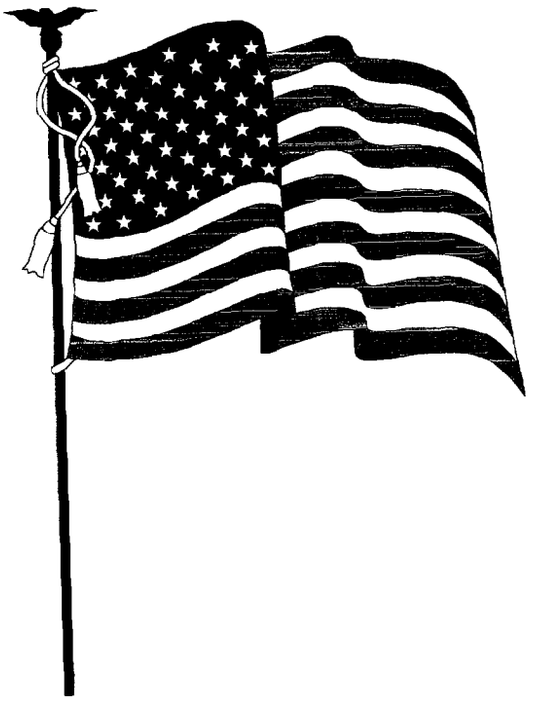
03.03 - 6/1/96 - 00218

Tarawa Terrace Hazardous Waste Storage Tank Site

Groundwater Sampling & Analysis Plan



0303-6/1/96-00218

Prepared by

Environmental Management
Department
Installation Restoration Division

U. S. MARINE CORPS BASE
CAMP LEJEUNE, NC

June 1996

Site History

The hazardous waste storage tanks (STT-61, STT-62, STT-63, STT-64, and STT-65) were located at Tarawa Terrace (TT) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. This site was situated within a fenced area between a railroad, approximately 75 feet to the south, and Highway 24, approximately 75 feet to the north. Entrance to the compound lies approximately 200 feet west of Tarawa Terrace at MCB, Camp Lejeune. Within the tank compound there were a pump house, and six above ground storage tanks with associated piping. Each tank had a capacity of 30,000 gallons. The tanks were being used to store used oil until it was determined that hazardous waste constituents had been introduced into the tanks.

The used oil tanks were five of the six horizontal, steel cylindrical tanks which were constructed in the early 1940s for the purpose of storing liquid propane gas (LPG) which was fed to the heating units of housing throughout the Base. Storage of LPG at the site was discontinued in 1984 at which time the piping was modified for used oil storage. Much of the ancillary piping to the tanks was disconnected or removed except for a header system at the bottom of the tanks which connects to the loading/inloading station.

The tanks were surrounded by an earthen berm dike with dimensions of 2' x 90' x 100'. This berm did not meet the requirements of 40 CFR 265.193(b) through (f). Therefore, a contingent closure plan for complying with 40 CFR 265.197(b) and 40 CFR 265.310 was required. The closure plan was developed and submitted in 1989.

The pump house, piping, and the six above ground storage tanks have been removed from the site. In April 1992, O'Brien and Gere completed a site assessment, in June 1993 O'Brien and Gere completed an Addendum Site Assessment. These reports indicate groundwater and soil contamination at levels above the North Carolina standards. After further review of the available information it was determined to complete some additional sampling at this site. Dewberry & Davis completed sampling at the Tarawa Terrace Hazardous Waste Tank site in accordance with the Tarawa Terrace Hazardous Waste Sampling Plan dated June 7, 1994, revised August 16, 1994, and approved by the North Carolina Department of Environment, Health, and Natural Resources. None of the constituents detected were at levels above EPA Region III's Risk Based Concentrations. Based on these sampling results MCB, Camp Lejeune recommended that no further action be required to remediate the site. North Carolina Department of Environment, Health, and Natural Resources reviewed the data obtained by Dewberry & Davis and determined that additional sampling must be completed. This additional sampling will be conducted in accordance with the Sampling and Analysis plan that follows.

Table of Contents

Groundwater Sampling and Analysis Plan

Marine Corps Base (MCB), Camp Lejeune is located within the coastal plain in Onlsow County, North Carolina. The facility covers approximately 151,000 acres and is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. Figure 1-1 indicates the overall boundaries of MCB, Camp Lejeune.

Topography and Surface Drainage

The generally flat topography of MCB, Camp Lejeune is typical of the seaward portions of the North Carolina coastal plain. Elevations on the Base vary from sea level to 72 feet above mean sea level (msl). Drainage at MCB, Camp Lejeune is generally toward the New River, except for areas near the coast, which drain into the Atlantic Ocean via the Intracoastal Waterway. In developed areas, natural drainage has been altered by asphalt, storm sewer, and drainage ditches.

