMPLE NO: P0225128
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	5	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
Report No.: 00013686
Section A Page 48

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 4-OW
NUS SAMPLE NO: P0225128

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	190 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	330 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

.
Sample number P225128 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported.

.
"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

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900 Gemini Avenue
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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 4-AS
NUS SAMPLE NO: P0225129
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	4	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	8	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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CLIENT ORIGINAL

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900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 4-AS
NUS SAMPLE NO: P0225129

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

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Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 4-AC
NUS SAMPLE NO: P0225130
P.O. NO.: CTO # 19017

DATE SAMPLED: 03-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	< 2	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 4-AC
NUS SAMPLE NO: P0225130

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample number P225130, toluene was not observed in the confirmational analysis. The toluene result observed in the primary analysis was not reported.

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

1-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225107___

Level (low/med): LOW__ Date Received: 02/02/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	7620	_		P_
7440-36-0	Antimony_	26.5	B		F_
7440-38-2	Arsenic__	13.7	_		F_
7440-39-3	Barium___	110	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	15900	_		P_
7440-47-3	Chromium_	19.0	_		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	120	_		P_
7439-89-6	Iron_____	17200	_		P_
7439-92-1	Lead_____	13.4	_		F_
7439-95-4	Magnesium	5080	_		P_
7439-96-5	Manganese	191	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	28.0	_		P_
7440-09-7	Potassium	4550	B		P_
7782-49-2	Selenium_	1.2	B	W	F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	23400	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	17.0	B		P_
7440-66-6	Zinc_____	136	_		P_
			_		__
			_		__

Color Before: BLACK_____ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

1-AS

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225106___

Level (low/med): LOW__ Date Received: 02/02/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	886	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	15.4	_		F_
7440-39-3	Barium___	71.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	13900	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	45.0	_		P_
7439-89-6	Iron_____	39000	_		P_
7439-92-1	Lead_____	80.5	_		F_
7439-95-4	Magnesium	4520	B		P_
7439-96-5	Manganese	199	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	23.0	_		P_
7440-09-7	Potassium	1440	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14400	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	289	_		P_
			_		
			_		

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

FORM I - IN

ILM02.1

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

1-OW

Lab Name: HALLIBURTON_NUS Contract:

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225105___

Level (low/med): LOW__ Date Received: 02/02/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	344	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	77.0	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	11200	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	9.0	B		P_
7439-89-6	Iron_____	8610	_		P_
7439-92-1	Lead_____	52.0	_		F_
7439-95-4	Magnesium	2810	B		P_
7439-96-5	Manganese	56.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1290	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13500	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	185	_		P_

Color Before: COLORLESS Clarity Before: CLEAR_ Texture:

Color After: COLORLESS Clarity After: CLEAR_ Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

2-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225110___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	5580	_		P_
7440-36-0	Antimony_	10.0	U	__W___	F_
7440-38-2	Arsenic__	11.1	_		F_
7440-39-3	Barium___	85.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	12600	_		P_
7440-47-3	Chromium_	18.0	_		P_
7440-48-4	Cobalt___	9.0	B		P_
7440-50-8	Copper___	102	_		P_
7439-89-6	Iron_____	13200	_		P_
7439-92-1	Lead_____	14.1	_		F_
7439-95-4	Magnesium	3230	B		P_
7439-96-5	Manganese	149	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	186	_		P_
7440-09-7	Potassium	2270	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	15500	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	12.0	B		P_
7440-66-6	Zinc_____	190	_		P_

Color Before: BLACK____ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

FORM I - IN

ILM02.1

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

2-AS

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225109___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	451	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	71.0	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	11100	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	20.0	B		P_
7439-89-6	Iron_____	8340	_		P_
7439-92-1	Lead_____	89.5	_		F_
7439-95-4	Magnesium	2720	B		P_
7439-96-5	Manganese	65.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1300	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13500	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	192	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

2-OW

Lab Name: HALLIBURTON_NUS Contract:

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225108___

Level (low/med): LOW__ Date Received: 02/02/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	608	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	74.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium_	6.0	_		P_
7440-70-2	Calcium_	10700	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt__	10.0	B		P_
7440-50-8	Copper__	14.0	B		P_
7439-89-6	Iron____	7740	_		P_
7439-92-1	Lead____	34.6	_		F_
7439-95-4	Magnesium	2560	B		P_
7439-96-5	Manganese	51.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel__	20.0	U		P_
7440-09-7	Potassium	1330	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver__	3.0	U		P_
7440-23-5	Sodium___	13300	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc____	121	_		P_

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

3-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225113___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	6510	_		P_
7440-36-0	Antimony_	10.0	U	W	F_
7440-38-2	Arsenic__	9.1	B		F_
7440-39-3	Barium___	101	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	12300	_		P_
7440-47-3	Chromium_	23.0	_		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	103	_		P_
7439-89-6	Iron_____	19200	_		P_
7439-92-1	Lead_____	23.6	_		F_
7439-95-4	Magnesium	2560	B		P_
7439-96-5	Manganese	193	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	33.0	_		P_
7440-09-7	Potassium	1990	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	15000	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	18.0	B		P_
7440-66-6	Zinc_____	153	_		P_
			_		
			_		

Color Before: BLACK____ Clarity Before: OPAQUE Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

3-AS

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: FKG2__

Matrix (soil/water): WATER Lab Sample ID: P225112___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	317	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	77.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	11200	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	24.0	B		P_
7439-89-6	Iron_____	6910	_		P_
7439-92-1	Lead_____	45.0	_		F_
7439-95-4	Magnesium	2670	B		P_
7439-96-5	Manganese	57.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1380	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14200	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	144	_		P_
			_		
			_		

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

3-OW

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225111___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	166	B		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	80.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10600	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	14.0	B		P_
7439-89-6	Iron_____	7270	_		P_
7439-92-1	Lead_____	25.2	_		F_
7439-95-4	Magnesium	2550	B		P_
7439-96-5	Manganese	46.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	22.0	_		P_
7440-09-7	Potassium	1330	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13700	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	101	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

4-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225130___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	1560	_		P_
7440-36-0	Antimony_	10.0	U	__W___	F_
7440-38-2	Arsenic__	7.9	B		F_
7440-39-3	Barium___	13.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	11300	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	11.0	B		P_
7439-89-6	Iron_____	2730	_		P_
7439-92-1	Lead_____	10.3	_		F_
7439-95-4	Magnesium	2520	B		P_
7439-96-5	Manganese	19.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1590	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14700	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	8.0	B		P_
7440-66-6	Zinc_____	43.0	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

4-AS

Lab Name: HALLIBURTON_NUS____________ Contract: ____________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: _______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225129___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	117	B		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic_	2.0	U		F_
7440-39-3	Barium__	83.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10700	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt__	8.0	U		P_
7440-50-8	Copper___	18.0	B		P_
7439-89-6	Iron_____	6590	_		P_
7439-92-1	Lead_____	27.2	_		F_
7439-95-4	Magnesium	2720	B		P_
7439-96-5	Manganese	51.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1410	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14400	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	142	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

4-OW

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225128___

Level (low/med): LOW__ Date Received: 02/03/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	70.0	B		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium__	86.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10200	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	5.0	B		P_
7439-89-6	Iron_____	7390	_		P_
7439-92-1	Lead_____	13.2	_		F_
7439-95-4	Magnesium	2650	B		P_
7439-96-5	Manganese	45.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1360	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14200	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	100	_		P_

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

5-AC

Lab Name: HALLIBURTON_NUS___________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225127___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	1850	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	9.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	11300	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	5.0	B		P_
7439-89-6	Iron_____	1140	_		P_
7439-92-1	Lead_____	3.7	_		F_
7439-95-4	Magnesium	1400	B		P_
7439-96-5	Manganese	8.0	B		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1720	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14700	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	31.0	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

5-AS

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225126___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	86.0	B		P_
7440-36-0	Antimony_	10.0	U	W	F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	88.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10900	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	20.0	B		P_
7439-89-6	Iron_____	7150	_		P_
7439-92-1	Lead_____	11.6	_		F_
7439-95-4	Magnesium	2820	B		P_
7439-96-5	Manganese	51.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1390	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14000	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	149			P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

5-OW

Lab Name: HALLIBURTON_NUS___________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225125___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	52.0	B		P_
7440-36-0	Antimony_	10.0	U	W	F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	91.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	_		P_
7440-70-2	Calcium__	10400	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	51.0	_		P_
7439-89-6	Iron_____	7700	_		P_
7439-92-1	Lead_____	17.6	_		F_
7439-95-4	Magnesium	2670	B		P_
7439-96-5	Manganese	46.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1340	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13500	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	106	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

6-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225124___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	1470	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	5.9	B		F_
7440-39-3	Barium___	21.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	6.0	_		P_
7440-70-2	Calcium__	12700	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	17.0	B		P_
7439-89-6	Iron_____	4760	_		P_
7439-92-1	Lead_____	9.7	_		F_
7439-95-4	Magnesium	3090	B		P_
7439-96-5	Manganese	28.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1450	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13700	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	B		P_
7440-66-6	Zinc_____	68.0	_		P_
			_		
			_		

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

6-AS

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225123___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: _0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	84.0	B		P_
7440-36-0	Antimony_	10.0	U		P_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	90.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10800	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	32.0	_		P_
7439-89-6	Iron_____	6790	_		P_
7439-92-1	Lead_____	10.8	_		F_
7439-95-4	Magnesium	2730	B		P_
7439-96-5	Manganese	54.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1360	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13700	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	154	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

6-OW

Lab Name: HALLIBURTON_NUS Contract:

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225122___

Level (low/med): LOW__ Date Received: 02/04/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	104	B		P_
7440-36-0	Antimony_	10.0	U		P_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium__	90.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	_		P_
7440-70-2	Calcium__	10400	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	26.0	_		P_
7439-89-6	Iron____	7570	_		P_
7439-92-1	Lead____	12.7	_		F_
7439-95-4	Magnesium	2630	B		P_
7439-96-5	Manganese	48.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1330	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13400	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc____	101	_		P_

Color Before: COLORLESS Clarity Before: CLEAR_ Texture:

Color After: COLORLESS Clarity After: CLEAR_ Artifacts:

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

7-AC

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225120___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	893	_		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	B		F_
7440-39-3	Barium___	10.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	12600	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	7.0	B		P_
7439-89-6	Iron_____	1580	_		P_
7439-92-1	Lead_____	5.0	_		F_
7439-95-4	Magnesium	2690	B		P_
7439-96-5	Manganese	7.0	B		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1500	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	14300	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	26.0	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

7-AS

Lab Name: HALLIBURTON_NUS Contract:

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225119___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	143	B		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	91.0	B		P_
7440-41-7	Beryllium	1.0	U		P_
7440-43-9	Cadmium__	5.0	U		P_
7440-70-2	Calcium__	10700	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	37.0	_		P_
7439-89-6	Iron_____	6870	_		P_
7439-92-1	Lead_____	18.2	_		F_
7439-95-4	Magnesium	2680	B		P_
7439-96-5	Manganese	51.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1350	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13400	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	146	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture:

Color After: COLORLESS Clarity After: CLEAR_ Artifacts:

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

7-OW

Lab Name: HALLIBURTON_NUS__________ Contract: __________

Lab Code: HNUS__ Case No.: BKHD__ SAS No.: ______ SDG No.: PKG2__

Matrix (soil/water): WATER Lab Sample ID: P225118___

Level (low/med): LOW__ Date Received: 02/05/93

% Solids: __0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_	115	B		P_
7440-36-0	Antimony_	10.0	U		F_
7440-38-2	Arsenic__	2.0	U		F_
7440-39-3	Barium___	91.0	B		P_
7440-41-7	Beryllium	1.0	B		P_
7440-43-9	Cadmium__	7.0	_		P_
7440-70-2	Calcium__	10500	_		P_
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt___	8.0	U		P_
7440-50-8	Copper___	26.0	_		P_
7439-89-6	Iron_____	7580	_		P_
7439-92-1	Lead_____	9.4	_		F_
7439-95-4	Magnesium	2630	B		P_
7439-96-5	Manganese	46.0	_		P_
7439-97-6	Mercury__	0.20	U		CV
7440-02-0	Nickel___	20.0	U		P_
7440-09-7	Potassium	1350	B		P_
7782-49-2	Selenium_	1.0	U		F_
7440-22-4	Silver___	3.0	U		P_
7440-23-5	Sodium___	13200	_		P_
7440-28-0	Thallium_	1.0	U		F_
7440-62-2	Vanadium_	4.0	U		P_
7440-66-6	Zinc_____	110	_		P_
			_		__
			_		__

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: ______

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: ______

Comments:

Burlington Research

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AATCC Testing Services • NPDES Testing • Reporting & Data Handling Services
PMN Aquatic Bioassay Evaluations

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ANALYTICAL REPORT

CUSTOMER: Baker Environmental
FACILITY: Coraopolis, PA
REPORT TO: Steve Kretschman

SAMPLE: MCB Camp Lejeune NC
4-AC Grab 2/4/93

WORK ORDER #: 93-02-097-01

COLLECTED: 02/04/93
RECEIVED: 02/05/93
REPORTED: 02/15/93

PARAMETER	METHOD	STARTED	ANALYZED	RESULT
LC50, Fathead 48-Hour	EPA600485013	02/05/93	02/08/93	> 100 %

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ACUTE TOXICITY DATA SHEET

TEST #: 9302097-01 **SAMPLE:** Baker Environmental 4-AC Grab (After Carbon) 2/4

TEST ORGANISM: *Pimephales promelas*

DATE BEGUN: 2/5/93 **TIME BEGUN:** 1600 **By:** arm

DATE ENDED: 2/7/93 **TIME ENDED:** 1500 **By:** mac

Chamber #	Toxicant %	Total Volume mls	Deaths at 48hrs	D.O. at 48hrs	pH at 48hrs	Other Temp	Other
1	0	200	0	7.5	7.68	25.1	
2	0	200	0				
3	12.5	200	0	7.5	7.74	25.3	
4	12.5	200	0				
5	25	200	0				
6	25	200	0				
7	50	200	1				
8	50	200	1				
9	100	200	0				
10	100	200	2	7.5	7.98	25.9	

Notes: High conc. @ 0 hr.: DO = 8.1 ppm pH = 9.36
Temp. = 25.0 degrees C

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ACUTE TOXICITY DATA SHEET

TEST INFORMATION

TEST #: **9302097-01** CLIENT: Baker Environmental

SAMPLE: Baker Environmental
4-AC Grab (After Carbon) 2/4

NPDES #: n/a

TEST ORGANISM: Pimephales promelas

AGE OF TEST ORGANISM: 8 to 11 days of age

TEMPERATURE RANGE: 25 degrees C +/- 1 degree C

TEST TYPE: 48 hour Pimephales promelas acute static

DATE BEGUN: 2/5/93 TIME BEGUN: 1600

DATE ENDED: 2/7/93 TIME ENDED: 1500

END POINT OF TEST: Death or immobility after 48 hours.

EFFLUENT PARAMETERS

pH: 9.41 CHLORINE: n/a

DISSOLVED OXYGEN: 8.45 ppm

SPECIFIC CONDUCTANCE: 169 micromhos at 25 C

TEMPERATURE: 1.6 degrees C COLOR: colorless

OTHER:

DILUTION WATER PARAMETERS

DILUTION WATER: IR-Lake mixture LOT #: 1-25L;2-2I

pH: 7.99 DISSOLVED OXYGEN: 8.65 ppm

SPECIFIC CONDUCTANCE: 159 micromhos at 25 C

HARDNESS: 46 ppm as calcium carbonate

LAST COMPREHENSIVE DILUTION WATER CHEMISTRY: 1/93

BURLINGTON RESEARCH, INC.
TRIMMED SPEARMAN-KARBER METHOD FOR CALCULATION OF
EC50 AND LC50 VALUES IN BIOASSAYS

DATE: 2/5/93 THROUGH 2/7/93
WORK ORDER #: 9302097-01
CHEMICAL: Baker Environmental (After carbon)
SPECIES: Pimephales promelas
DURATION: 48 HOURS

RAW DATA

CONCENTRATION(%)	12.5	25	50	100
ln CONCENTRATION	2.53	3.22	3.91	4.61
NUMBER EXPOSED	20	20	21	20
MORTALITIES	0	0	2	2

The minimum required trim 90.0 is too large.
The LC50 IS > 100 %, so SK is not calculable.

REFERENCE:
M.A. HAMILTON, R.C. RUSSO, AND R.V. THURSTON. 1977. TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS. ENVIRON. SCI. TECHNOL. 11:714-719; CORRECTION 12:417 (1978).

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PMN Aquatic Bioassay Evaluations

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ANALYTICAL REPORT

CUSTOMER: Baker Environmental
FACILITY: Coraopolis, PA
REPORT TO: Steve Kretschman

SAMPLE: MCB Camp Lejeune NC
4-AS Grab 2/4/93

WORK ORDER #: 93-02-097-02

COLLECTED: 02/04/93
RECEIVED: 02/05/93
REPORTED: 02/15/93

PARAMETER	METHOD	STARTED	ANALYZED	RESULT
LC50, Fathead 48-Hour	EPA600485013	02/05/93	02/08/93	> 100 %

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ACUTE TOXICITY DATA SHEET

TEST #: 9302097-01 SAMPLE: Baker Environmental 4-AC Grab (After Carbon) 2/4

TEST ORGANISM: Pimephales promelas

DATE BEGUN: 2/5/93 TIME BEGUN: 1600 By: arm

DATE ENDED: 2/7/93 TIME ENDED: 1500 By: mac

Chamber #	Toxicant %	Total Volume mls	Volume Dilution mls	Volume Toxicant mls	Volume Transfer mls	# of Organisms	Deaths at 48hrs
1	0	200	200	0	0	10	0
2	0	200	200	0	0	10	0
3	12.5	200	175	25	0	10	0
4	12.5	200	175	25	0	10	0
5	25	200	150	50	0	10	0
6	25	200	150	50	0	10	0
7	50	200	100	100	0	11	1
8	50	200	100	100	0	10	1
9	100	200	0	200	0	10	0
10	100	200	0	200	0	10	2

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ACUTE TOXICITY DATA SHEET

TEST #: 9302097-02 SAMPLE: Baker Environmental
4-AS (Air Stripper) Grab 2/4

TEST ORGANISM: Pimephales promelas

DATE BEGUN: 2/5/93 TIME BEGUN: 1610 By: dlj

DATE ENDED: 2/7/93 TIME ENDED: 1510 By: mac

Chamber #	Toxicant %	Total Volume mls	Volume Dilution mls	Volume Toxicant mls	Volume Transfer mls	# of Organisms	Deaths at 48hrs
1	0	200	200	0	0	10	0
2	0	200	200	0	0	10	0
3	10	200	180	20	0	10	0
4	10	200	180	20	0	11	1
5	25	200	150	50	0	10	0
6	25	200	150	50	0	10	0
7	50	200	100	100	0	10	0
8	50	200	100	100	0	10	1
9	75	200	50	150	0	10	0
10	75	200	50	150	0	10	0
11	100	200	0	200	0	10	0
12	100	200	0	200	0	10	0

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ACUTE TOXICITY DATA SHEET

TEST #: 9302097-02 SAMPLE: Baker Environmental
4-AS (Air Stripper) Grab 2/4

TEST ORGANISM: Pimephales promelas

DATE BEGUN: 2/5/93 TIME BEGUN: 1610 By: dlj

DATE ENDED: 2/7/93 TIME ENDED: 1510 By: mac

Chamber #	Toxicant %	Total Volume mls	Deaths at 48hrs	D.O. at 48hrs	pH at 48hrs	Other Temp	Other
1	0	200	0	7.4	7.85	25.5	
2	0	200	0				
3	10	200	0				
4	10	200	1	7.45	7.78	25.9	
5	25	200	0				
6	25	200	0				
7	50	200	0				
8	50	200	1				
9	75	200	0				
10	75	200	0				
11	100	200	0				
12	100	200	0	7.5	7.64	25.3	

Notes: High conc. @ 0 hr.: DO = 8.1 ppm pH = 7.52
Temp. = 25.0 degrees C

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ACUTE TOXICITY DATA SHEET

TEST INFORMATION

TEST #: **9302097-02** CLIENT: Baker Environmental

SAMPLE: Baker Environmental
4-AS (Air Stripper) Grab 2/4

NPDES #: n/a

TEST ORGANISM: Pimephales promelas

AGE OF TEST ORGANISM: 8 to 11 days of age

TEMPERATURE RANGE: 25 degrees C +/- 1 degree C

TEST TYPE: 48 hour Pimephales promelas acute static

DATE BEGUN: 2/5/93 TIME BEGUN: 1610

DATE ENDED: 2/7/93 TIME ENDED: 1510

END POINT OF TEST: Death or immobility after 48 hours.