The Unites States Army Corps of Engineers has mapped the limits of the 100-year floodplain at Marine Corps Base, Camp Lejeune at 7.0 feet above msl in the upper reaches of the New River. The elevation of the 100-year floodplain increases downstream to 11 feet above msl near the coastal area.

Geology

Marine Corps Base, Camp Lejeune is located in the Atlantic Coastal Plain physiographic province. The sediments of the Atlantic Coastal Plain consist of interbedded sands, clays, calcareous clays, shell beds, sandstone, and limestone. These sediments are layered in interfingering beds and lenses that gently dip and thicken to the southeast. Regionally, they comprise 10 aquifers and nine confining units which overlie igneous and metamorphic basement rocks of pre-Cretaceous age. These sediments were deposited in marine or near-marine environments and range in age from early Cretaceous to Quaternary time. Figure 1-2 presents a generalized stratigraphic column for this area.

The previous investigations at Tarawa Terrace, involved the upper 30 feet of sediments. Split spoon samples revealed a subsurface geology characterized by sand, silt and clays in various hues of gray (bluish, greenish and pinkish) and light brown.

United Stated Geological Survey (USGS) studies at MCB, Camp Lejeune indicate that the Base in 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 thickness of these sediments is approximately 1,500 feet. Less permeable clay and silt beds function as confining units or semiconfining units which separate the aquifers and impede the flow of groundwater between aquifers. A generalized hydrologic cross-section of this area is presented in Figure 1-3.

Hydrology

The surface aquifer is a series of sediments, primarily sand and clay, which commonly extend to depths of 50 to 100 feet. No laterally extensive clay confining units have been encountered in this interval during previous subsurface investigations in the area. This unit is not used for water supply in this part of the Base. The principal water-supply aquifer for the Basin is the series of sand and limestone beds that occur between 50 and 300 feet below land surface. This series of sediments generally is known as the Castle Hayne aquifer. The Castle Hayne aquifer is about 150 to 350 feet thick in the area and is the most productive aquifer in North Carolina. Figure 1-4 is a generalized geologic cross section of the subsurface at MCB, Camp Lejeune.

The aquifers that lie below the Castle Hayne consist of 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.

Water levels in wells tapping the surficial aquifer vary seasonally. The surficial aquifer receives more recharge in the winter than in the summer when much of the water evaporates or is transpired by plants before it can reach the water table. Therefore, the water table is generally highest in the winter months and lowest in the summer or early fall.

Groundwater at this specific site appears to be flowing in a overall southerly direction, as shown on Figure 1-5, at a very slow rate. With an estimated hydraulic gradient of 0.001 ft/ft and an effective porosity of 0.40, the flow velocity of the groundwater can be approximated at 0.008 ft/day or 3 ft/yr.

Surface Water Hydrology

The dominant surface water feature at MCB, Camp Lejeune is the New River. It receives drainage from most of the Base. The New River is short, with a course of approximately 50 miles on the central coastal plain of North Carolina. At MCB, Camp Lejeune the New River flows in a southerly direction and empties into the Atlantic Ocean through the New River Inlet. Several small coastal creeks drain the area of MCB, Camp Lejeune that is not drained by the New River and its tributaries. These creeks flow into the intracoastal waterway, which is connected to the Atlantic Ocean by Bear Inlet, Brown's Inlet, and the New River Inlet.

Well Data

Monitoring wells to be sampled in accordance with this plan are MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7 and MW-8. The monitoring well data is provided in appendix (a).

Sample Collection Data

The following data must be gathered and entered into a log book:

1. Name of sampler
2. Date and time of sampling
3. Time
4. Temperature
5. Weather
6. Any unusual conditions
7. Equipment used to measure water level
8. Elevation of water level
9. Well depth
10. Well purging time and date
11. Equipment used for purging
12. Amount of water removed during purging
13. Types and numbers of samples taken
14. Sample handling procedures
15. Specific conductance
16. pH
17. Sample temperature

Sample Identification

Prior to collecting each groundwater sample, sample bottles will be labeled with the following information:

1. Date and time of sample collection
2. Project identification number
3. Sample location number
4. Initials of person collecting sample
5. Type of preservative added
6. Parameter(s) or group to be analyzed for