EFFLUENT PARAMETERS

pH: 7.21 CHLORINE: n/a

DISSOLVED OXYGEN: 8.6 ppm

SPECIFIC CONDUCTANCE: 175 micromhos at 25 C

TEMPERATURE: 2.8 degrees C COLOR: yellow-beige

OTHER:

DILUTION WATER PARAMETERS

DILUTION WATER: IR-Lake mixture LOT #: 1-25L;2-2I

pH: 7.99 DISSOLVED OXYGEN: 8.4 ppm

SPECIFIC CONDUCTANCE: 159 micromhos at 25 C

HARDNESS: 46 ppm as calcium carbonate

LAST COMPREHENSIVE DILUTION WATER CHEMISTRY: 1/93

BURLINGTON RESEARCH, INC.
TRIMMED SPEARMAN-KARBER METHOD FOR CALCULATION OF
EC50 AND LC50 VALUES IN BIOASSAYS

DATE: 2/5/93 THROUGH 2/7/93
WORK ORDER #: 9302097-02
CHEMICAL: Baker Environmental (Air Stripper)
SPECIES: Pimephales promelas
DURATION: 48 HOURS

RAW DATA

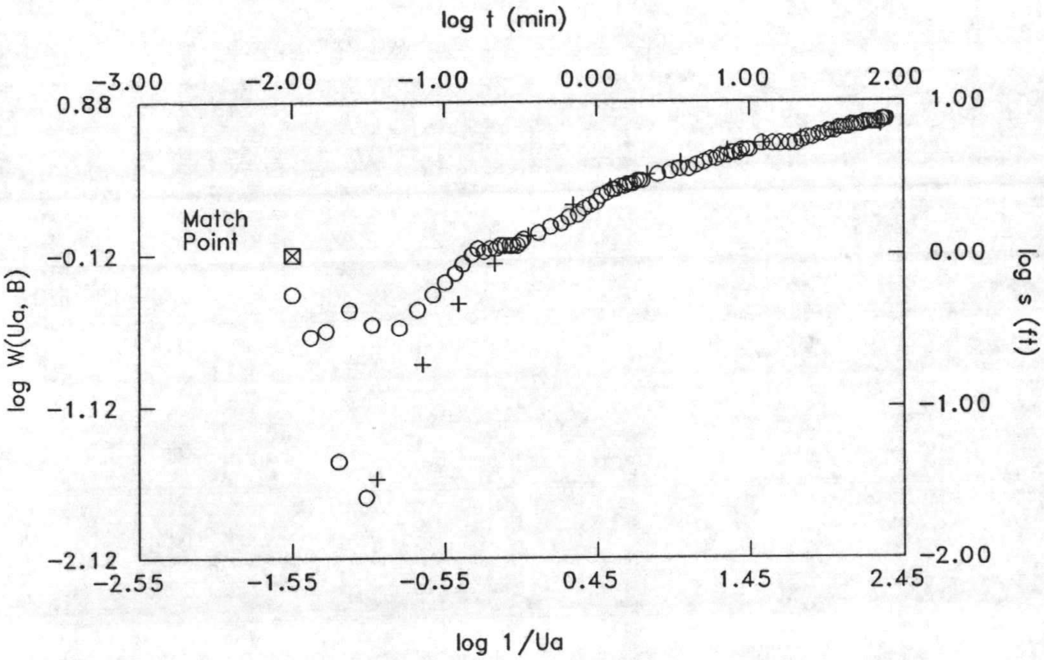
CONCENTRATION(%)	10	25	50	75	100
ln CONCENTRATION	2.30	3.22	3.91	4.32	4.61
NUMBER EXPOSED	21	20	20	20	20
MORTALITIES	1	0	1	0	0

The minimum required trim 98.0 is too large.
The LC50 IS > 100 %, so SK is not calculable.

REFERENCE:
M.A. HAMILTON, R.C. RUSSO, AND R.V. THURSTON. 1977. TRIMMED SPEARMAN-KARBER METHOD FOR ESTIMATING MEDIAN LETHAL CONCENTRATIONS IN TOXICITY BIOASSAYS. ENVIRON. SCI. TECHNOL. 11:714-719; CORRECTION 12:417 (1978).

APPENDIX J
AQUIFER TEST RESULTS

RW-1

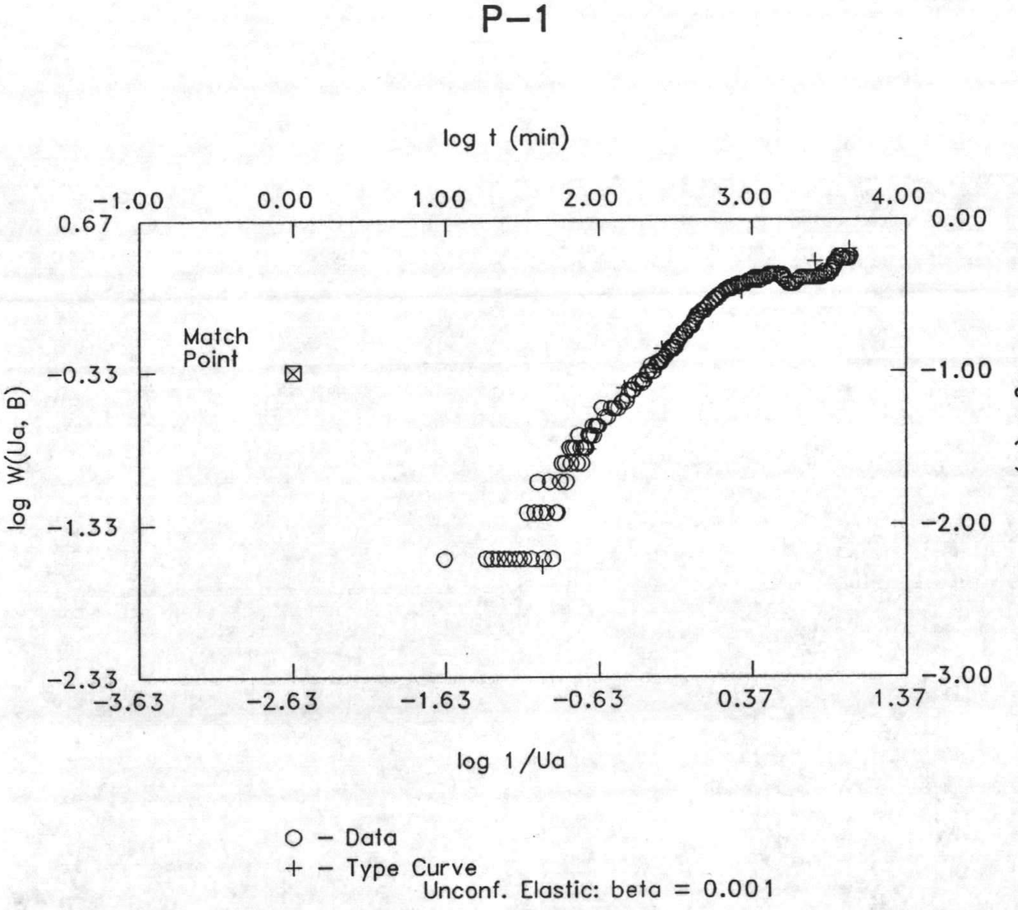


○ – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.001

MATCH POINT			SOLUTION		
t	=	1.000E-0002	Transmissivity (T)	=	1.304E+0002 gpd/ft
s	=	1.000E+0000	Hydraulic Conductivity (K)	=	5.215E+0000 gpd/sq ft
1/Ua	=	2.818E-0002	Storativity (S)	=	6.872E-0002
W(Ua, B)	=	7.586E-0001			

WELL INFORMATION

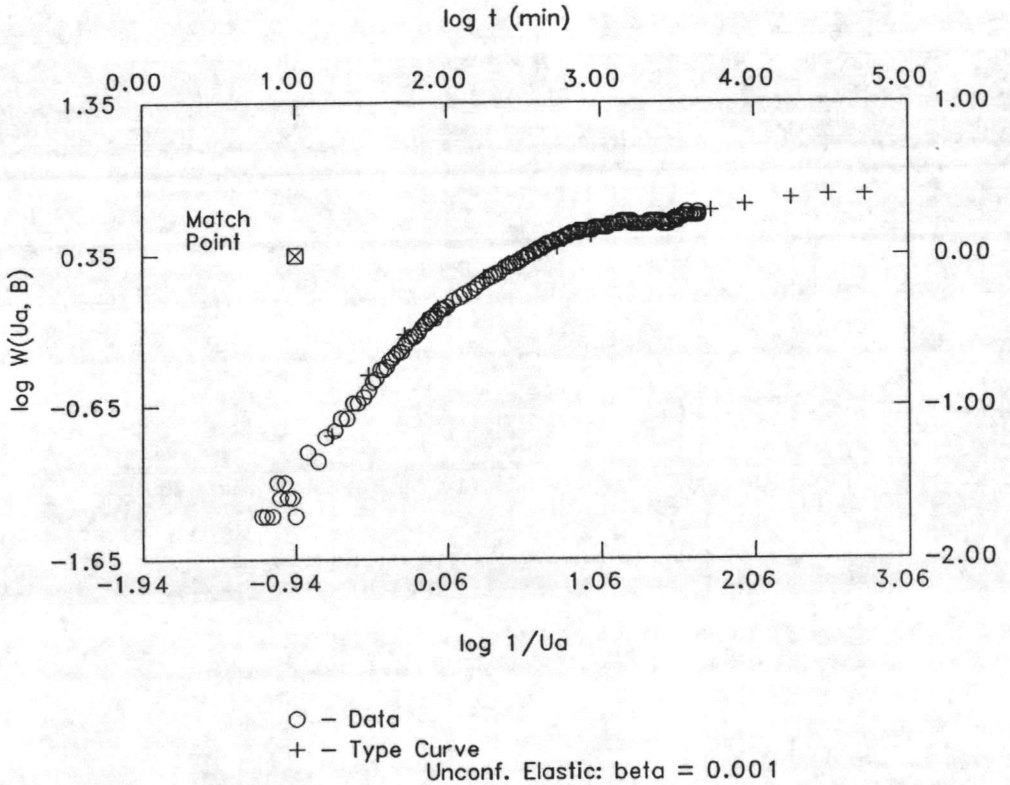
WELL IDENTIFICATION	: RW-1
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 2.500E-0001 ft



MATCH POINT		SOLUTION	
t	= 1.000E+0000	Transmissivity (T)	= 8.038E+0002 gpd/ft
s	= 1.000E-0001	Hydraulic Conductivity (K)	= 3.215E+0001 gpd/sq ft
1/Ua	= 2.344E-0003	Storativity (S)	= 4.061E-0002
W(Ua, B)	= 4.677E-0001		

WELL INFORMATION	
WELL IDENTIFICATION	: P-1
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 2.800E+0001 ft

P-2

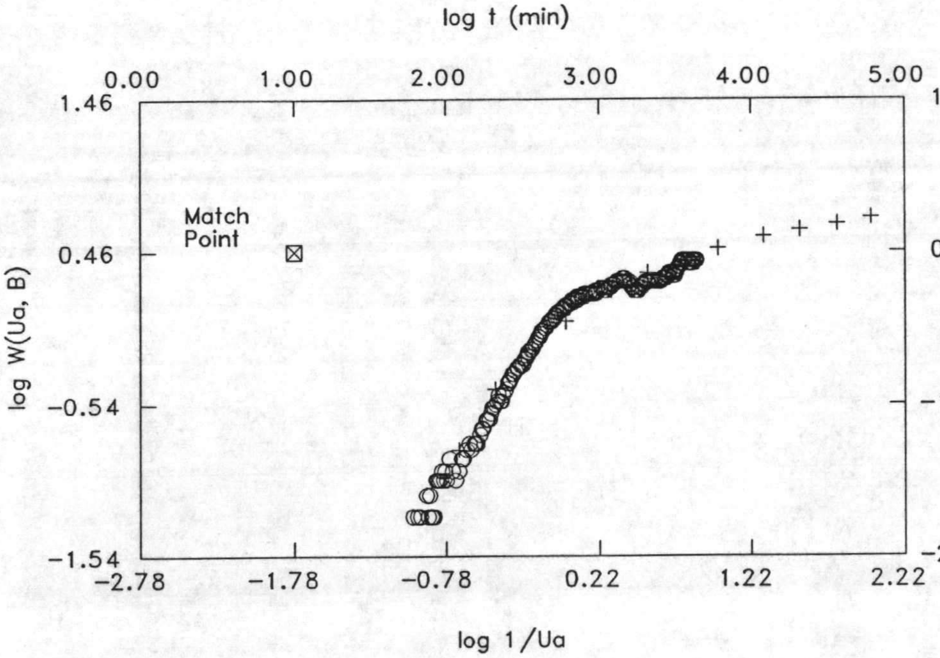


MATCH POINT		SOLUTION	
t	= 1.000E+0001	Transmissivity (T)	= 3.847E+0002 gpd/ft
s	= 1.000E+0000	Hydraulic Conductivity (K)	= 1.539E+0001 gpd/sq ft
1/Ua	= 1.148E-0001	Storativity (S)	= 8.671E-0004
W(Ua, B)	= 2.239E+0000		

WELL INFORMATION

WELL IDENTIFICATION	: P-2
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 5.990E+0001 ft

24-1

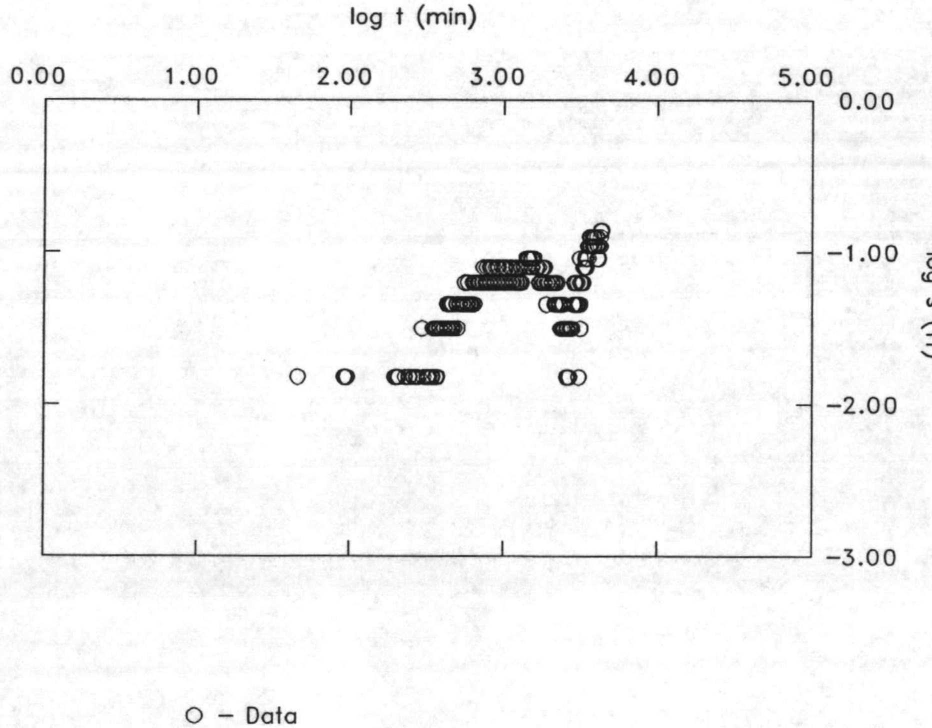


O – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.001

MATCH POINT			SOLUTION		
t	=	1.000E+0001	Transmissivity (T)	=	4.956E+0002 gpd/ft
s	=	1.000E+0000	Hydraulic Conductivity (K)	=	1.983E+0001 gpd/sq ft
1/Ua	=	1.660E-0002	Storativity (S)	=	4.891E-0003
W(Ua, B)	=	2.884E+0000			

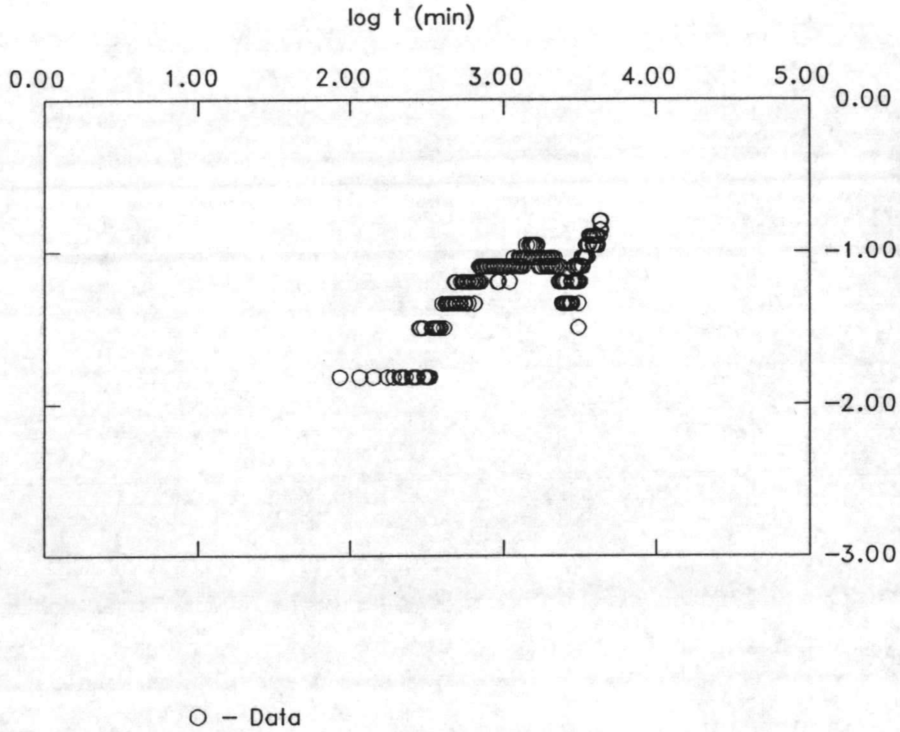
WELL INFORMATION	
WELL IDENTIFICATION	: 24-1
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 7.530E+0001 ft

24-2



WELL INFORMATION	
WELL IDENTIFICATION	: 24-2
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 9.670E+0001 ft

24-3



WELL INFORMATION	
WELL IDENTIFICATION	: 24-3
DATE OF AQUIFER TEST	: 1/93
AQUIFER THICKNESS (b)	: 2.500E+0001 ft
DISCHARGE RATE (Q)	: 1.500E+0000 gpm
PUMPING WELL RADIUS (r)	: 2.500E-0001 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 1.187E+0002 ft

APPENDIX K
PILOT-SCALE TREATABILITY STUDY ANALYTICAL RESULTS - QA/QC

CLIENT ORIGINAL

HALLIBURTON NUS
Environmental Corporation
Environmental Laboratories

5350 Campbells Run Road
Pittsburgh, PA 15205

900 Gemini Avenue
Houston, TX 77058

February 23, 1993
Report No.: 00013686
Section A Page 22

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

Carbon Copy:

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

SAMPLE ID: 8-OW
NUS SAMPLE NO: P0225115
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	4	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	3	ug/L
		ethylbenzene	2	ug/L
		methylbenzene [toluene]	9	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	3	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 8-OW
NUS SAMPLE NO: P0225115

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 40 D	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	180 D	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	340 D	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

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Sample number P225115 exhibited high surrogate recoveries in both the primary and confirmational analyses. The high surrogate recoveries were due to a matrix interference. The matrix interference also interferred with the confirmation of benzene. The benzene result from the primary analysis is reported. M/P-xylene was not observed in the confirmational analysis. The m/p-xylene result observed in the primary analysis was not reported.