Groundwater Sample Collection Procedures

New, clean protective/nonreactive gloves will be donned prior to sampling each monitoring well. Open the well cap and use volatile organic detection equipment on the escaping gases at the well head to determine the need for respiratory protection. After proper respiratory protection has been donned, sound the well for total depth and water level and record the appropriate data in the log book. Install the purging equipment (bailer or submersible pump) into the well to a short distance below the water level. Begin purging the well. Purged water will be temporarily stored in Department of Transportation approved 55 gallon drums. Purged water will be sampled and disposed of in accordance with the applicable regulations. Measure the rate of the water being purged by using a graduated bucket and a stopwatch. Purge a minimum of three well volumes or until the well is purged to dryness. Allow the well to recharge as necessary, but preferably to 70% of the static water level, and then sample. Record measurements of specific conductance, temperature, and pH during purging to ensure that the groundwater stabilizes. Generally, these measurements are made after three, four, and five well volumes. After the well has been prepared

for sampling, lower the teflon bailer into the well, submerge it into the groundwater and then remove the bailer. A teflon coated line must be used for lowering the bailer. Pour groundwater from the bailer into the laboratory-supplied sample bottles without filtering the groundwater. Samples will be taken for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). These samples will be collected in laboratory supplies glass bottles with a teflon covered septum top. There will not be any headspace in the samples in order to prevent volatilization.

Sample Preservation

Glass containers will be used. Containers will be kept out of direct sunlight until they reach the analytical laboratory. The sample container will not have any headspace. The laboratory shall provide sample containers that have been certified clean according to USEPA procedures. Shipping containers for samples consisting of sturdy ice chests will be provided by the laboratory. Once opened, the sample container must be used at once for storage of the groundwater sample. Any unused containers which appear contaminated upon receipt, or found to have loose caps shall be discarded. Sample container, preservation, and holding time requirements are listed below:

	EPA Document SW-846			Contract Laboratory Personnel			
Parameter	Container	Preservation	Holding Time	Container	Preservation	Holding Time	Analysis
VOCs	Glass w/ teflon covered septum top	Cool to 4° Celsius	14 Days	40 ml VOA glass w/ teflon covered septum top	Conc. HCl Cool to 4° Celsius	10 Days	EPA Method 8240
SVOCs	Glass w/ teflon covered septum top	Cool to 4° Celsius	Extract within 7 days, analyze 40 days	250 ml glass w/ teflon covered septum top	Cool to 4° Celsius	Extract within 5 days, analyze 40 days	EPA Method 8270

Water Level Monitoring

Static water level measurements from all wells must be obtained prior to well purging procedure. Measurements will proceed from the least to the most contaminated wells based on the latest analytical data.

New, clean protective/nonreactive gloves will be donned prior to measuring the water level and total depth at each monitoring well. Water levels in the groundwater monitoring wells will be measured from the top of the protective steel casing using an electronic water level measuring device (water level indicator). Water levels are measured by lowering the probe into the well until the device indicates that water has been encountered, usually with either a constant buzz, or a light, or both. The location of the electric cord/tape against the measuring point on the top of the PVC or stainless steel casing is marked for surveys. The water level is measured off the cord/tape to the nearest 0.01 foot. This measurement when subtracted from the measuring point elevation yields the water level elevation.

Well Depth Measurement

Wells depths are typically measured using a weighted measuring tape. The tape is lowered down the well until resistance is no longer felt, indicating that the weight has touched the bottom of the well. The weight should be moved in a up and down motion a few times, so that obstructions if present may be bypassed. The slack in the tape then is collected until the tape is taut. The well depth measurement is read directly off the measuring tape, at the top of the PVC or stainless steel casing to the nearest 0,01 foot.

Quality Assurance/Quality Control

Field internal quality control checks to be used during this investigation include field duplicates, equipment rinsates, field blanks, preservation blanks, and trip blanks. The results from the field quality control samples will be used by the data validator to determine the overall quality of the data. The description of the quality contol checks are as follows:

1. Field Duplicates

Duplicates for soil samples are collected homogenized and split. All samples except VOCs are homogenized and split. The duplicate for water samples should be collected simultaneously. Field duplicates should be collected at a frequency of 5% per sample matrix. All the duplicates should be sent to the primary laboratory responsible for analysis. The same samples used for field duplicates shall be split by the laboratory and used by the laboratory as the duplicate or matrix spike. This means that the duplicate sample, there will be analyses of the normal sample, the field duplicate, and the laboratory matrix spike/duplicate.

2. Equipment Rinsates

Equipment rinsates are the final organic-free deionized water rinse from equipment cleaning collected daily during the sampling event. Initially, samples from every other day should be analyzed. If constituents pertinent to the project are found in the rinsate, the remaining samples must be analyzed. The results of the blanks will be used to flag or assess levels of constituents in the samples. This comparison is made during validation. The rinsates are analyzed for the same parameters as the related samples.

3. Field Blanks

Field Blanks consist of the source water used in decontamination, steam cleaning, and drilling. At a minimum, one field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples. Organic-free deionized water is taken to the field in sealed containers and poured into the appropriate sample containers at pre-designated locations. This is done to determine if any contaminants preset in the area may have an affect on the sample integrity.

4. Preservation Blank

To determine if the preservative used prior and during field operations was contaminated, preservative blanks are prepared. These samples are prepared by putting organic-free deionized water in the container and preserving the sample with the appropriate preservative.

5. Trip Blank

Analysis of trip blanks are performed to monitor possible contamination during shipment and collection of samples. Trip blanks are initiated in the laboratory prior to the shipping of sample packs. A corresponding trip blank is prepared for each set of samples to be analyzed for VOCs.

Trip blank samples are prepared by adding four drops of concentrated hydrochloric acid and then filling the container with organic-free deionized water(ASTM Type II). The trip blanks accompany the samples through shipment to the sample site, sample collection, shipment to the laboratory, and storage of the samples.

If the analyses indicate contamination of the trip blank, the sample sources may be resampled.

Replicates and spikes will be run at 5% of the number of samples taken and analyzed under this plan. All analysis must be run by a laboratory certified in the State of North Carolina, for analysis of the site-specific parameter.

Decontamination of Measuring Devices

Water level indicators, interface probes and weighted measuring tapes that come in contact with groundwater must be decontaminated using the following steps after use in each well:

1. Remove excess soil/sludge as necessary
2. Wash with phosphate-free soap and hot potable water
3. Rinse with hot potable water
4. Rinse with deionized water
5. Allow equipment to fully dry
6. Wrap equipment with non-reactive material prior to transport

Chain of Custody and Transportation Procedures

Chain of Custody (COC) procedures will be followed to establish documentation of sample possession from the time of collection until completion of analysis for the laboratory. As few people as possible will handle the samples. The sampler will be responsible for the care and custody of the samples until they are dispatched for shipment to the laboratory. An accurate record of sample collection, transport, and analysis will be maintained and documented. An example COC form is provided as Figure 1-6.

Schedule for Sampling/Reporting

Samples will be taken at monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5 and MW-6 within 60 days after approval of the sampling plan. The samples will be submitted to a certified laboratory and analyzed for VOCs by EPA method 8240 and SVOCs (base/neutral/acid extractables) by EPA method 8270. The sample analytical results will be submitted within 90 days after sample collection.