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"D" indicates that the result was obtained from an analysis performed at a secondary dilution.

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February 23, 1993
Report No.: 00013686
Section A Page 24

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 8-AS
NUS SAMPLE NO: P0225116
P.O. NO.: CTO * 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	5	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	10	ug/L
		benzene	2	ug/L
		ethylbenzene	13	ug/L
		methylbenzene [toluene]	13	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 8-AS
NUS SAMPLE NO: P0225116

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

CLIENT ORIGINAL

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February 23, 1993
Report No.: 00013686
Section A Page 26

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: 8-AC
NUS SAMPLE NO: P0225117
P.O. NO.: CTO * 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
1	ACLPW	TAL METALS & CLP DATA PACKAGE	DONE	
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	3	ug/L
		methylbenzene [toluene]	4	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L

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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: 8-AC
NUS SAMPLE NO: P0225117

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column.

For sample number P225117, benzene and toluene were not observed in the confirmational analysis. The benzene and toluene results observed in the primary analysis were not reported. A low surrogate recovery was observed for this sample in both the primary and confirmational analyses. The low surrogate recoveries were proabably due to the matrix.

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February 23, 1993
Report No.: 00013686
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LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: TB
NUS SAMPLE NO: P0225114
P.O. NO.: CTO # 19017

DATE SAMPLED: 05-FEB-93
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	13	ug/L
		1,3-dimethylbenzene, 1,4-dimethylbenzene [m-/p-xylenes]	2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	6	ug/L
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L

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February 23, 1993
Report No.: 00013686
Section A Page 21

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
SAMPLE ID: TB
NUS SAMPLE NO: P0225114

LN	TEST CODE	DETERMINATION	RESULT	UNITS
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

For sample P225114, o-xylene and m/p-xylenes were not observed in the confirmational analysis. The results for these compounds observed in the primary analysis were not reported.

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February 23, 1993
Report No.: 00013686

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: TRIP 1
NUS SAMPLE NO: P0225131
P.O. NO.: CTO # 19017

DATE SAMPLED: UnAvail
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
2	DPACK	CLP Data Package Deliverable	DONE	
5	G100W	PURGEABLE HALOCARBONS		
		1,1,1-trichloroethane	< 2	ug/L
		1,1,2,2-tetrachloroethane	< 2	ug/L
		1,1,2-trichloroethane	< 2	ug/L
		1,1-dichloroethane	< 2	ug/L
		1,1-dichloroethene [1,1-dichloroethylene]	< 2	ug/L
		1,2-dichlorobenzene [o-dichlorobenzene]	< 5	ug/L
		1,2-dichloroethane	< 2	ug/L
		1,2-dichloropropane	< 2	ug/L
		1,3-dichlorobenzene [m-dichlorobenzene]	< 5	ug/L
		1,4-dichlorobenzene [p-dichlorobenzene]	< 5	ug/L
		2-chloroethylvinyl ether	< 2	ug/L
		bromodichloromethane [dichlorobromomethane]	< 2	ug/L
		bromomethane [methyl bromide]	< 2	ug/L
		carbon tetrachloride	< 2	ug/L
		chlorobenzene	< 2	ug/L
		chloroethane	< 2	ug/L
		chloroform	< 2	ug/L
		chloromethane [methyl chloride]	< 2	ug/L
		cis-1,3-dichloropropene	< 2	ug/L
		dibromochloromethane	< 2	ug/L
		dichlorodifluoromethane	< 2	ug/L
		dichloromethane [methylene chloride]	< 5	ug/L
		tetrachloroethene [tetrachloroethylene]	< 2	ug/L
		trans-1,2-dichloroethene [trans-1,2-dichloroethylene]	< 2	ug/L
		trans-1,3-dichloropropene	< 2	ug/L
		tribromomethane [bromoform]	< 5	ug/L
		trichloroethene [trichloroethylene]	< 2	ug/L
		trichlorofluoromethane	< 2	ug/L
		vinyl chloride	< 5	ug/L

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Houston, TX 77058

February 23, 1993
Report No.: 00013686
Section A Page 55

LABORATORY ANALYSIS REPORT

CLIENT NAME: BAKER ENVIRONMENTAL, INC. /NAVY CLEAN
ADDRESS: 420 ROUSER ROAD
CORAOPOLIS, PA 15108-
ATTENTION: MR. JOHN LOVELY

NUS CLIENT NO: 1600 0006
WORK ORDER NO: 55830
VENDOR NO:

Carbon Copy:

SAMPLE ID: TRIP 2
NUS SAMPLE NO: P0225132
P.O. NO.: CTO # 19017

DATE SAMPLED: UnAvail
DATE RECEIVED: 06-FEB-93
APPROVED BY: Joanne Simanic

LN	TEST CODE	DETERMINATION	RESULT	UNITS
2	DPACK	CLP Data Package Deliverable	DONE	
3	G107W	BTEX PACKAGE		
		1,2-dimethylbenzene [o-xylene]	< 2	ug/L
		1,3-dimethylbenzene,1,4-dimethylbenzene [m-/p-xylenes]	< 2	ug/L
		benzene	< 2	ug/L
		ethylbenzene	< 2	ug/L
		methylbenzene [toluene]	< 2	ug/L

COMMENTS: In the BTEX analysis, m- and p-xylene co-elute on the capillary column. The concentration reported represents the sum of the two isomers.

APPENDIX L
WELL CONSTRUCTION AND BORING DATA

Baker

Baker Environmental, Inc.

FIELD TEST BORING RECORD

PROJECT:
S.O. NO.: 19017-50-SRN BORING NO.: RW-1
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: B-80	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	TOP OF CASING WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2 in		8.25" I.D.		1-29-93	25 FT	WARM, SUNNY		
LENGTH	2 FT		5 FT						
TYPE	STD		H.S.A.						
HAMMER WT.	140#								
FALL	30 in								
STICK UP									

REMARKS: Log was prepared from Auger Cuttings. Due to Overhead utilities, the Mast could not be raised and therefore Split Spoon samples were not collec[ted]

DEPTH	SOIL / ROCK	Sample ID / Type - No. (N = No' Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class. / Pen. Rate	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
1							SILT, Little Clay, Trace Sand	Brown	Med. Dense	DRY		
2							2.0				2.0	
3							SAND, Medium to Fine grained, Little Silt	Brown	Med. Dense	DAMP		
4												
5												
6							6.5				6.5	
7							SAND, Fine grained, Little Silt	Grey	Med. Dense	Moist to Wet, encountered G.W. at 7-9 Ft.		
8												
9												
10												

DRILLING CO.: Hardin-Huber Inc BAKER REP.: J. Culp
DRILLER: Royce Keenan BORING NO.: RW-1 SHEET 1 OF 2

FIELD TEST BORING RECORD

Baker

Baker Environmental, Inc.

PROJECT:

S.O. NO.: 19017-50-SRN   BORING NO.: RW-1

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class. / Pen. Rate	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
1							SAND, Fine grained, LITTLE SILT	Grey	MED. DENSE	WET		
2												
3												
4												
5							15.0			15.0		
6										LOST RECOVERY OF SOILS DUE TO CLAY & SILT ADHERING TO AUGERS AND SIDES OF BOREHOLE.		
7												
8												
9												
0												
1												
2												
3												
4							25.0			25.0		
5							END OF BORING AT 25.0 FEET					
6												
7												
8												
9												
0												

DRILLING CO.: HARDIN-HUBER INC.   BAKER REP.: J. CULP

DRILLER: ROYCE KEENAN   BORING NO.: RW-1   SHEET 2 OF 2

Baker
Baker Environmental, Inc.

FIELD TEST BORING RECORD

PROJECT:
S.O. NO.: 19017-50-SRN BORING NO.: P-1
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: B-80	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	TOP OF CASING WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2 in.		4.25" H.S.A		1-29-93	26.0 FT	WARM, SUNNY		
LENGTH	2 FT.		5 FT.						
TYPE	STD		H.S.A.						
HAMMER WT.	140 #								
FALL	30 in.								
STICK UP									

REMARKS: BORING WAS ADVANCED TO A DEPTH OF 26.0 FT BUT ~~to~~ PIEZOMETER WAS INSTALLED TO 24.0 FT.

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No' Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft. & %)	Lab. Class. / Pen. Rate	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
1		A.				N.R.	SILT, Little Clay, Some Sand	LIGHT BROWN	MEDIUM DENSE	Damp		
3.5		A.N.					3.5				3.5	
5–6			1.0 / 2.0 / 50%	1 / 3 / 7 / 5		N.R.	SAND, Medium to fine grained, Some SILT	LIGHT Brown	Medium Dense	Damp To MOIST		
6.0							6.0				6.0	
6–7							SAND, Fine grained, Little SILT	LIGHT Grey	MEDIUM DENSE	MOIST, encountered Groundwater at 7.0 FEET.		
8–9		A.N.										
10												

DRILLING CO.: Hardin-Huber Inc BAKER REP.: J. CULP
DRILLER: Royce Keenan BORING NO.: P-1 SHEET 1 OF 2

Baker

Baker Environmental, Inc.

FIELD TEST BORING RECORD

PROJECT:
S.O. NO.: 19017-50-SRN BORING NO.: P-1

DEPTH	SOIL / ROCK	Sample ID / Type-No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / RQD (Ft & %)	Lab. Class. / Pen. Rate	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / Classification (Name, Grain Size, Principal Constituents, Etc.)	Color	Consist. or Density / Hardness	Moisture Content, Organic Content, Plasticity, and Other Observations / Weathering, Bedding, Fracturing, and Other Observations	SOIL / ROCK	ELEVATION
1			1.6 / 2.0 80%	4 3 4 4		N.R	SAND, Fine grained, Little SILT	Grey	M Loose	Wet		
2–4		A.N.										
5							15.0				15.0	
6			2.0 / 2.0 100%	0 0 0 1		N.R.	Clayey SILT, Little Sand	Light Grey	Very Soft	Wet		
7–9		A.N.										
0–2			2.0 / 2.0 100%	3 3 2 2		N.R	21.0 SILTY PEAT, Trace Sand	DARK BROWN	SO LOOSE	DAMP TO DRY	21.0	
3			2.0 / 2.0 100%	3 2 4 6		N.R.	SILTY Peat, Trace Sand	Dark Brown	LOOSE	Damp To Dry, Wet at 24.0 FEET		
4–5			2.0 / 2.0 100%	3 4 3 5		N.R.	25.0 SAND, MEDIUM TO FINE GRAINED, LITTLE SILT	LIGHT Grey	LOOSE	WET	25.0 / 26.0	

TERMINATION DEPTH = 26.0 FEET.

DRILLING CO.: HARDIN-HUBER Inc BAKER REP.: J. CULP
DRILLER: ROYCE KEENAN BORING NO.: P-1 SHEET 2 OF 2

Baker

Baker Environmental, Inc.

FIELD TEST BORING RECORD

PROJECT:
S.O. NO.: 19017-50-SRN BORING NO.: P-2
COORDINATES: EAST: NORTH:
ELEVATION: SURFACE: TOP OF PVC CASING:

RIG: B-80	SPLIT SPOON	CASING	AUGERS	CORE BARREL	DATE	PROGRESS (FT)	WEATHER	TOP OF CASING WATER DEPTH (FT)	TIME
SIZE (DIAM.)	2 in.		4.25" I.D.		1-29-93	24.0 FT	WARM, SUNNY		
LENGTH	2 FT.		5 FT						
TYPE	STD		H.S.A.						
HAMMER WT.	140#								
FALL	30 in.								
STICK UP									

REMARKS: LOG WAS PREPARED FROM AUGER CUTTINGS. DUE TO OVERHEAD UTILITIES, THE MAST COULD NOT BE RAISED AND THEREFORE SPLIT SPOON SAMPLES COULD NOT BE COLLEC

DEPTH	SOIL / *ROCK*	Sample ID / Type - No. (N = No/ Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / *RQD (Ft. & %)*	Lab. Class. / *Pen. Rate*	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / *Classification (Name, Grain Size, Principal Constituents, Etc.)*	Color / *Color*	Consist. or Density / *Hardness*	Moisture Content, Organic Content, Plasticity, and Other Observations / *Weathering, Bedding, Fracturing, and Other Observations*	SOIL / *ROCK*	ELEVATION
0–2.5							SILT, LITTLE CLAY, SOME SAND	LIGHT BROWN	MEDIUM DENSE	DRY		
2.5							2.5			2.5		
2.5–5.0							SAND, MEDIUM TO Fine grained, Little SILT	Brown	MEDIUM DENSE	DAMP TO MOIST		
5.0							5.0			5.0		
5.0–10							SAND, Fine grained, Trace SILT	Grey	LOOSE	MOIST TO WET, encountered G.W. between 7-9 FT.		

DRILLING CO.: Hardin-Huber Inc. BAKER REP.: J. Culp
DRILLER: Royce Keenan BORING NO.: P-2 SHEET 1 OF 2

Baker

Baker Environmental, Inc.

FIELD TEST BORING RECORD

PROJECT:

S.O. NO.: 19017-50-SRN

BORING NO.: P-2

DRILL RECORD							VISUAL DESCRIPTION					
DEPTH	SOIL / *ROCK*	Sample ID / Type - No. (N = No Samp.)	Samp. Rec. (Ft. & %)	SPT Blows Per 0.5' / *RQD (Ft. & %)*	Lab. Class.. / *Pen. Rate*	PID (ppm)	Classification (Grain Size, Principal Constituents, Etc.) / *Classification (Name, Grain Size, Principal Constituents, Etc.)*	Color / *Color*	Consist. or Density / *Hardness*	Moisture Content, Organic Content, Plasticity, and Other Observations / *Weathering, Bedding, Fracturing, and Other Observations*	SOIL / *ROCK*	ELEVATION
1							SAND, Fine grained, Trace SILT	Grey	Loose	WET		
2												
3												
4												
5												
6												
7							17.0				17.0	
8										LOST RECOVERY OF SOILS DUE TO Clay ADHERING TO AUGERS AND SIDES OF BORE HOLE		
9												
0												
1												
2												
3												
4							24.0				24.0	
							END OF BORING AT 24.0 FT.					
5												
6												
7												
8												
9												
0												

DRILLING CO.: HARDIN-HUBER INC.

DRILLER: ROYCE KEENAN

BAKER REP.: J. CULP

BORING NO.: P-2

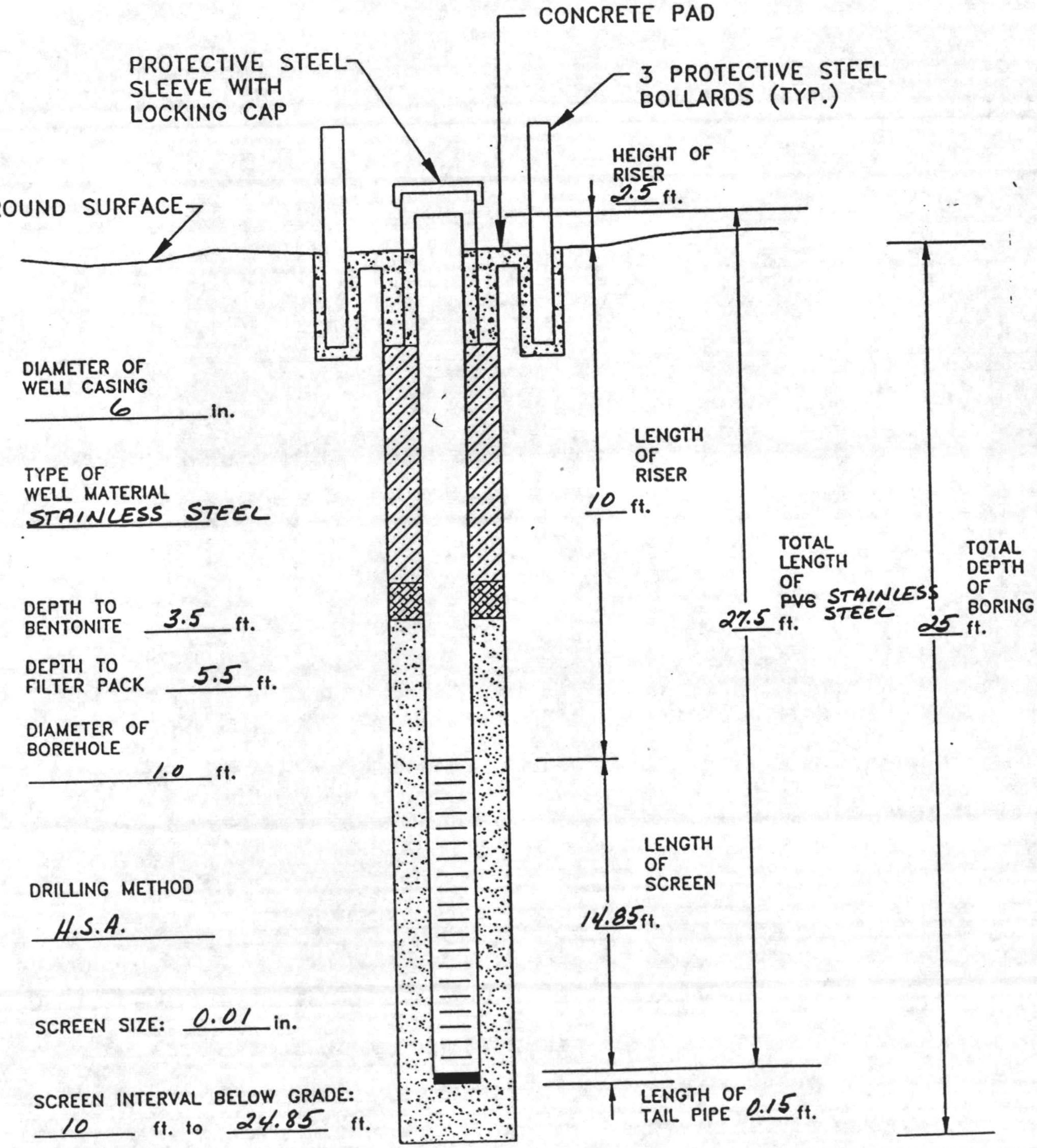
SHEET 2 OF 2

Baker
Baker Environmental, Inc.

ABOVE GRADE TYPE II MONITORING WELL

PROJECT No.: 19017-50-SRN
PROJECT NAME:
WELL No.: RW-1
DRILLING CO.: Hardin-Huber

DATE STARTED: 1-29-93
DATE COMPLETED: 1-29-93
DATE DEVELOPED: 1-30-93
DEVELOPMENT METHOD:



DIAMETER OF WELL CASING 6 in.

TYPE OF WELL MATERIAL STAINLESS STEEL

DEPTH TO BENTONITE 3.5 ft.

DEPTH TO FILTER PACK 5.5 ft.

DIAMETER OF BOREHOLE 1.0 ft.

DRILLING METHOD H.S.A.

SCREEN SIZE: 0.01 in.

SCREEN INTERVAL BELOW GRADE: 10 ft. to 24.85 ft.

BAKER ENVIRONMENTAL REPRESENTATIVE: James S. Culp

Boring No. HPGW 24 | Location Coordinates N

Hole Size 6" | Slot 0.01 | E

Screen Size 2" | Mat'l PVC | Filter Materials Silica Sand

Casing Size 2" | Mat'l PVC | Grout Type Bentonite Pellets

Geologist David Brentlinger | Development

Date Start 11/13/86 | Finish 11/12 | Static Water Level 6.83'

Contractor ESE | Top of Well Elevation 9.33'

Driller Davis | Drill Type Hollow Stem Auger

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT)
0.0-1.5		0.0-0.75	10YR 2.5/1 Black, Silty fine Sand' 50% organic matter, saturated H_2O	SM	4
		0.75-1.5	10YR 6.5/3 Pale - Very Pale Brown Silty fine Sand (silt 25%), loose, wet, slightly dense		3 4
1.5-3.0			Same as (0.75-1.5) less wet	SM	4 8 6
3.0-4.5			10YR 5/3, light Brown with Black-grey' silty Clay mottles throughout, silty fine Sand (silt 30%), moist, non-plastic, slightly dense	SM	5 9 7
4.5-6.0			10YR 4.5/2, Grey - dark grey Silty Clayey Sand, (silt + Clay 45%), slightly dense - mid. dense, Moist, Slightly plastic	SC/SM	2 3 4
6.0-7.5			10YR 4.5/4 Yellow Brown - dark yellow Brown', Silty Clayey Sand, (silt + Clay 45%), Slightly plastic - plastic, moist, Slightly dense	SC/SM	3 4 7

Boring No. HP GW 24 Location Coordinates N

Hole Size . Slot E

Screen Size Mat'l Filter Materials

asing Size Mat'l Grout Type

ologist Development

Date Start 11/12 Finish 11/12 Static Water Level

Contractor Top of Well Elevation

Driller Drill Type

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT)
7.5–9.0			10YR 4/1, dark Grey, Silty-Clayey Sand, (Silt + Clay 45%), moist, Slightly plastic, mrd. dense - dense	SC / SM	5 10 26
9.0–10.5			10YR 6.5/1, Grey - light Grey, Silty Fine Sand (silt 10-15%), loose, slightly dense, moist-wet, Top 5" Black silty Sand	SW	8 12 15
14.0–15.5			2.5Y 4.5/6 Grey - dark Grey, Silty Fine Sandy Clay (silt + sand 30%) Sticky, Slightly dense, Slightly plastic, wet	SC	2 1 1
19.0–20.5			7YR 2/0, Black, Silty ORganic Clay (organic matter 45%), firm, dense, moist, Slightly plastic	ML / Pt	2 3 5
24.0–25.5			10YR 2.5/1 Black, Silty Sandy Peat (silt + Sand 30%, dry, mod. dense	Pt	5 6 10

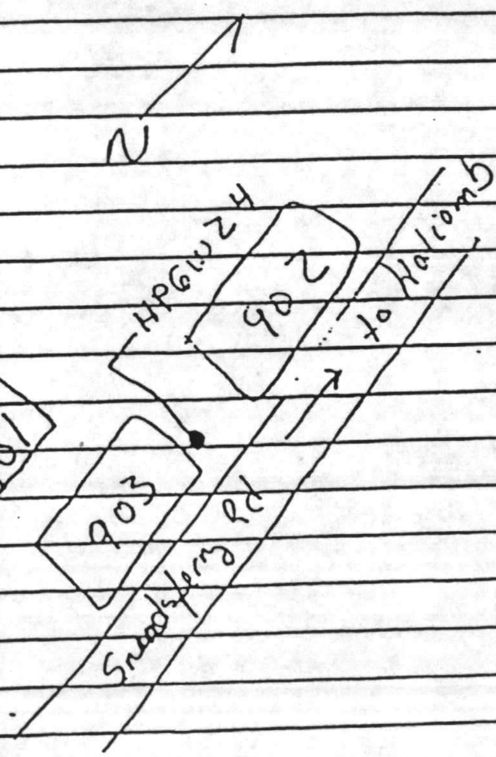
Boring No. HPGW24 SHEET ______ OF ______

11/12/86

On Site 1215 PM

1st Spoon 1220
last Spoon 120
Well Complete 150

Standard Well Specs.



DATE ______ SIGNED ______

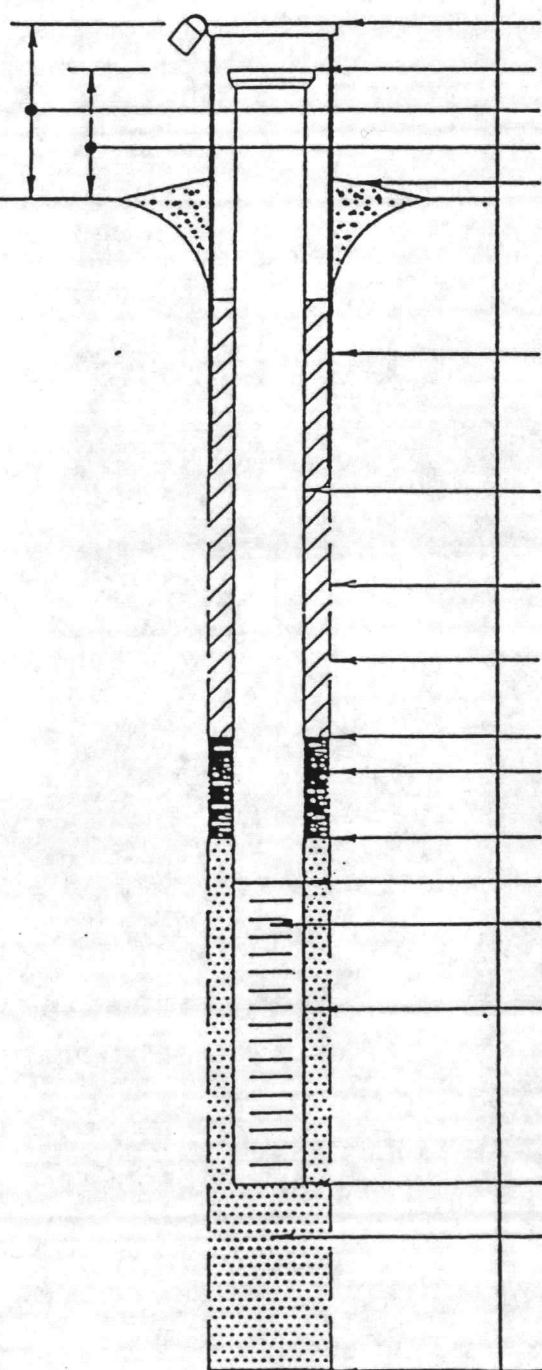
SOURCE: Environmental Science and Engineering, Inc., 19

T

OVERBURDEN MONITORING WELL SHEET

WELL NO. HP-GW24-1

PROJECT: Camp Lejeune - HPIA	DRILLER: David Drilling Co.
PROJECT NO.: 49-02036 BORING NO.: HP-GW24	DRILLING METHOD: Hollow Stem Auger
ELEVATION: DATE: 11/12/86 - 11/13/86	DELVELOPMENT METHOD:
FIELD GEOLOGIST: David Drentlinger (ESE)	



ELEVATION OF TOP OF SURFACE CASING: 33.46'

ELEVATION OF TOP OF RISER PIPE: 32.31'

STICK-UP TOP OF SURFACE CASING: 2.70'

STICK-UP RISER PIPE: 1.55'

TYPE OF SURFACE SEAL: concrete

I.D. OF SURFACE CASING: 5"

TYPE OF SURFACE CASING: carbon steel

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Schedule 40 PVC

BOREHOLE DIAMETER: 6"

TYPE OF BACKFILL: concrete

ELEVATION/DEPTH TOP OF SEAL: 2'

TYPE OF SEAL: Bentonite Pellets

DEPTH TOP OF SAND PACK: 3

ELEVATION/DEPTH TOP OF SCREEN: 5'

TYPE OF SCREEN: Schedule 40 PVC

SLOT SIZE X LENGTH: 0.010" x 20'

TYPE OF SAND PACK: coarse silica sand

ELEVATION/DEPTH BOTTOM OF SCREEN: 25'

ELEVATION/DEPTH BOTTOM OF SAND PACK:

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION/DEPTH OF HOLE: 25.5

NOT TO SCALE

OVBOMW.DWG

NORTH CAROLINA DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF ENVIRONMENTAL MANAGEMENT - GROUNDWATER SECTION
P.O. BOX 27687 - RALEIGH, N.C. 27611, PHONE (919) 733-5083

GW-29

WELL CONSTRUCTION RECORD

FOR OFFICE USE ONLY	
Quad. No.	Serial No.
Lat.	Long. / Pc
Minor Basin	
Basin Code	
Header Ent.	GW-1 Ent.

DRILLING CONTRACTOR Davis Drilling Co.
DRILLER REGISTRATION NUMBER Pending

STATE WELL CONSTRUCTION PERMIT NUMBER: 66-0135-WM-0141

1. WELL LOCATION: (Show sketch of the location below)
Nearest Town: Jacksonville NC   County: Onslow
(Road, Community, or Subdivision and Lot No.)

2. OWNER US Navy
ADDRESS Camp LeJeune (Street or Route No.)
28542
City or Town   State   Zip Code

3. DATE DRILLED 11/12/86 USE OF WELL monitor
4. TOTAL DEPTH 25.5' CUTTINGS COLLECTED ☒ Yes ☐ No
5. DOES WELL REPLACE EXISTING WELL? ☐ Yes ☒ No
6. STATIC WATER LEVEL: 6.83 FT. ☐ above ☒ below TOP OF CASING.
TOP OF CASING IS 2.50 FT. ABOVE LAND SURFACE.
7. YIELD (gpm): METHOD OF TEST
8. WATER ZONES (depth):
9. CHLORINATION: Type Amount

DRILLING LOG

Depth From - To	Formation Description
0.0 - 4.5	Silty Fine Sand
4.5 - 9.0	Silty Clayey Sand
9.0 - 10.5	Silty Fine Sand
14.0 - 15.5	Silty Fine Sandy Clay
19.0 - 20.5	Silty Clay
24.0 - 25.5	Silty Sandy Peat

If additional space is needed use back of form.

10. CASING:

	Depth		Diameter	Wall Thickness or Weight/Ft.	Material
From	+2.5	To -5.0 Ft.	2"	1/8"	PVC
From		To Ft.			
From		To Ft.			

11. GROUT:

	Depth		Material	Method
From	0.0	To -2.0 Ft.	Concrete	
From	-2.0	To -3.0 Ft.	Clay	

12. SCREEN:

	Depth		Diameter	Slot Size	Material
From	-5.0	To -25' Ft.	2" in.	0.01 in.	PVC
From		To Ft.	in.	in.	
From		To Ft.	in.	in.	

13. GRAVEL PACK:

	Depth		Size	Material
From	-3.0	To -25' Ft.	Coarse	Sand
From		To Ft.		

LOCATION SKETCH
(Show direction and distance from at least two State Roads, or other map reference points)

See Fig. (2-5)

REMARKS:

I DO HEREBY CERTIFY THAT THIS WELL WAS CONSTRUCTED IN ACCORDANCE WITH 15 NCAC 2C, WELL CONSTRUCTION STANDARDS, AND THAT A COPY OF THIS RECORD HAS BEEN PROVIDED TO THE WELL OWNER.

[signature]   2/11/87
SIGNATURE OF CONTRACTOR OR AGENT   DATE

Submit original to Division of Environmental Management and copy to well owner.

GW-1 Revised 11/84

Hole Size 5" Slot 0.01 HP 6W 24-2 E

Screen Size 2" Mat'l PVC Filter Materials Coarse Sand

ing Size 2" Mat'l PVC Grout Type #1 Portland

ologist David Brentlinger Development Bailed (184 gallons.)

Date Start 6/8/87 Finish 6/9/87 Static Water Level ~~14.61' TOC~~ 11.42

Contractor ESE Top of Well Elevation ~~3.31'~~ 3.25' stick

Driller ATEC & Associates (Don Sweeting) Drill Type Rotary - Mud

79.90 TOC

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT
0-5			Silty fine sand		
5-10			Silty fine sand		
10-15			Silty fine sand		
15-20			Silty very fine sand		
-25			very fine sand		
25-30			very fine sand, some coarse sand, white fines, coarse material well rounded		
30-35			very fine sand same as above		
35-40			very ~~fine~~ silty-clayey fine sand		
-50			same as above 35-40 with more clay in ...		

HPCW 24-2 E

Size ______ Slot ______ Filter Materials ______

en Size ______ Mat'l ______ Grout Type ______

ing Size ______ Mat'l ______ Development ______

ologist ______ Static Water Level ______

Date Start ______ Finish ______ Top of Well Elevation ______

Contractor ______ Drill Type ______

Driller ______

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SP (BL/
50 - 55			Silty Sand - fine Sandy silt with Clay + Small shells		
55 - 60			Clayey Silty fine sand mostly fine sand some Med. - Coarse sand ~~and~~ with small Clastics (shells)		
60 - 65			Same as above 55 - 60 more shells		
65 - 70		hard layer	silty med sand with Coarse - Sand and uncemented Clastics + Cemented (lots of shells)	Rock	
70 - 75		Semi lithofied Limestone?	Same as above 70 - 75	Rock	

Comments:

Rock layer is not very hard, driller went through easilly.

Boring No. HPGW24-2 ATEC

on-site and Ready 1:45 PM
6/8/87

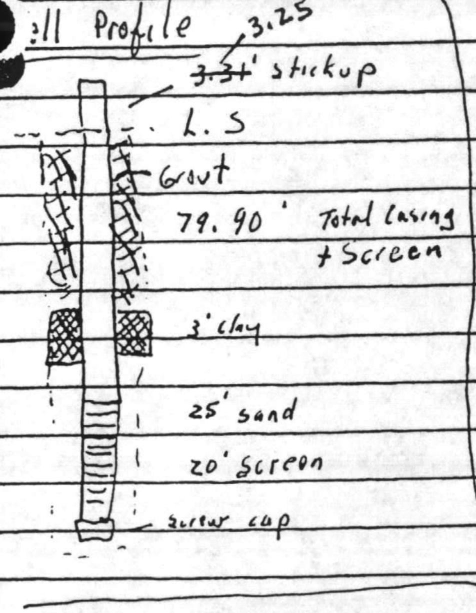
Start – 6/8/87
Finish – 6/9/87

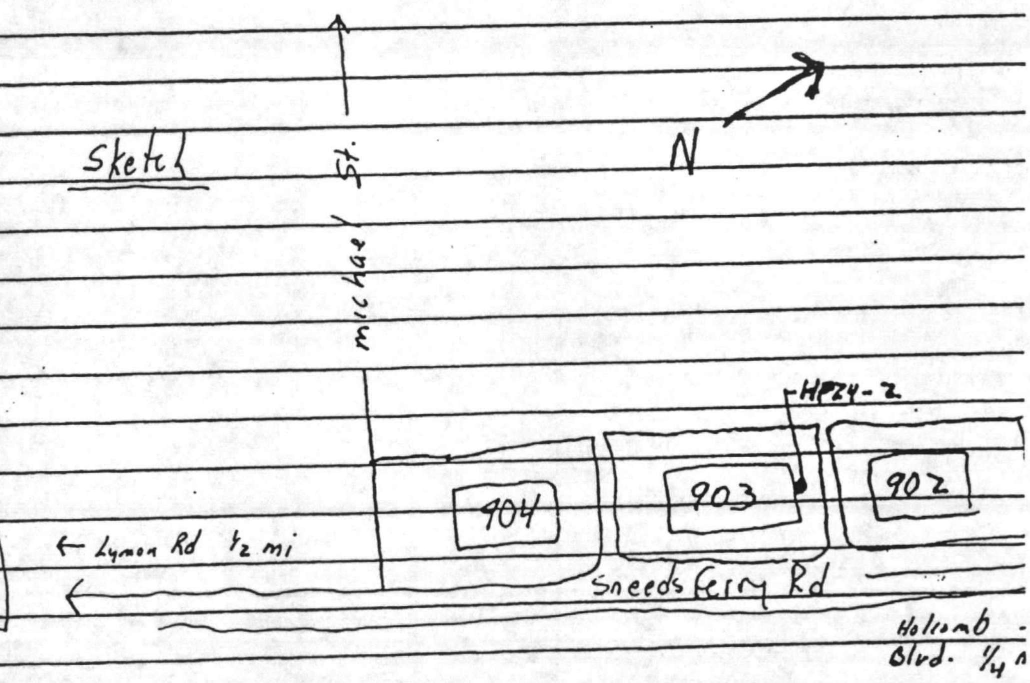
Drilling Stops 300 PM, hole closing, mud pump breaking down

HPGW24-2
On site 700 AM 6/9/87
Well Drilling complete – 1030
Casing + Screen in – 1038
Well complete – 2:30

lunch 1130 - 100 PM

Comments: Drillers worked very well, hole remained open during casing installation (soft fine sand most of hole)





6/8/87
DATE

David A. Bottiger
SIGNED

HPGW 24-3

Hole Size 6⅝" 5" Slot 0.01

Screen Size 2" Mat'l PVC

Casing Size 2" Mat'l PVC

Geologist David Brentlinger

Date Start 6/10/87 Finish 6/18/87

Contractor ESE

Driller Don Sweeting (ATEC)

Filter Materials natural formation

Grout Type Portland #1

Development Bailer

Static Water Level 11.90' BGL

Top of Well Elevation 1.81'; (150' TOC

Drill Type Rotary - Mud

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT)
0-10			silty fine sand with organic matter top 5', some clay layers		
10-15			silty fine sand and organic clay throughout.		
15-20			silty fine - med. sand with coarse sand + pebbles bottom 3'		
20-30			coarse sand TOP 5', silty clayey finesand		
30-35			silty fine sand.		
35-40			silty med sand with clay layers (clay brown with coarse sand)		
40-50			same as above (35-40) little/no coarse material		
50-60			silty med. - coarse sand Rock at 58' (cemented clastics + shells).		