MCB, Camp Lejeune Boundaries

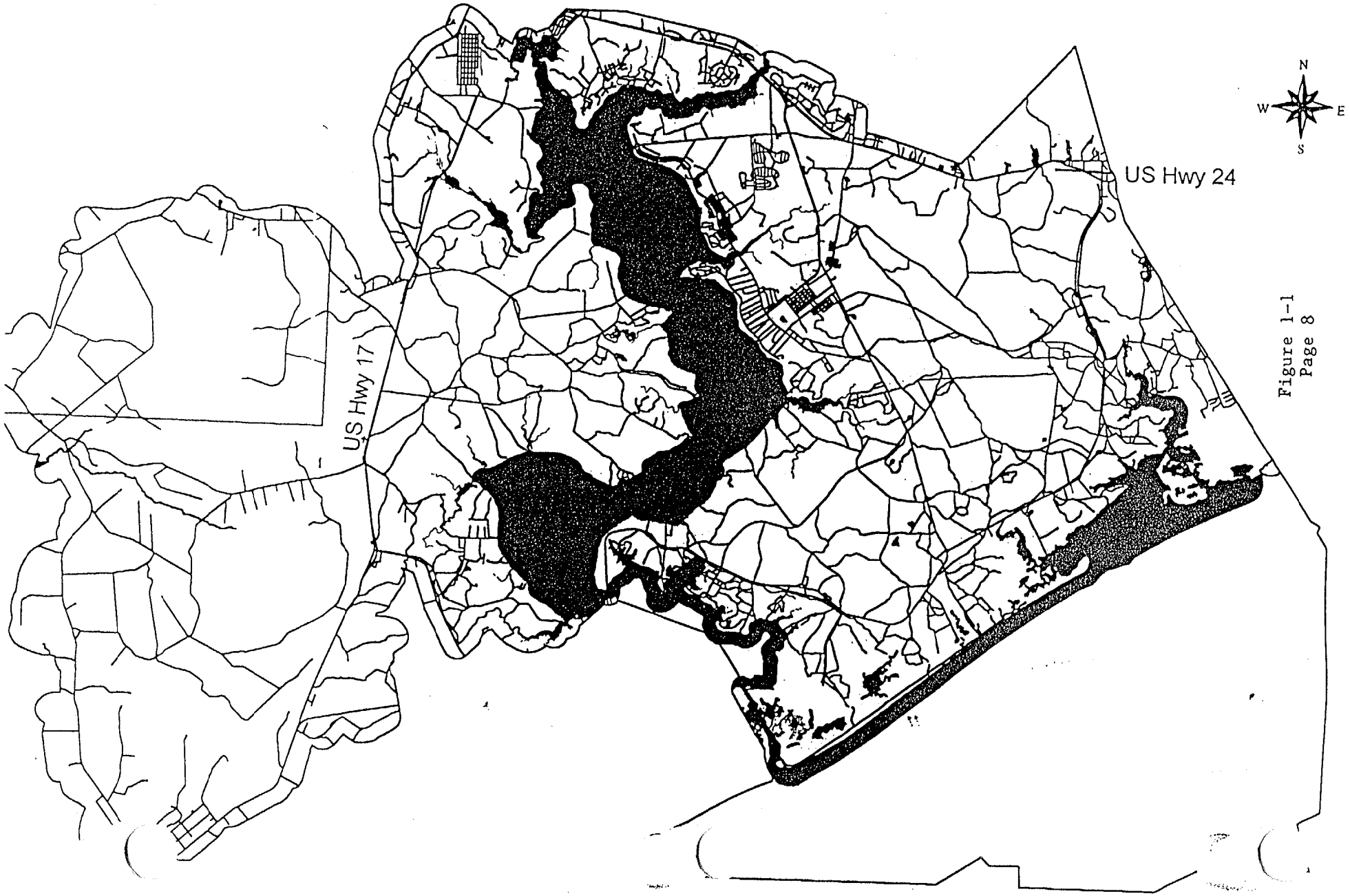


Figure 1-1
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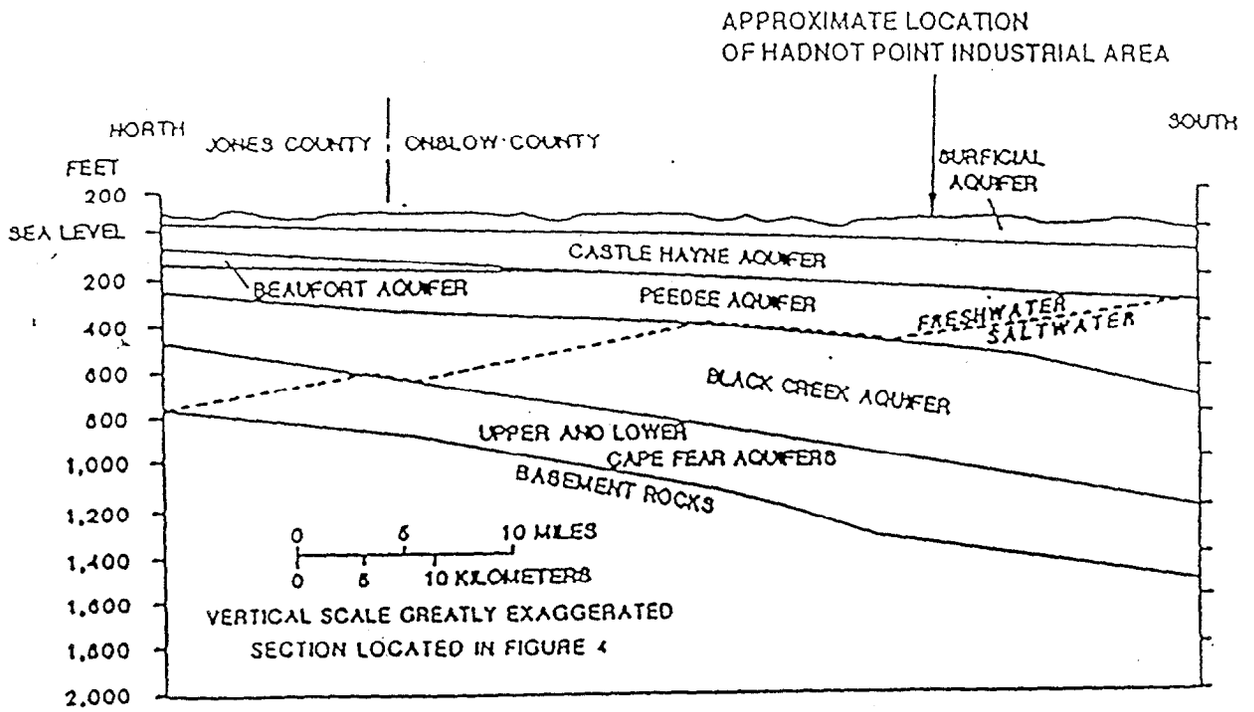
FIGURE 1-2