HP24-3

/Size ______ Slot ______

en Size ______ Mat'l ______ Filter Materials ______

ing Size ______ Mat'l ______ Grout Type ______

logist ______ Development ______

ate Start ______ Finish ______ Static Water Level ______

Contractor ______ Top of Well Elevation ______

Driller ______ Drill Type ______

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/FT)
60 - 70	Sand Silt Rock	68-70'	Silty fine-med sand v. little clay, coarse sand well rounded + small shells cemented clastics limestone + shells	very	Hard
70 - 75			Rock (cincmented clastics) shells and coarse sand (well rounded). fine silty sand (74-75)' with less rock and shells		
75 - 80			silty fine sand with gellous clay peds. less 10% coarse sand.		
0 - 85	Soft	Sand Rock (1'2') Sand	fine silty sand; Rock layer (83→84)', silty fine sand		
5 - 90			Silty very fine sand with small shells and rounded v. coarse sand pebbles		
90 - 95			silty med. sand with more shells and coarse sand + pebbles		
95 - 100			Same as above (90-95)		
0 - 105		100-103	Silty fine sand		
		103-104	solid cemented layer		
			[illegible]		

HP6W24-3

Size	Size		
en Size	Mat'l	Filter Materials	
ing Size	Mat'l	Grout Type	
ologist		Development	
ate Start	Finish	Static Water Level	
Contractor		Top of Well Elevation	
Driller		Drill Type	

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/F
105-110			Silty fine - Vc fine sand with shells + rock fragments		
110-115			silty fine sand and coarse sand with cemented clastics shells Coarse sand angular, clear		
115-120			med. sand, 50% semi cemented clastics (gray) and fossils, shells		
120-125			same as above (115-120)		
125-130			silty fine sand with lots of shells + fossils, coarse rounded sand		
130-135			same as above (125-130)		
135-140			silty med sand (angular) with cemented clastics, loosely full of shells		

E HP6WC4-3

Slot

Mat'l

Mat'l

Filter Materials

Grout Type

Development

Static Water Level —

Top of Well Elevation

Drill Type

...art Finish

...ractor

...riller

Depth (feet)	Sample	Sketch	Lithology, Color	USCS	SPT (BL/F
140 - 145			silty fine-med. sand with less shells + Rocks, not much coarse sand		
145 - 150			same as above (140-145)		
150 - 155			silty fine - med. sand little shell + rock		

Boring No. HPGW 24-3 **ATEC** SHEET ______ OF ______

6/18/87
onsite 700 Am ; drilling begins 715
Problems
1030 Am pump Breaks down ; hole 60'

6/15/87 (HPGW 24-3)
On site 0700 Am Drillers arrive 0730
Rig set up and drilling 0815 ; (40' hole closed in).
0930 - Rig's Rods clogged, Helper gets water
1030 - Drilling Resumes
1130 - Drill breaks down ; mud pump broke
need new pump ; get from Raleigh
start up Tuesday ?

6/16/87 (HPGW 24-3)
On site 0830 . drillers arrive
0900 begin working on rig , drilling Begins
1200 pm . 1430 drilling stops at 150' begin pulling Rods.
(130' - 1500) 1500 screen + casing into hole, at 70' hole
closes , casing stuck , after 1 hour driller
pulls casing + screen out ; 1630 off post.

6/17/87
Onsite 0700 Drilling begins 0800 ; hole
closed badly overnight driller trys to set the
casing but fails at 1045 . 1200 pm after 1hr break
driller sets 25' casing (temporary) , casing in place
1350 ; driller begins drilling past casing and
by 1600 bores down to 150' , pulls out and
finally gets screen + casing in hole 1630 ;
off post 1700

DATE SIGNED

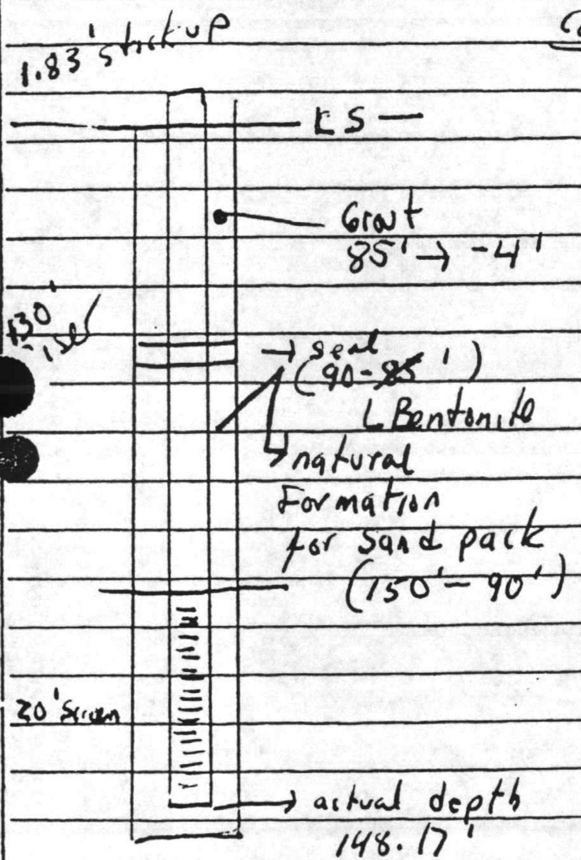
SOURCE: Environmental Science and Engineering, Inc., 1

Boring No. ______ **ATEC** SHEET ______ OF ______

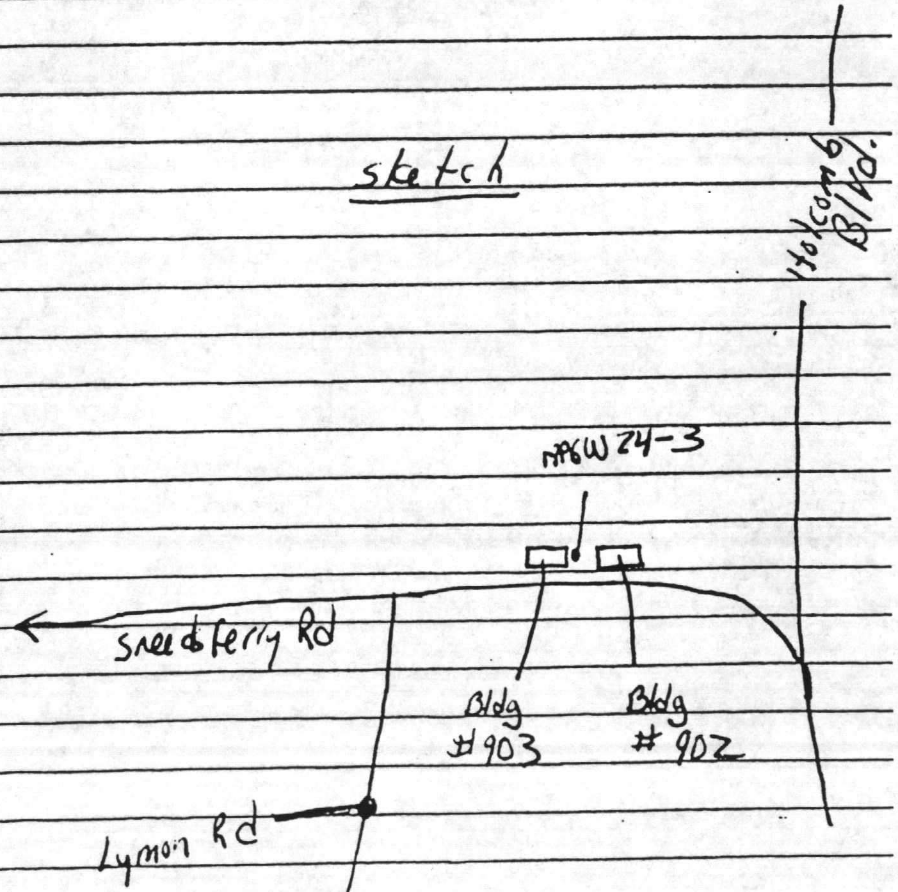
6/18/87 HPGW24-3

On site 0730, drillers arrive 0800. Begin pulling casing 0830 (hole caves to 90') Bentonite (90→80) cement portland #1 to LS well complete 1130. Drillers Breaking down - heading to next hole.

Comments: Strong chemical smell at 50' Broke down consistency of drill mud!



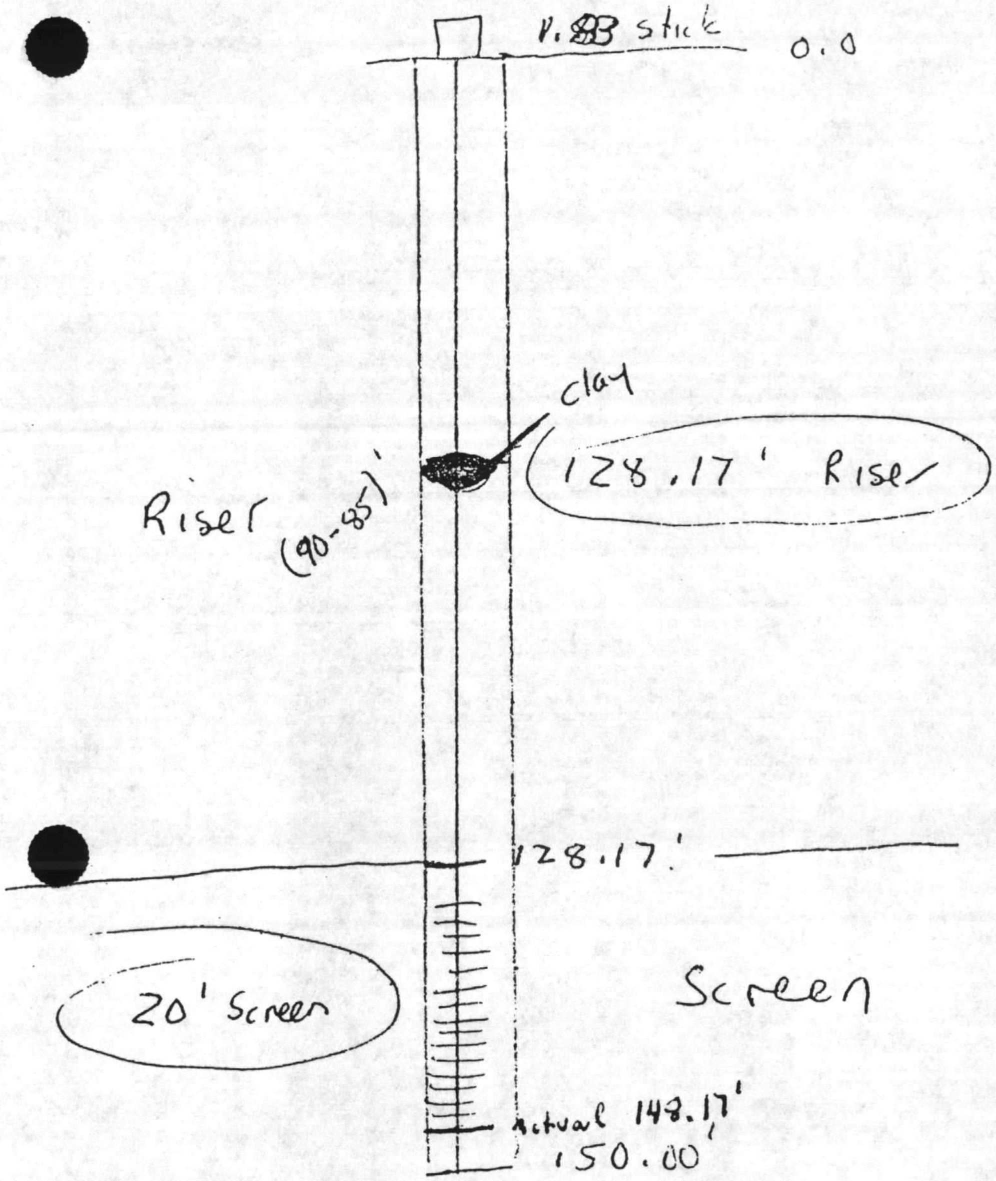
sketch



7/1/87
DATE

[illegible signature]
SIGNED

SOURCE: Environmental Science and Engineering, Inc., 19



148.17
Screen + Riser (BGL,

21.83
-150.00

APPENDIX M
SEWER CAPACITY STUDY

FINAL

SEWER CAPACITY STUDY

HADNOT POINT INDUSTRIAL AREA
MARINE CORPS BASE CAMP LEJEUNE
ONSLOW COUNTY, NORTH CAROLINA

CONTRACT TASK ORDER 0017

Prepared For:

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

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared By:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

MARCH 11, 1993

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1.0 INTRODUCTION

This report documents the Sewer Capacity Study for the Hadnot Point Industrial Area (HPIA) at Marine Corps Base (MCB) Camp Lejeune located in Onslow County, North Carolina. This study is based on the Remedial Design Project Plans for the Interim Remedial Action (IRA) of the Shallow Aquifer at the HPIA, as documented in the Final Record of Decision (ROD) for the HPIA Operable Unit (Baker, September 17, 1992).

This study was completed pursuant to the Revised Implementation Plan and Fee Proposal for Remedial Design Support Studies for the IRA of the Shallow Aquifer at the HPIA, MCB Camp Lejeune, Contract Task Order 001703 under the LANTDIV Clean Program, Contract N62470-89-D-4814.

1.1 Objective of the Study

The objective of this study is to collect and evaluate information to determine the capacity and current usage of the sewer lines proposed for transporting treated groundwater from the two planned groundwater treatment systems located within the HPIA to the HPIA Sewage Treatment Plant (STP). This study will provide accurate sewer line usage rates in order to evaluate whether the sewer lines can handle the proposed groundwater pumping rate of between 40 gpm to 160 gpm.

1.2 Site Description

The HPIA, constructed in the late 1930s, was the first facility at MCB Camp Lejeune. It was comprised of approximately 75 buildings and facilities including maintenance shops, gas stations, administrative offices, commissaries, warehouses, storage yards, and a dry cleaning facility.

Baker Environmental, Inc. (Baker) conducted an IRA Remedial Investigation (RI) and Feasibility Study (FS) for the HPIA during 1991-1992. These studies focused on the shallow groundwater aquifer beneath the HPIA and were based solely on data generated during previous field investigations. The investigations identified two contaminated groundwater plumes in the shallow aquifer at the HPIA, as shown on Figure 1-1. The FS identified seven alternatives for limiting the migration of the contamination in the shallow aquifer and reducing the concentrations of contaminants in the groundwater.

The selected interim remedial action for the shallow aquifer, as documented in the ROD, is groundwater pump-and-treat systems located at the HPIA near each contaminated plume. This IRA will be part of an overall remedy for the HPIA site which will attain protectiveness for the entire operable unit. Each treatment system will employ on-site treatment via air stripping and discharge of the treated groundwater to the sanitary sewer system for final discharge from the HPIA STP. The proposed locations of the treatment systems, as well as the proposed sewer lines to be used to convey groundwater to the STP and the flow meter locations for this study, are also shown on Figure 1-1.

The estimated flow to be added to the sanitary sewer system will come initially from four 4-inch wells installed at each of the two groundwater plumes and pumped at a rate of two to five gpm. These initial wells may contribute up to 20 gpm of groundwater flow to the sanitary sewer system from each contaminated plume. Additional wells may be added to the system as dictated by groundwater monitoring results. The maximum groundwater flow to be added to the sanitary sewer system is estimated to be 80 gpm from each contaminant plume, or a total of 160 gpm.

The sanitary sewer system conveys sanitary wastewater from both residential and industrial areas to the HPIA STP. The sewer lines are constructed of vitrified clay pipe and range in size from 8-inch at the northernmost (and upstream) portion of the sewer system to 36-inch at the inlet to the STP. The HPIA STP, located south of the HPIA area, has an operating capacity of 8 million gallons per day (MGD). The STP is a biological treatment system consisting of an aerated equalization lagoon, primary clarifiers, trickling filters, secondary clarifiers, chlorine contact chamber, anaerobic digesters, and sludge drying beds.

Final discharge of the treated groundwater from the HPIA STP is into the New River. The Environmental Protection Agency and the State of North Carolina Department of Environment, Health and Natural Resources (DEHNR) have concurred with the selection of this interim remedial alternative.

2.0 FLOW MONITORING

2.1 Meter Installation and Monitoring

Flow monitoring was accomplished by installing a "Marsh-McBirney" Model 260 open channel flow meter in three key manholes. The flow meter was linked to a sensing device that monitored velocity and fluid level in the open channel pipe entering the manhole at predetermined time intervals. The meter recorded velocities and fluid levels and calculated flow. This data was then averaged and recorded by the meter at 30 minute intervals. Flow monitoring began on December 8, 1992 and continued through December 29, 1992.

The manholes selected for flow monitoring are shown on Figure 1-1. These manholes were selected because of their location near the point of greatest existing flow in the smallest diameter line which could service the probable tie-in location for the groundwater treatment systems. Flow meter No.1 (FM-1) was installed in the 12-inch line entering the unmarked manhole between MH 806 and MH 807, just north of Birch Street. The tie-in to the sanitary sewer system from the treatment system for the northernmost contaminated plume will most likely be at an upstream point along this 12-inch line. Flow meter No. 2 (FM-2) was installed in the 15-inch line entering MH 115, which is downstream of the probable tie-in location for the treatment system for the southernmost contaminated plume. Although possible metering locations further downstream along this line carry more flow from contributing residential areas, an increase in pipe diameter and slope compensates for this additional flow. Flow meter No. 3 (FM-3) was installed in the 8-inch line entering MH 881 in the alley south of the 900 series buildings. This location was selected to provide flow information in the event that the remedial design process relocates the proposed northernmost treatment area north towards Sneads Ferry Road or determines that a more appropriate tie-in location for the northernmost treatment system is into this 8-inch line to avoid trenching across Michael Road.

2.2 Rainfall Monitoring

Camp Lejeune is influenced by mild winters and humid summers with elevated temperatures. Rainfall averages more than 50 inches per year. The winter and summer months are typically the wet seasons.

Cumulative rainfall totals were monitored during the flow monitoring activities at the base using a self emptying, remote indicator, rain gauge mounted to the roof of the Baker office

trailer. To supplement this effort, daily rainfall data was obtained from the Marine Air Station in Jacksonville.

Total rainfall during the period recorded, December 8 through December 29, 1992, averaged 3.75 inches, with the majority of it falling during one rainfall event on December 10, 1992.

3.0 CAPACITY REPORT

3.1 Line Capacities

Table 3-1 presents the calculated line capacities for the three line segments of the HPIA sewer system which were monitored during this study. The calculations for flow are based on Manning's equation for maximum flow in open pipes, using a depth to diameter at 93.8 percent and the specific n value for the identified type of pipe (vitrified clay).

3.2 Observations

During the installation of the flow meters, a large amount of sediment build-up was observed, particularly in the 8-inch line running along the alley behind the 900 series buildings. This sediment extended upstream into the pipes as far as could be observed. The depth of sediment in the 15-inch pipe at MH 115 and the 12-inch pipe at the manhole between MH 806 and MH 807 was approximately 2 inches. The depth of sediment in the 8-inch pipe at MH 881 was 4 inches. The only useful data acquired from the meters are flow level readings, perhaps as a result of irregular hydraulic conditions resulting from this sediment buildup or other undefinable conditions. The level data have been converted by equation to produce estimated flow quantities, as shown in Table 3-1.

3.3 Monitoring Results

Table 3-1 provides selected data acquired during the flow monitoring period. For each day of monitoring, the maximum depth of flow for the AM period and the PM period is shown, along with the time of occurrence. Using Manning's equation, depth of flow has been converted to flow in cfs, and subtracted from the calculated line capacity to determine the excess capacity remaining in the pipe to accommodate the addition of flow from the groundwater pump-and-treat system. Excess capacity is presented in cubic feet per minute and gallons per minute.

As shown in the table, under normal operating conditions there is on average 25 GPM of excess capacity in the 8-inch line at MH 881, 270 GPM of excess capacity in the 12-inch line at MH 806.5, and 327 GPM of excess capacity in the 15-inch line at MH 115. Under normal operating conditions the sewer system is flowing at a maximum of 86 percent of capacity at MH 881, 50 percent of capacity at MH 806.5, and 53 percent of capacity at MH 115.

Table 3-1
Flow Monitoring Results
MH 881 - 8 Inch Diameter Pipe

DATE	PEAK TIME	DEPTH (IN)	FLOW (CFS)	LINE CAPCITY (CFS)	EXCESS CAPACITY (CFS)	EXCESS CAPACITY (GPM)
08-Dec	05:24 PM	5.80	0.30	0.36	0.07	30.4
09-Dec	09:54 AM	5.90	0.30	0.36	0.06	27.6
09-Dec	10:24 PM	6.40	0.33	0.36	0.03	14.9
10-Dec	11:54 AM	surcharge	n/a	n/a	n/a	n/a
10-Dec	02:54 PM	surcharge	n/a	n/a	n/a	n/a
11-Dec	10:54 AM	6.00	0.31	0.36	0.06	24.9
11-Dec	09:24 PM	6.60	0.34	0.36	0.02	10.6
12-Dec	12:54 AM	6.00	0.31	0.36	0.06	24.9
12-Dec	12:54 PM	5.70	0.29	0.36	0.07	33.2
13-Dec	01:24 AM	5.60	0.28	0.36	0.08	36.2
13-Dec	06:54 PM	5.60	0.28	0.36	0.08	36.2
14-Dec	01:24 AM	6.10	0.31	0.36	0.05	22.2
14-Dec	11:54 PM	6.80	0.35	0.36	0.02	6.9
15-Dec	07:24 AM	6.20	0.32	0.36	0.04	19.7
15-Dec	04:54 PM	5.90	0.30	0.36	0.06	27.6
16-Dec	01:54 AM	6.60	0.34	0.36	0.02	10.6
16-Dec	12:24 PM	6.00	0.31	0.36	0.06	24.9
17-Dec	11:54 AM	6.20	0.32	0.36	0.04	19.7
17-Dec	01:24 PM	5.80	0.30	0.36	0.07	30.4
18-Dec	11:24 AM	6.00	0.31	0.36	0.06	24.9
18-Dec	03:54 PM	6.40	0.33	0.36	0.03	14.9
19-Dec	11:54 AM	6.40	0.33	0.36	0.03	14.9
19-Dec	12:24 PM	6.00	0.31	0.36	0.06	24.9
20-Dec	01:54 AM	5.90	0.30	0.36	0.06	27.6
20-Dec	05:54 PM	5.90	0.30	0.36	0.06	27.6
21-Dec	10:54 AM	6.00	0.31	0.36	0.06	24.9
21-Dec	12:54 PM	5.80	0.30	0.36	0.07	30.4
22-Dec	11:54 AM	6.30	0.33	0.36	0.04	17.2
22-Dec	01:24 PM	5.90	0.30	0.36	0.06	27.6
23-Dec	03:54 AM	6.10	0.31	0.36	0.05	22.2
23-Dec	09:24 PM	6.30	0.33	0.36	0.04	17.2
24-Dec	09:24 AM	6.20	0.32	0.36	0.04	19.7
24-Dec	08:24 PM	5.70	0.29	0.36	0.07	33.2
25-Dec	09:54 AM	5.70	0.29	0.36	0.07	33.2
25-Dec	04:24 PM	5.80	0.30	0.36	0.07	30.4
26-Dec	12:24 AM	6.30	0.33	0.36	0.04	17.2
26-Dec	02:54 PM	5.70	0.29	0.36	0.07	33.2
27-Dec	04:24 AM	5.90	0.30	0.36	0.06	27.6
27-Dec	06:24 PM	5.70	0.29	0.36	0.07	33.2
28-Dec	07:54 AM	5.80	0.30	0.36	0.07	30.4
28-Dec	07:24 PM	5.90	0.30	0.36	0.06	27.6
29-Dec	10:54 AM	6.20	0.32	0.36	0.04	19.7
					AVG	25

Table 3-1 (continued)
Flow Monitoring Results
MH 806.5 - 12 Inch Diameter Pipe

DATE	PEAK TIME	DEPTH (IN)	FLOW (CFS)	LINE CAPACITY (CFS)	EXCESS CAPACITY (CFS)	EXCESS CAPACITY (GPM)
08-Dec	09:49 AM	7.63	0.83	1.22	0.39	189.4
08-Dec	12:19 PM	4.93	0.61	1.22	0.61	295.9
09-Dec	05:49 AM	6.63	0.67	1.22	0.55	268.2
09-Dec	12:49 PM	5.63	0.58	1.22	0.64	310.5
10-Dec	06:19 AM	surcharge	n/a	n/a	n/a	n/a
10-Dec	12:19 PM	surcharge	n/a	n/a	n/a	n/a
11-Dec	11:49 AM	6.63	0.67	1.22	0.55	268.2
11-Dec	10:49 PM	5.93	0.57	1.22	0.65	316.6
12-Dec	05:49 AM	5.93	0.57	1.22	0.65	316.6
12-Dec	03:49 PM	5.73	0.58	1.22	0.64	312.6
13-Dec	03:19 AM	5.73	0.58	1.22	0.64	312.6
13-Dec	02:49 PM	6.13	0.59	1.22	0.63	307.8
14-Dec	02:19 AM	6.33	0.62	1.22	0.60	292.0
14-Dec	01:19 PM	6.33	0.62	1.22	0.60	292.0
15-Dec	09:19 AM	6.83	0.70	1.22	0.52	252.4
15-Dec	12:19 PM	5.63	0.58	1.22	0.64	310.5
16-Dec	08:49 AM	7.03	0.73	1.22	0.48	236.5
16-Dec	11:49 PM	5.33	0.59	1.22	0.62	304.3
17-Dec	05:49 AM	6.63	0.67	1.22	0.55	268.2
17-Dec	08:49 PM	5.83	0.57	1.22	0.64	314.6
18-Dec	04:49 AM	7.23	0.76	1.22	0.45	220.7
18-Dec	12:49 PM	6.23	0.60	1.22	0.61	299.9
19-Dec	06:19 AM	6.23	0.60	1.22	0.61	299.9
19-Dec	05:49 PM	5.83	0.57	1.22	0.64	314.6
20-Dec	03:49 AM	5.73	0.58	1.22	0.64	312.6
20-Dec	03:49 PM	5.73	0.58	1.22	0.64	312.6
21-Dec	07:19 AM	5.93	0.57	1.22	0.65	316.6
21-Dec	01:49 PM	5.93	0.57	1.22	0.65	316.6
22-Dec	07:19 AM	6.93	0.72	1.22	0.50	244.4
22-Dec	05:19 PM	6.33	0.62	1.22	0.60	292.0
23-Dec	03:49 AM	7.23	0.76	1.22	0.45	220.7
23-Dec	09:19 PM	5.33	0.59	1.22	0.62	304.3
24-Dec	02:49 AM	5.83	0.57	1.22	0.64	314.6
24-Dec	09:19 PM	5.33	0.59	1.22	0.62	304.3
25-Dec	03:19 AM	5.63	0.58	1.22	0.64	310.5
25-Dec	03:19 PM	5.63	0.58	1.22	0.64	310.5
26-Dec	03:19 AM	5.53	0.58	1.22	0.63	308.5
26-Dec	08:19 PM	5.03	0.61	1.22	0.61	298.0
27-Dec	12:19 AM	5.13	0.60	1.22	0.61	300.1
27-Dec	07:19 PM	5.53	0.58	1.22	0.63	308.5
28-Dec	04:49 AM	6.23	0.60	1.22	0.61	299.9
28-Dec	12:49 PM	5.43	0.59	1.22	0.63	306.4
29-Dec	02:49 AM	5.63	0.58	1.22	0.64	310.5
					AVG	293

Table 3-1 (continued)
Flow Monitoring Results
MH 115 - 15 Inch Diameter Pipe

DATE	PEAK TIME	DEPTH (IN)	FLOW (CFS)	LINE CAPACITY (CFS)	EXCESS CAPACITY (CFS)	EXCESS CAPACITY (GPM)
08-Dec	10:02 AM	7.70	0.75	1.54	0.79	387.2
08-Dec	12:02 PM	7.10	0.73	1.54	0.81	395.0
09-Dec	11:02 AM	7.90	0.78	1.54	0.76	371.2
09-Dec	12:02 PM	7.50	0.72	1.54	0.82	403.1
10-Dec	09:02 AM	surcharge	n/a	n/a	n/a	n/a
10-Dec	12:02 PM	surcharge	n/a	n/a	n/a	n/a
11-Dec	12:02 AM	11.80	1.38	1.54	0.16	80.3
11-Dec	12:02 PM	10.80	1.24	1.54	0.30	145.4
12-Dec	12:02 AM	7.90	0.78	1.54	0.76	371.2
12-Dec	12:32 PM	6.20	0.77	1.54	0.77	376.0
13-Dec	01:32 AM	5.60	0.80	1.54	0.74	363.6
13-Dec	04:02 PM	6.50	0.76	1.54	0.78	382.3
14-Dec	07:02 AM	7.70	0.75	1.54	0.79	387.2
14-Dec	12:02 PM	7.10	0.73	1.54	0.81	395.0
15-Dec	10:02 AM	6.60	0.75	1.54	0.79	384.5
15-Dec	12:02 PM	6.40	0.76	1.54	0.78	380.2
16-Dec	10:02 AM	6.40	0.76	1.54	0.78	380.2
16-Dec	12:02 PM	6.30	0.77	1.54	0.77	378.1
17-Dec	06:32 AM	8.20	0.83	1.54	0.71	347.1
17-Dec	12:02 PM	6.20	0.77	1.54	0.77	376.0
18-Dec	08:02 AM	6.10	0.78	1.54	0.76	373.9
18-Dec	12:02 PM	6.00	0.78	1.54	0.76	371.8
19-Dec	06:32 AM	5.30	0.81	1.54	0.73	357.8
19-Dec	12:02 PM	4.90	0.82	1.54	0.72	350.7
20-Dec	08:32 AM	5.30	0.81	1.54	0.73	357.8
20-Dec	12:32 PM	5.40	0.81	1.54	0.74	359.7
21-Dec	05:02 AM	6.70	0.75	1.54	0.79	386.6
21-Dec	01:02 PM	7.30	0.72	1.54	0.82	399.1
22-Dec	08:32 AM	6.50	0.76	1.54	0.78	382.3
22-Dec	12:02 PM	5.60	0.80	1.54	0.74	363.6
23-Dec	05:02 AM	5.80	0.79	1.54	0.75	367.6
23-Dec	12:32 PM	4.40	0.84	1.54	0.70	343.4
24-Dec	06:02 AM	5.80	0.79	1.54	0.75	367.6
24-Dec	05:02 PM	5.00	0.82	1.54	0.72	352.4
25-Dec	07:32 AM	5.70	0.79	1.54	0.75	365.6
25-Dec	04:02 PM	5.20	0.81	1.54	0.73	356.0
26-Dec	04:32 AM	6.30	0.77	1.54	0.77	378.1
26-Dec	08:32 PM	6.50	0.76	1.54	0.78	382.3
27-Dec	10:02 AM	7.30	0.72	1.54	0.82	399.1
27-Dec	06:02 PM	9.00	0.96	1.54	0.58	282.8
28-Dec	05:02 AM	9.90	1.11	1.54	0.43	212.0
28-Dec	02:02 PM	7.20	0.73	1.54	0.81	397.0
29-Dec	05:02 AM	8.10	0.81	1.54	0.73	355.2
					AVG	355

During the significant rainfall event of December 10 which measured 3.67 at the Marine Air Station in Jacksonville, all of the monitored manholes experienced surcharge conditions. This means that due to inflow and/or infiltration, the flow of water exceeded the capacity of the sewer system, and as a result water backed up in the monitored manholes. Inflow is water discharged into sewer pipes from sources such as foundation drains, roof drains, cellars or from other commercial or industrial establishments. Infiltration is groundwater entering sewers through defective joints and broken or cracked pipe or manholes. The height of surcharge in MH 881 (FM-3) was recorded at 17 inches. More severe surcharges were measured by FM-1 at MH 806.5 (62 inches) and by FM-2 at MH 115 (46 inches).

4.0 SUMMARY AND RECOMMENDATIONS

This sewer capacity study involved the flow monitoring of three key manholes within the HPIA sanitary sewer system. Information was obtained which will assist in the design of the proposed groundwater pump-and-treat for the Interim Remedial Action of the Shallow Aquifer at the HPIA.

Under normal operating conditions, there is sufficient excess capacity in the 12-inch and larger sewer lines to accept the anticipated additional flow of 40 GPM to 160 GPM of treated groundwater. Based on the monitoring results, it is recommended that the 8-inch line not be used as a tie-in location for the system.

During severe rainfall events, inflow and infiltration result in excessive flows in the sewer system causing surcharges at the manholes. Design details should be incorporated into the pump-and-treat system to protect against extreme surcharges. These include a check valve in the clean water discharge line to prevent backflow, and a level switch at the clean water sump to stop groundwater pumping when excessive hydraulic head due to surcharging is encountered.

As a secondary, long-term recommendation, cleaning of the sewer lines, particularly the 8-inch lines, and grouting of the lines based on closed circuit television inspection would be beneficial to the cost-effective operation of the HPIA Sewage Treatment Plant.

APPENDIX N
AIR STRIPPER EMISSIONS REPORT

Internal Memorandum - Air Emissions Groundwater Treatment System
MCB Camp Lejeune

Introduction

The purpose of this document is to review the air quality impact of an air stripper that is being considered as part of a groundwater treatment system for remediating a former fuel tank farm located at the United States Marine Corps Base Camp Lejeune in Onslow County, North Carolina.

Previous studies indicate that the shallow groundwater is contaminated with benzene, 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE), and vinyl chloride (VC). These volatile organic compounds (VOCs) will be stripped from the groundwater to a gaseous stream that will be exhausted to the atmosphere.

Emissions Estimation

The maximum concentrations of the VOCs emitted from the air stripper are shown below:

benzene	7,900 ug/l
1,2-DCE	42,000 ug/l
TCE	14,000 ug/l
VC	360 ug/l

Assuming worst-case conditions, the maximum concentration of each VOC will be emitted continuously during the operation of the air stripper. Hourly VOC emissions may be estimated as follows:

$$\underset{(\text{lb/hr})}{\text{Hourly Emissions}} = \underset{(\text{ug/l})}{\text{Max VOC Conc.}} \times \underset{(\text{gal/min})}{\text{Stripper Exhaust Flowrate}} \times \frac{60\ \text{min}}{\text{hr}} \times \frac{1\ \text{lb}}{454\text{x}10^{6}\ \text{ug}} \times \frac{3.785\ \text{l}}{\text{gal}}$$

The stripper exhaust flowrate is assumed to be 80 gal/min. Combining all constants in the equation above yields the following equation:

$$\underset{(\text{lb/hr})}{\text{Hourly Emissions}} = 4\text{x}10^{-5}\ (\text{Max VOC Concentration, ug/l})$$

Daily VOC emissions may be estimated based on an assumed air stripper operation of 24 hours per day.

Annual VOC emissions may be estimated based on an assumed air stripper operation of 365 days per year.

15-minute VOC emissions may be estimated from the hourly emissions be assuming that 1/4 of the hourly emissions are emitted during each 15-minute interval.

Benzene, 1,2-DCE, TCE, and VC airborne emissions from the air stripper are shown in Table 1.

Regulatory Review

The following North Carolina air regulations are applicable to the air stripper.

15A NCAC 2D.0518 - Miscellaneous Volatile Organic Compound Emissions

This rule states the following:

"A person shall not discharge from all sources at any one plant site more than a total of 40 pounds of photochemically reactive solvent into the atmosphere in any one day, from any article, machine, equipment, or other contrivance used for employing, applying, evaporating, or drying any photochemically reactive solvent or substance containing such solvent unless the discharge has been reduced by at least 85 percent by weight."

This rule implies that the 85 percent VOC emission reduction must be achieved site-wide but not necessarily by each emission source. Thus, some emission sources may achieve greater than 85 percent reduction, while others may be controlled to a less stringent level as long as the overall 85 percent reduction is achieved.

It is unclear whether of not MCB Camp Lejeune is currently complying with this rule. If the base currently is complying, then an evaluation must be performed to determine if it would be most cost-effective to install an 85 percent efficient control device onto the exhaust of the air stripper or to offset the increased emissions from an uncontrolled air stripper by reducing emissions from another source or to employ some intermediate strategy.

If the base currently is not complying, then a site-wide evaluation must be performed to determine the most cost-effective strategy to meet the rule.

15A NCAC 2H.0600 - Air Quality Permits

This rule requires that a permit to emit toxic air pollutants be obtained from any facility whose actual emissions from all sources exceed de minimis emission rates for any of 105 listed air toxic compounds.

The de minimis emission rates for benzene, 1,2-DCE, TCE, and VC are shown in Table 2.

MCB Camp Lejeune is already in the process of obtaining an air permit per this rule. An air emissions inventory

performed by Baker Environmental, Inc. revealed that the site exceeds several of the de minimis air toxic emission rates listed in this rule.

TABLE 1
AIR STRIPPER AIRBORNE EMISSIONS

Pollutant	Emission Rate			
	lb/15-min	lb/hr	lb/day	lb/yr
Benzene	0.079	0.32	7.6	2,770
1,2-DCE	0.42	1.7	40	14,720
TCE	0.14	0.56	14	4,906
VC	0.0036	0.014	0.35	130

TABLE 2
DE MINIMIS EMISSION RATES

Pollutant	De Minimis Emission Rate	Actual Emission Rate	Emission Limit Exceeded?
Benzene	8.1 lb/yr	2,770 lb/yr	YES
1,2-DCE	NONE		N/A
TCE	4,000 lb/yr	4,906 lb/yr	YES
VC	26 lb/yr	130 lb/yr	YES

APPENDIX O
O'BRIEN & GERE PRELIMINARY ENGINEERING REPORT

Preliminary
Engineering Report

Product Recovery System Design Hadnot Point Fuel Farm Marine Corps Base Camp LeJeune, NC

Contract No. N62470-88-D-5825

Naval Facilities Engineering Command
Norfolk, Virginia

January 1990

O'BRIEN & GERE

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SECTION 2 - FIELD INVESTIGATIONS

2.01 General

The following investigations were conducted during the field study: monitoring well installation; grain size analysis; groundwater elevation and product thickness monitoring; aquifer analysis; groundwater sampling and analysis; and an engineering survey. These investigations were required to gather information to assist in the design of a recovery system that will efficiently remove the free product that exists at the HPFF. The field investigations are detailed below.

2.02 Well Installation

The locations of the groundwater monitoring wells were based upon consideration of the hydrogeologic conditions and the assessment of petroleum leakage in the study area. The placement of the wells, as illustrated in Figure 4, was selected to provide a more precise delineation of the extent of the product plume and to assist in evaluating the aquifer conditions during the pump test of the aquifer. Five (5) 2-inch PVC monitoring wells and two (2) 6-inch PVC test/recovery wells were installed at the HPFF. The 2-inch monitoring wells were constructed of Schedule 40 flush joint threaded PVC well screen (0.020 slot) and riser to a depth of 15 feet with 10 feet of screen. The 6-inch wells were constructed of Schedule 40 PVC with the screen constructed of continuous slot wire wrapped PVC (0.020 slot size). Recovery well

#1 was installed to a depth of 34 feet while recovery well #2 was installed to a depth of 33 feet below grade. Well construction diagrams and bore logs are included as Appendix A.

All wells were installed and constructed in accordance with NAVFAC guidelines and specifications, included in Appendix B. During the drilling program, boreholes were advanced using hollow stem auger. All wells were developed following installation to remove fine-grained materials that may have entered the well during construction. This was accomplished by a combination of the continuous low yield pumping; and air-lift pumping. Equipment used for well installation was decontaminated with a high pressure steam cleaner. Fluid generated from well development and equipment decontamination was discharged to the ground.

2.03 Grain Size Analysis

Grain size analysis was conducted on five (5) samples representative of the subsurface soils. Samples were initially obtained from split spoon samples; however, the split spoon did not provide enough of a sample. The augers were spun at the depth interval for 2-5 minutes to allow representative material to reach the surface and then a sediment sample was collected. The samples were obtained from each of the product recovery wells and from monitoring well #22. Each one kilogram sample of subsurface material was shipped to McCallum Testing Laboratories, Inc., located in Chesapeake, Virignia, for sieve analysis per ASTM D-422. The results of the grain size analysis are included as Appendix C,

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and will be used to specify the well screen and sand pack for the proposed recovery well during the design of the recovery system.