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 confining unit
		Pungo River Formation(1)	Pungo River aquifer
		Belgrade Formation(2)	Castle Hayne confining unit
	Oligocene	River Bend Formation	Castle Hayne aquifer
	Eocene	Castle Hayne Formation	Beaufort confining unit(3)
	Paleocene	Beaufort Formation	Beaufort aquifer
Cretaceous	Upper Cretaceous	Peedee Formation	Peedee confining unit Peedee aquifer
		Black Creek and Middendorf Formations	Black Creek confining unit Black Creek aquifer
		Cape Fear Formation	Upper Cape Fear confining unit Upper Cape Fear aquifer Lower Cape Fear confining unit Lower Cape Fear aquifer
	Lower Cretaceous(1)	Unnamed deposits(1)	Lower Cretaceous confining unit Lower Cretaceous aquifer(1)
Pre-Cretaceous basement rocks		--	--

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

Source: Harned et al., 1989

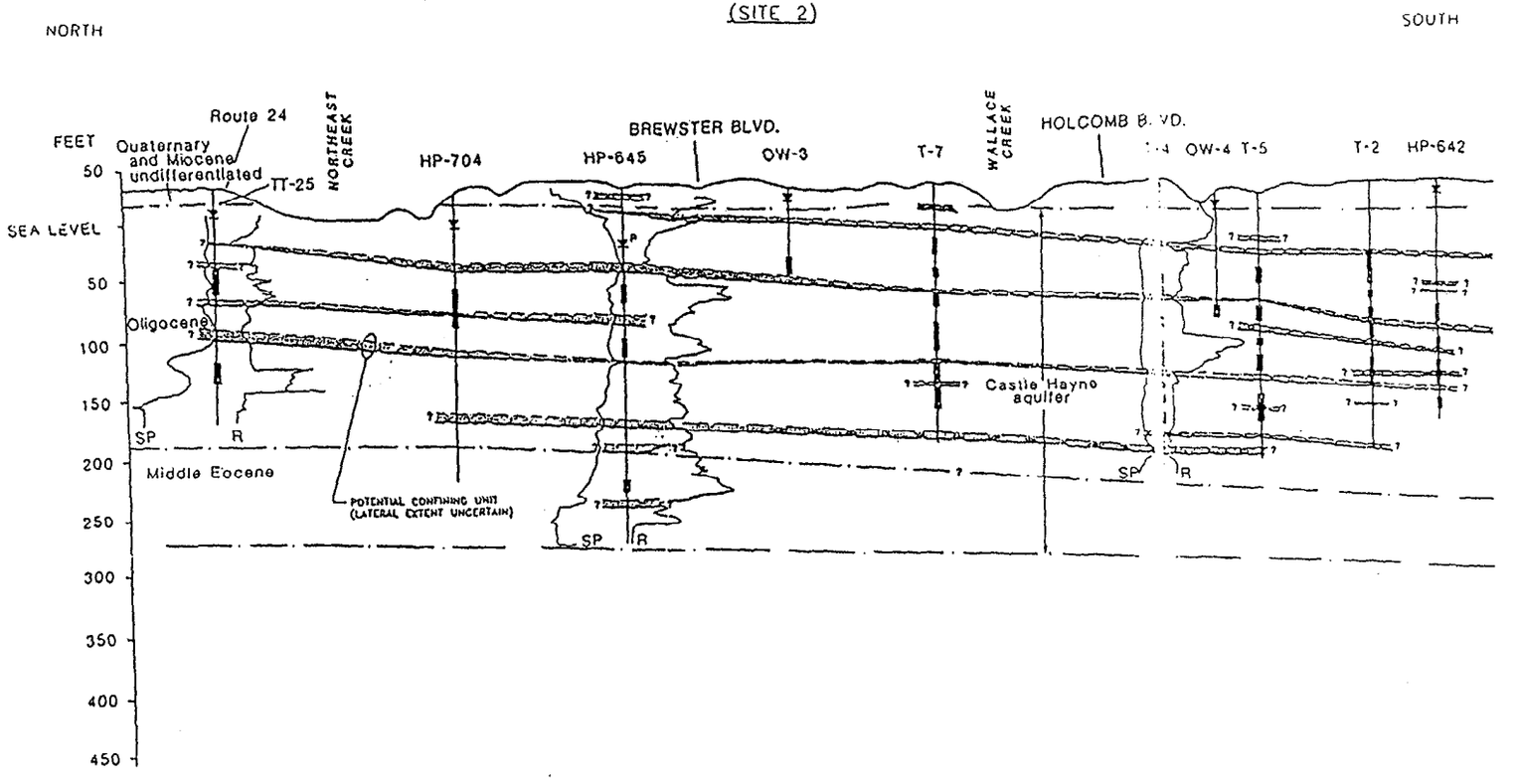


SOURCE: ESE, 1991

Baker Environmental, Inc.

FIGURE 1-3
GENERALIZED HYDROGEOLOGIC CROSS-SECTION
JONES AND ONSLOW COUNTIES, NORTH CAROLINA

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA



Baker Environmental, Inc.

1 inch = 0.5 mile
HORIZONTAL SCALE

1 inch = 25 ft.
VERTICAL SCALE

SOURCE: HARNED, et al. (1989)

FIGURE 1-4
HYDROGEOLOGIC CROSS SECTION

MARINE CORPS BASE CAMP LEJEUNE
JACKSONVILLE, NORTH CAROLINA

Tarawa Terrace, Camp Lejeune, NC
Groundwater Contour Map
Shallow Wells - December 1992

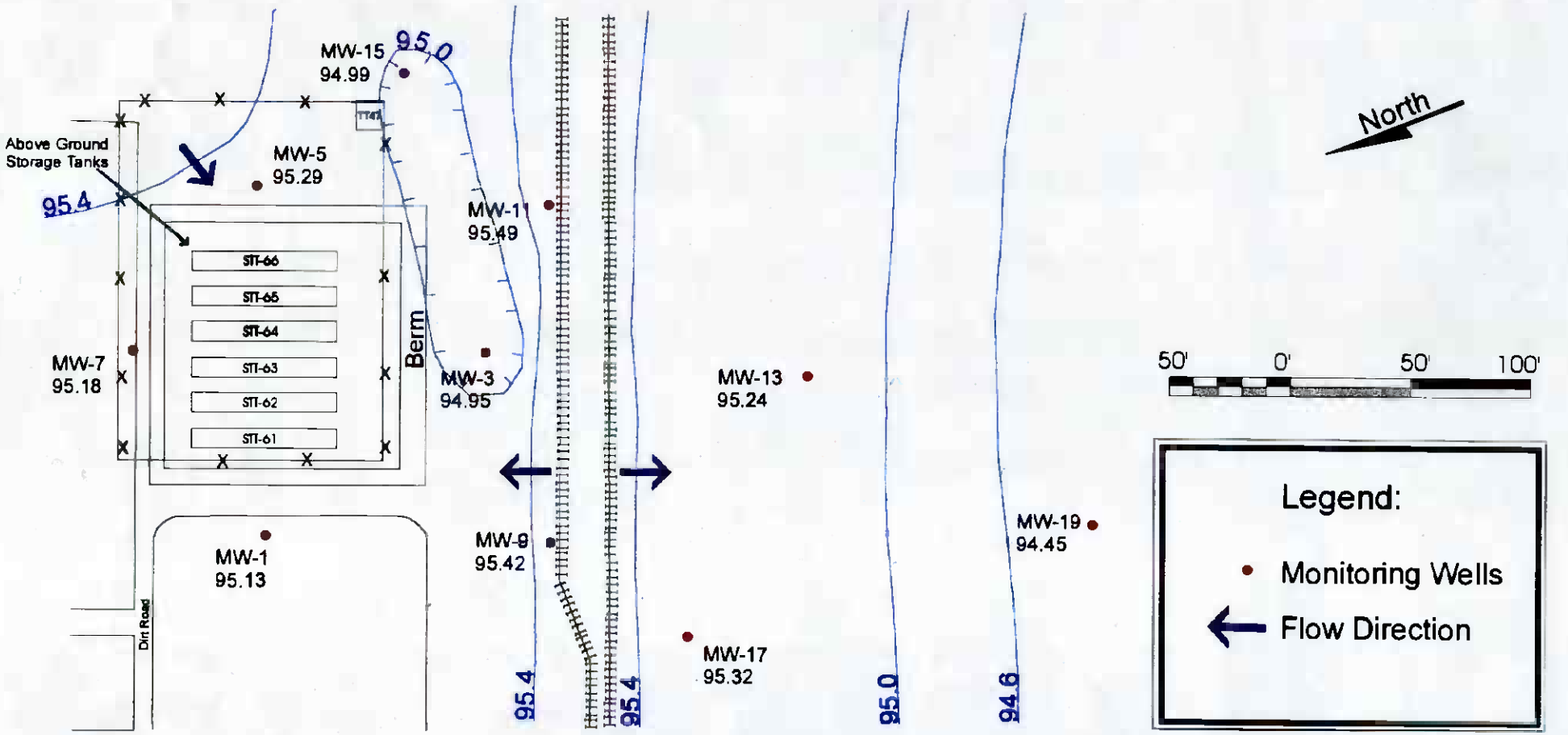


Figure 1-5
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Groundwater Contour Elevations in Feet