2.04 Groundwater Elevation and Product Thickness Monitoring

Groundwater elevations and product thickness measurements were collected from all of the HPFF monitoring wells before any work was performed at the site and upon completion of well installation. An oil/water interface probe was used to measure product thickness and groundwater elevation to the nearest 0.01 ft. These measurements, as well as measurements conducted during 1988, are summarized on Tables 2 and 3. These measurements are used in Section 3 to determine the hydraulic gradient, direction of groundwater flow, and assess the extent of free-phased product currently at the HPFF.

2.05 Aquifer Analysis

A short term pump test was performed on each of the 6-inch wells. This test was conducted to estimate design flow rates, and determine the site specific aquifer transmissivity, hydraulic conductivity, and the pumping wells radius of influence.

The test was conducted over an 8 hour period under the supervision of a hydrogeologist from O'Brien & Gere. Each well was pumped with a submersible pump at a constant rate for the duration of the test. The pumping rate was measured every 15 minutes during the aquifer testing. Water levels in the pumping and neighboring monitoring wells were recorded for the duration of the aquifer

test. Following the pump test, the residual-drawdown (recovery) rate was measured until the aquifer had reached 95% recovery.

Pump test data was tabulated and analyzed using Theis type curves, the Cooper and Jacob modification of the Theis equation, and the pump test well recovery curves. Each evaluation of the data produced a slightly different value for the various aquifer parameters. This results in a range of values being presented for each paramter (Appendix D). Using the Theis nonequilibrium well equation, a radius of influence was calculated to extend 300-400 feet after 60 days of pumping. The boundary of the radius of influence for this calculation is defined at a 0.1 foot drawdown of the aquifer.

Evaluating the various coefficients that were determined using the three methods allows an estimate of aquifer characteristics for final design. For the purposes of final design the assumed aquifer characteristics are as follows:

Transmissivity:	=	500 gpd/ft
Well Yield	=	3 gpm
Saturated Thickness	=	19-22 ft
Radius of influence	=	300-400 ft

2.06 Groundwater Sampling and Analysis

Groundwater samples were collected from each of the newly installed monitoring wells on a single occasion. A total of seven (7) samples were analyzed for volatile organic compounds and lead in accordance with the procedures outlined in the sampling and analysis plan included as Appendix E. The results will be forwarded as a separate submission.

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2.07 Engineering Survey

A topographic survey was conducted at the site to establish the horizontal location and elevation of above-grade features at the site. The topographic survey included the locations of catch basins, hydrants, power poles, manholes, roadways, buildings, tanks, fencing, monitoring wells, and any other indicators of subgrade utilities. Each monitoring well had the following points surveyed: top of PVC inner casing and ground elevation.

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Well Name: RW#1

Aquifer Thickness (b): 22.000 feet

Date of Test: 12/15/89

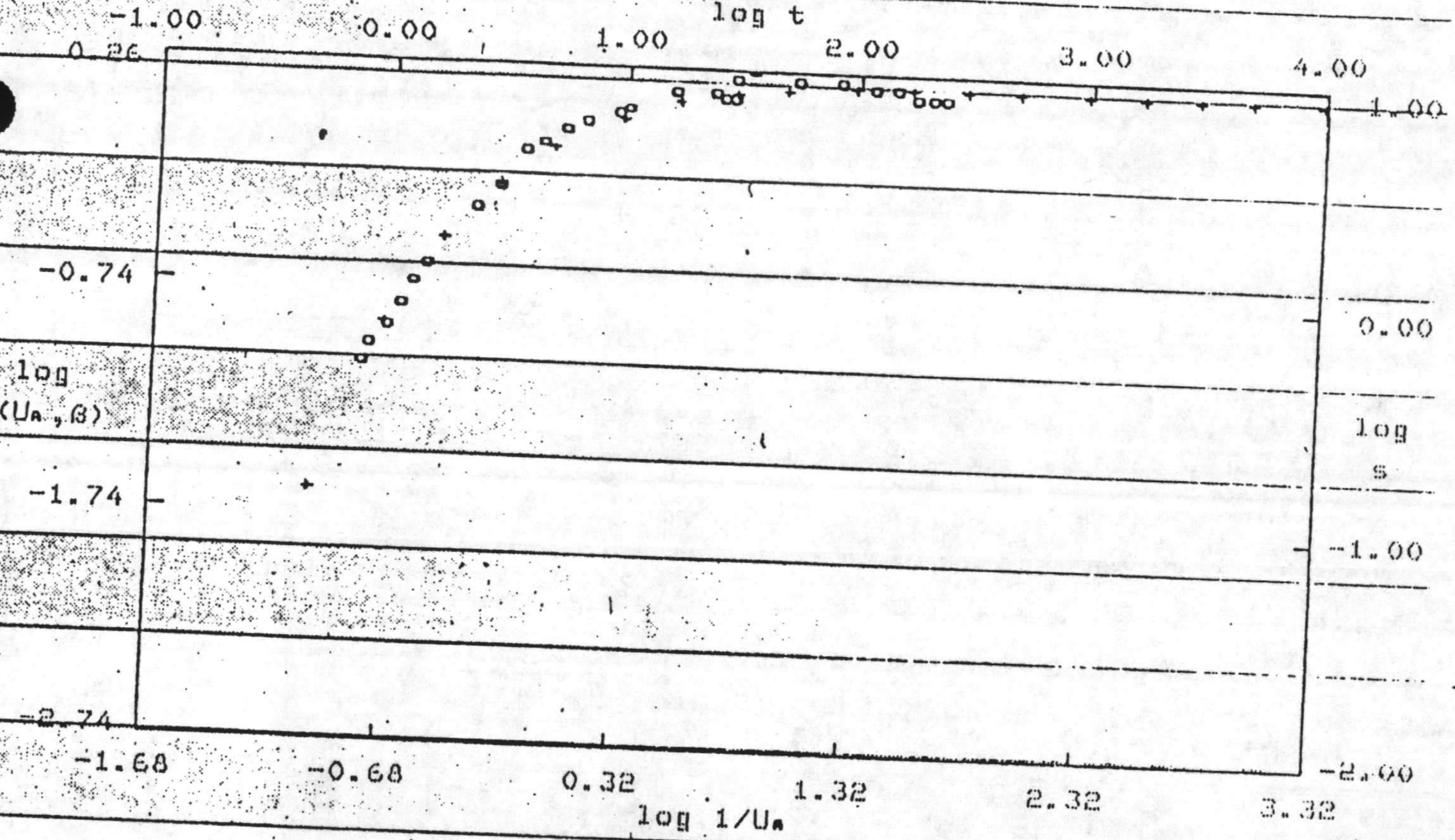
Pumped Well Discharge(Q) = 3.000 gpm

Radius of Pumping Well = 0.500 feet

Distance of Observation Well from Pumping Well = 0.500 feet

Entry No.	Time(t) (min.)	Drawdown(s) (ft.)	t / d² (min./sq.ft.)
********	************	************	*************
1	0.000	12.350	
2	0.780	0.450	3.12E+00
3	0.830	0.550	3.32E+00
4	0.980	0.650	3.92E+00
5	1.120	0.850	4.48E+00
6	1.250	1.050	5.00E+00
7	1.410	1.250	5.64E+00
8	2.280	2.250	9.12E+00
9	2.910	2.850	1.16E+01
10	3.670	4.150	1.47E+01
11	4.380	4.650	1.75E+01
12	5.380	5.150	2.15E+01
13	6.630	5.650	2.65E+01
14	9.083	6.420	3.63E+01
15	10.083	6.650	4.03E+01
16	15.670	7.850	6.27E+01
17	23.330	7.770	9.33E+01
18	26.000	7.550	1.04E+02
19	28.000	7.500	1.12E+02
20	29.000	8.950	1.16E+02
21	34.000	10.150	1.36E+02
22	54.000	9.150	2.16E+02
23	84.000	9.080	3.36E+02
24	114.000	8.870	4.56E+02
25	144.000	8.550	5.76E+02
26	174.000	8.060	6.96E+02
27	204.000	7.950	8.16E+02
28	234.000	7.850	9.36E+02
29	264.000	10.830	1.06E+03
30	294.000	10.810	1.18E+03
31	324.000	10.850	1.30E+03

...point recovery well #1



o - Data

+ - Type Curve
Unconfined Elastic: beta = 0.10

SOLUTION

Transmissivity = 6.255E+01 gal/day/ft
Aquifer Thick. = 2.200E+01 ft
Hydraulic Cond.= 2.843E+00 gal/day/sq ft
Storativity = 1.112E-01

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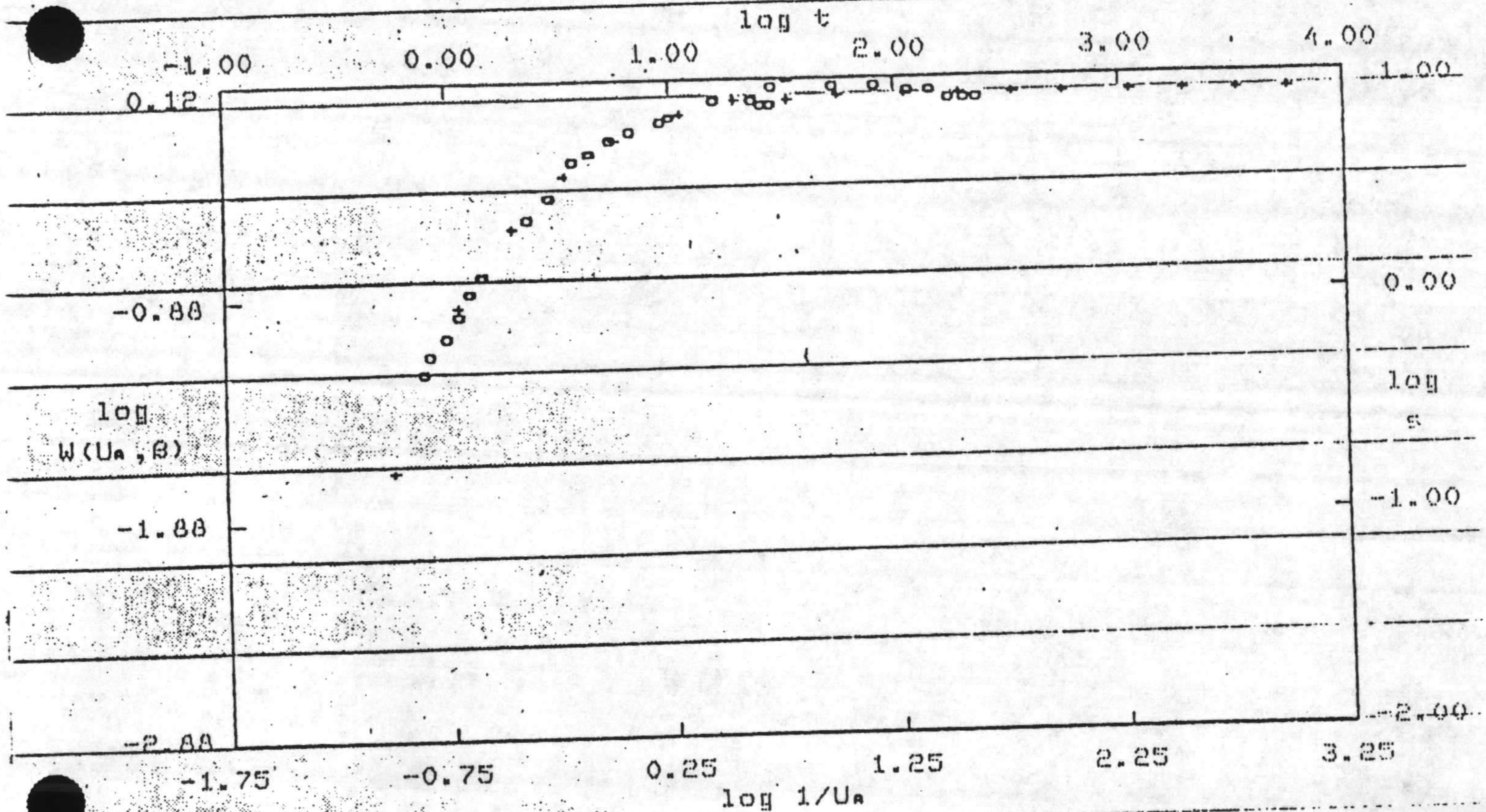
hadnot point recovery well #1



o - Data

~~+ Type Curve~~
Unconfined Elastic: beta = 0.20

SOLUTION

Transmissivity = 4.531E+01 gal/day/ft
~~Aquifer Thick. = 2.200E+01 ft~~
Hydraulic Cond.= 2.060E+00 gal/day/sq ft
Storativity = 9.463E-02

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Data for Pump Test

Well Name: rw2

Aquifer Thickness (b): 19.000 feet

Date of Test: 12/15/89

Pumped Well Discharge(Q) = 2.000 gpm

Radius of Pumping Well = 0.500 feet

Distance of Observation Well from Pumping Well = 0.100 feet

Entry No.	Time(t) (min.)	Drawdown(s) (ft.)	t / d^2 (min./sq.ft.)
********	************	************	*************
1	0.000	14.400	
2	0.170	0.200	1.70E+01
3	0.200	0.300	2.00E+01
4	0.270	0.350	2.70E+01
5	0.350	0.400	3.50E+01
6	0.420	0.450	4.20E+01
7	0.470	0.490	4.70E+01
8	0.600	0.550	6.00E+01
9	0.830	0.700	8.30E+01
10	0.920	0.760	9.20E+01
11	1.000	0.800	1.00E+02
12	2.300	1.200	2.30E+02
13	2.570	1.400	2.57E+02
14	2.920	1.600	2.92E+02
15	3.250	1.800	3.25E+02
16	3.600	2.000	3.60E+02
17	4.270	2.200	4.27E+02
18	5.500	2.400	5.50E+02
19	5.930	2.500	5.93E+02
20	6.670	2.700	6.67E+02
21	7.670	2.900	7.67E+02
22	8.730	3.100	8.73E+02
23	9.670	3.600	9.67E+02
24	10.350	3.700	1.03E+03
25	11.000	3.900	1.10E+03
26	17.630	4.250	1.76E+03
27	19.630	4.700	1.96E+03
28	21.480	5.150	2.15E+03
29	33.930	6.100	3.39E+03
30	50.700	6.260	5.07E+03
31	65.650	6.250	6.56E+03
32	108.000	5.950	1.08E+04
33	134.000	6.750	1.34E+04
34	180.000	6.580	1.80E+04
35	240.000	6.300	2.40E+04
36	300.000	5.150	3.00E+04
37	330.000	7.430	3.30E+04
38	360.000	7.580	3.60E+04

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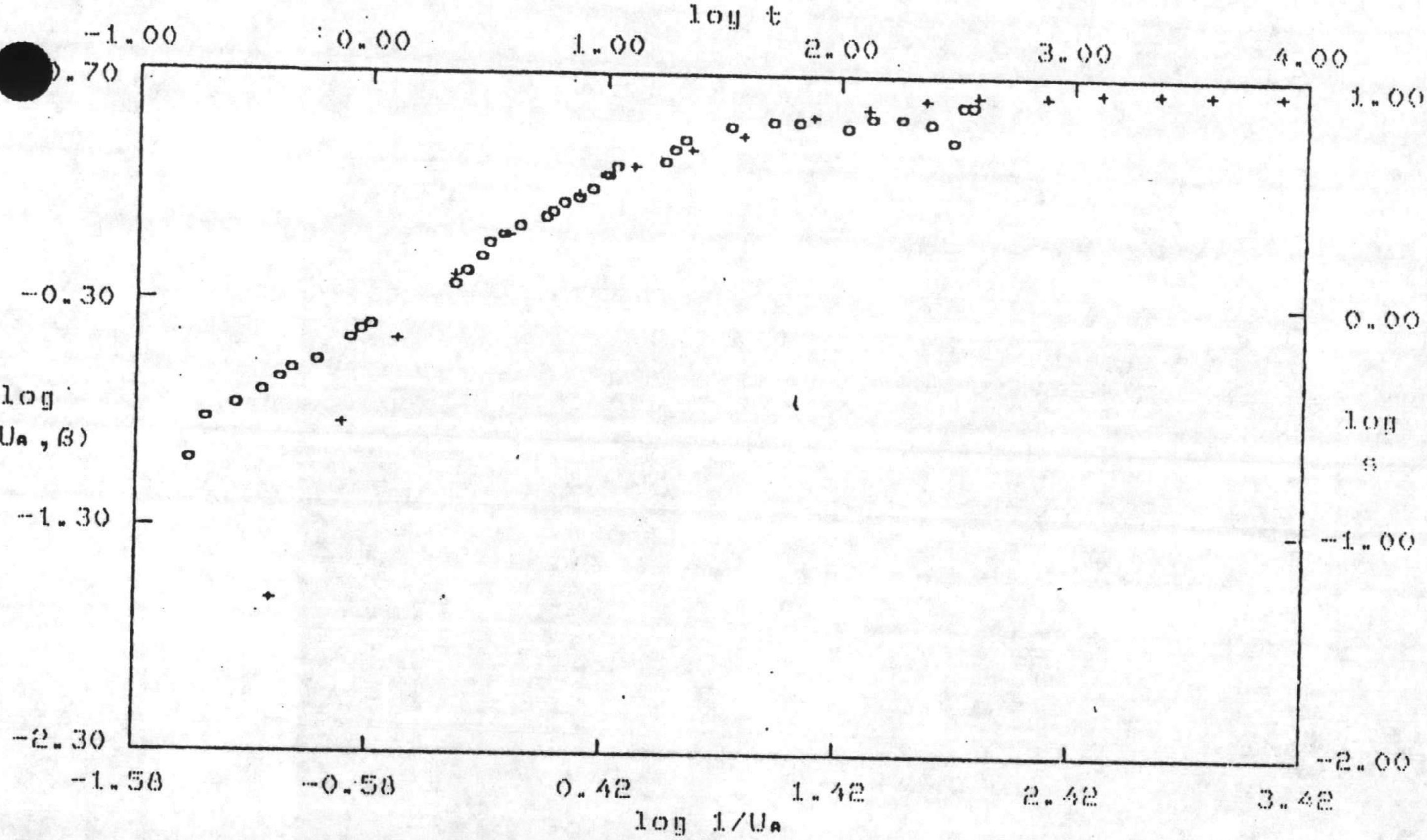
hadnot point RW#2



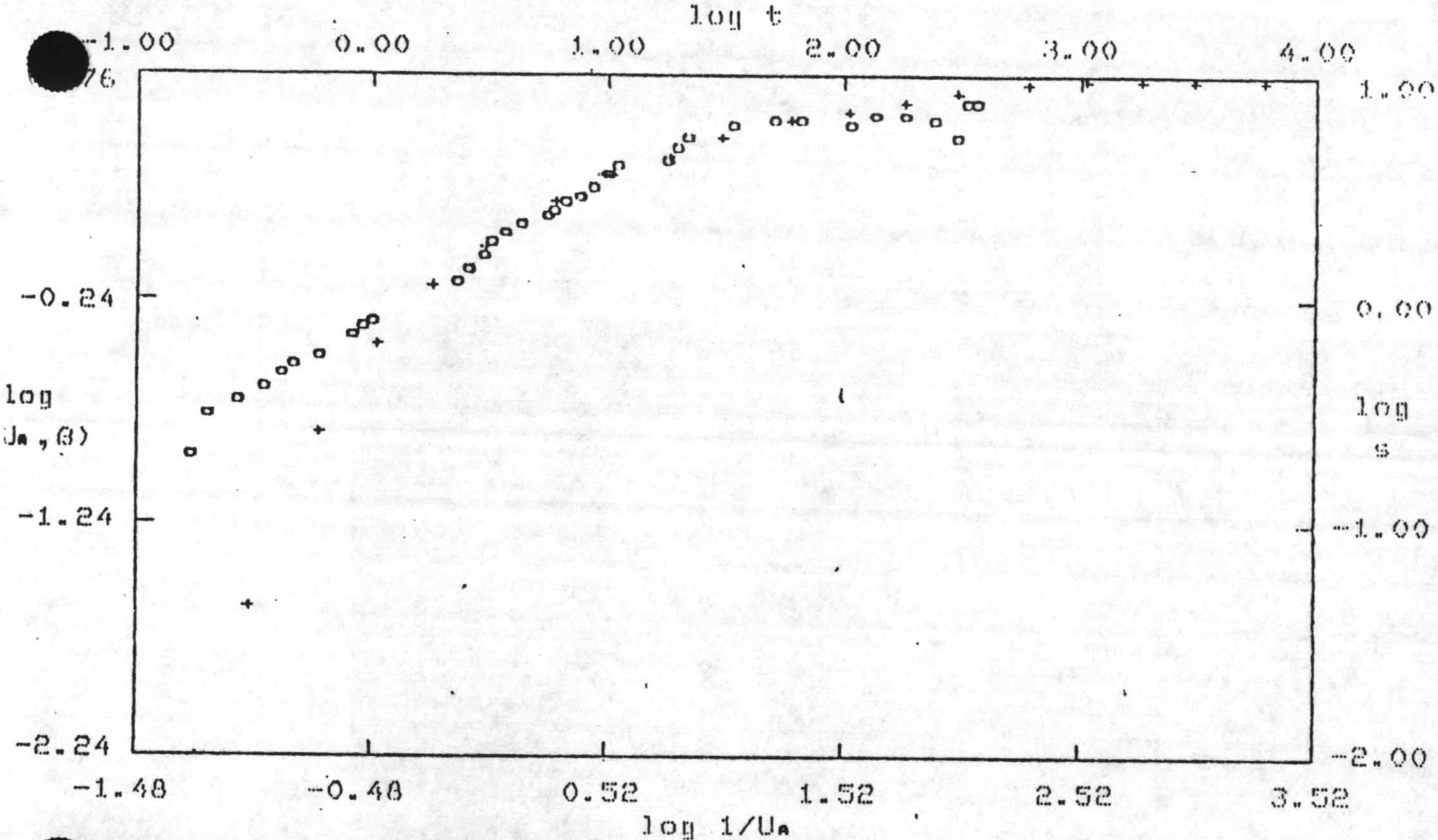
o - Data

+ - Type Curve
Unconfined Elastic: beta = 0.004

SOLUTION

Transmissivity = 1.148E+02 gal/day/ft
Aquifer Thick. = 1.900E+01 ft
Hydraulic Cond.= 6.044E+00 gal/day/sq ft
Storativity = 4.054E+00

nadnot point Rw#2



o - Data

+ - Type Curve
Unconfined Elastic: beta = 0.001

SOLUTION

Transmissivity = 1.319E+02 gal/day/ft
Aquifer Thick. = 1.900E+01 ft
Hydraulic Cond. = 6.940E+00 gal/day/sq ft
Storativity = 3.697E+00

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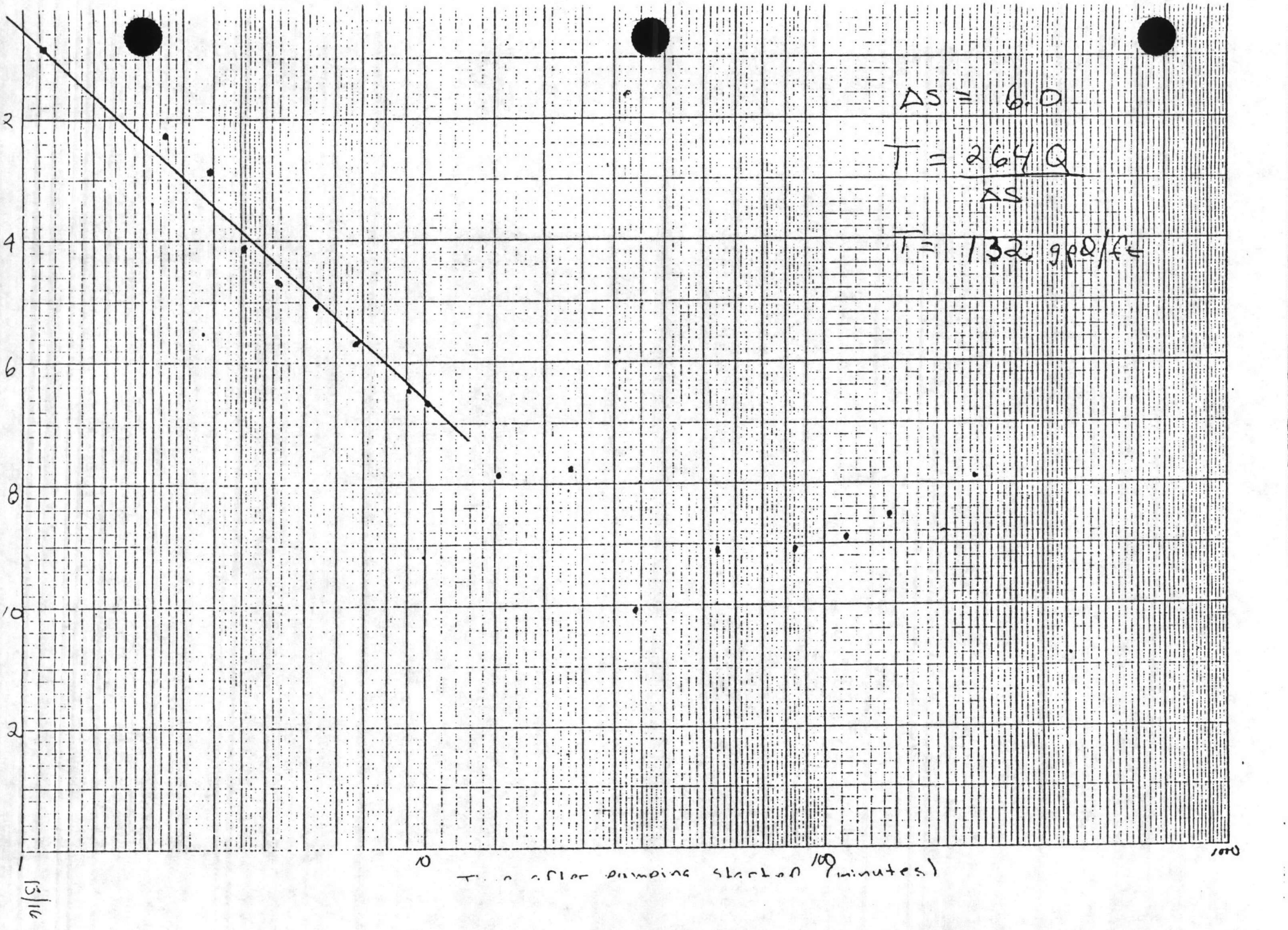
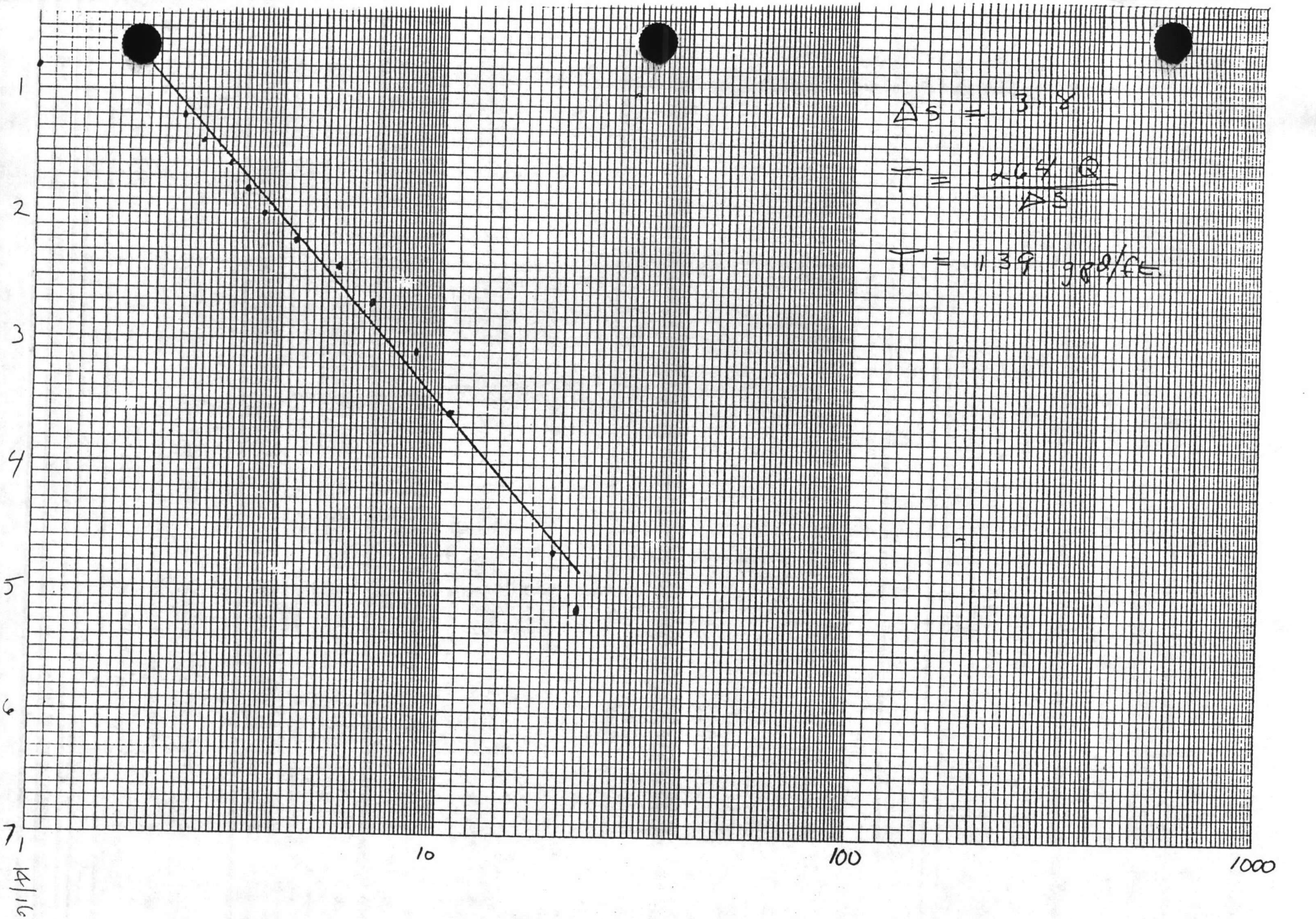


ΔS = 6.0
T = 264 Q / ΔS
T = 132 gpd/ft
2
4
6
8
10
2
1
10
100
1000
(minutes)



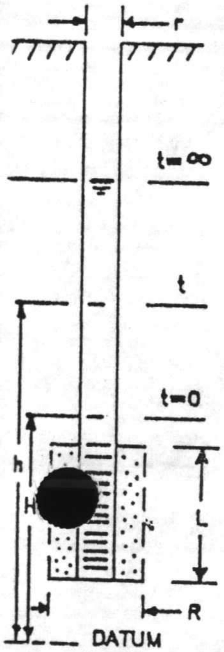
Δs = 3.8
T = 264 Q / Δs
T = 139 gpd/ft
1
2
3
4
5
6
7
10
100
1000

O'BRIEN & GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

PROJECT 3543.042
WELL NUMBER KW41
DATE 12/15/89

LOCATION Camp Lejeune
ELEVATION



STATIC HEAD (H) 12.35

PIPE RADIUS (r) .5

SCREEN RADIUS (R) 1.0

SCREEN LENGTH (L) 25.0

INITIAL HEAD (Ho) 23.3

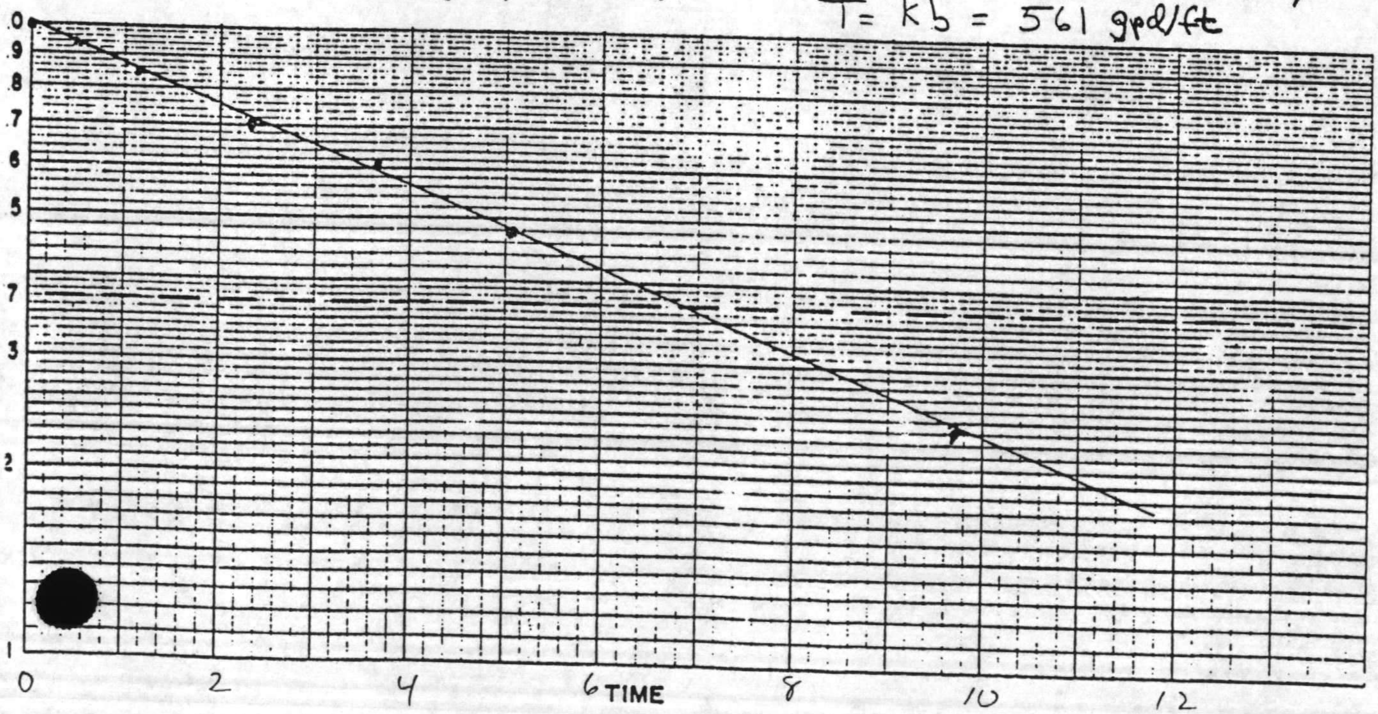
HYDRAULIC CONDUCTIVITY :

$$K=\frac{r^2 \ln(L/R)}{2LT_o}$$

$$K= \frac{(.5)^2 \ln(25/1)}{2(25)(408)} = 3.9\times10^{-5} \text{ ft/s} = 25.5 \text{ gpd/ft}^2$$

$$T = Kb = 561 \text{ gpd/ft}$$

TIME	WATER DEPTH	t	h	$\frac{H-h}{H-H_o}$ 10.95
0		0	23.3	1
28		.47	22.7	.94
1:09		1.15	21.6	.84
2:21		2.35	20.0	.70
3:39		3.65	19.0	.61
5:24		5.04	17.5	.47
9:41		9.68	15.0	.24
11:15		11.25	14.5	



T_o = 6.8 min = 408 secs

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GERE

IN-SITU PERMEABILITY TEST
FIELD LOG

CT 3543.012

UMBER RW#2

12/15/89

LOCATION Camp Lejeune

ELEVATION

STATIC HEAD (H) 14.40

PIPE RADIUS (r) .5

SCREEN RADIUS (R) 1.0

SCREEN LENGTH (L) 25

INITIAL HEAD (Ho) 21.9

HYDRAULIC CONDUCTIVITY :

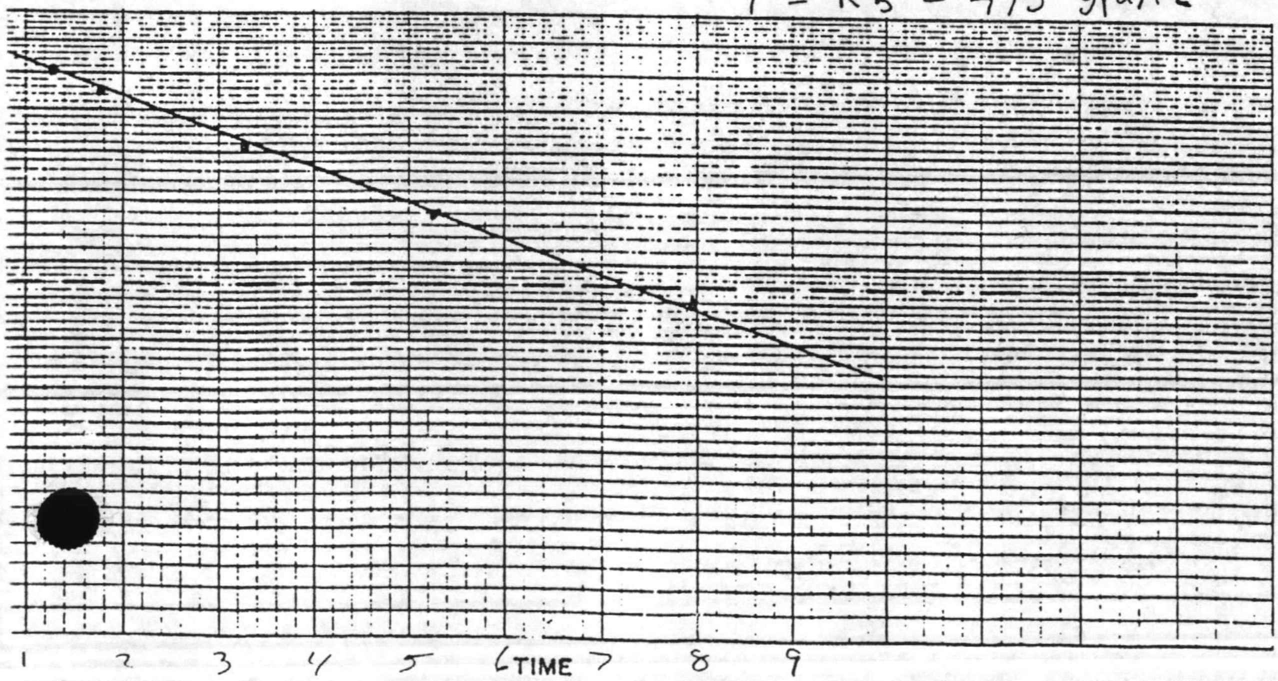
$$K=\frac{r^2\ln(L/R)}{2LTo}$$

$$K=\frac{(.5)^2\ln\left(\frac{25}{1}\right)}{2(25)(441)} = 3.65\times10^{-5}\text{ ft/s} = 23.6\text{ gpd/ft}$$

$$T = Kb = 495\text{ gpd/ft}$$

TIME	WATER DEPTH	t	h	H-h / H-Ho
40		.67	21.0	.88
1:13		1.22	20.5	.81
1:45		1.75	20	.75
3:15		3.25	19.0	.61
5:14		5.23	18.0	.48
7:56		7.93	17.0	.35
9:58		9.97	16.0	.21

7.5



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