4, 5, 6, 7
23 " B 4A
Std 21

00218M01Y

Inchcape Testing Services NDRC Laboratories. **CHAIN OF CUSTODY RECORD** 1089 East Collins Blvd., Richardson, TX 75081 (214) 238-5591

Submitted by
Name: Baker
Address: 1223 Lejeune Blvd
Jacksonville, NC
Contact: Jim Culp
Phone: 910-353-3336
Fax:

Bill to
Name: Baker
Address: 420 Rouser Rd.
Coraopolis, Pa 15108
Contact: R. Hoffs
Phone: 412-269-2099
PO #: 62470-232

By submitting these samples, you agree to the terms and conditions contained in NDRC's Price Schedule.

Proj. No. 232 | Project Name: SITE 35

Matrix[1]	Date	Time	Comp	Grab	Identifying Marks	No. of Containers[2] VOA	A/G 1 Lt.	250 ml	P/O	EPA 601	EPA 602 + MTBE	TCL VOLS.	Lab. Sample ID
W	5-20	2020		X	35-MW38BAW-01					X	X		Replace 35-MW38AW-01 Recieved on 5-21-94 with this sample
W	5-20	2020		X	35-MW38AW-01D					Y	X		
W	5-20	2020		X	35-MW38AW-01MS					Y	X		
W	5-20	2020		X	35-MW38AW-01MSD					Y	Y		
W	5-21			Y	35-TB39					~~X~~ SL	X		

Lab use only
Due Date:

RCRA ☐
NPDES ☐
Screened For Radioactivity ☐
Temp. _____ °C

Turn around time ☐ Priority 1 or Standard ☐ Priority 2 or 50% ☐ Priority 3 or 100% ☐ Priority 4 ERS *

* BTEX (602/8020), TPH (418.1 or 8015), VOLATILES (624/8240), IGNITABILITY, TOTAL LEAD (6010)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
[signature]	5/21/94	1100			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Remarks: If you have question - Please Call R. Hoffs.

[1] Matrix WW - Wastewater W - Water S - Soil SD - Solid L - Liquid A - Air Bag C - Charcoal tube SL - Sludge O - Oil
[2] Container VOA - 40 ml vial A/G - Amber / Or Glass 1 Liter 250 ml - Glass wide mouth P/O - Plastic or other_____

NDRC cannot accept verbal changes. Please Fax written changes to 214-238-5592

OFFICE USE ONLY

Appendix (a)

Monitoring Well Construction Data

Well ID	Top Elevation of Screen	Bottom Elevation of Screen	Elevation of Top of Casing (Meauring Point)	Elevation of Land Surface
MW-1	95.88	85.88	100.88	Not Surveyed
MW-2	80.81	70.81	100.81	Not Surveyed
MW-3	96.09	86.09	101.09	Not Surveyed
MW-4	80.99	70.99	100.99	Not Surveyed
MW-5	96.53	86.53	101.53	Not Surveyed
MW-6	82.53	72.53	101.61	Not Surveyed
MW-7	96.74	86.74	101.74	Not Surveyed
MW-8	81.70	71.70	101.70	Not Surveyed
MW-9	97.08	87.08	101.08	Not Surveyed
MW-10	80.98	70.98	100.98	Not Surveyed
MW-11	96.63	86.63	101.63	Not Surveyed
MW-12	81.54	71.54	101.54	Not Surveyed
MW-13	98.20	88.20	100.20	Not Surveyed
MW-14	83.18	73.18	100.18	Not Surveyed
MW-15	96.29	86.29	100.29	Not Surveyed
MW-16	79.65	69.65	99.65	Not Surveyed
MW-17	94.70	84.70	98.70	Not Surveyed
MW-18	79.74	69.74	99.74	Not Surveyed
MW-19	96.36	84.36	100.36	Not Surveyed
MW-20	80.47	70.47	100.47	Not Surveyed

Note: The data provided in the table above is based on a survey completed by Robert H. Davis, RLS Surveyors and Planners in 1992. The elevations noted are calculated from a temporary benchmark with an assumed elevation of 100.00 feet. Actual elevations of the land surface would be approximaetly 30 feet above mean sea level.

Monitoring Well Construction Data

Well ID	Top Elevation of Screen	Bottom Elevation of Screen	Elevation of Top of Casing (Meauring Point)	Elevation of Land Surface
MW-1	95.88	85.88	100.88	Not Surveyed
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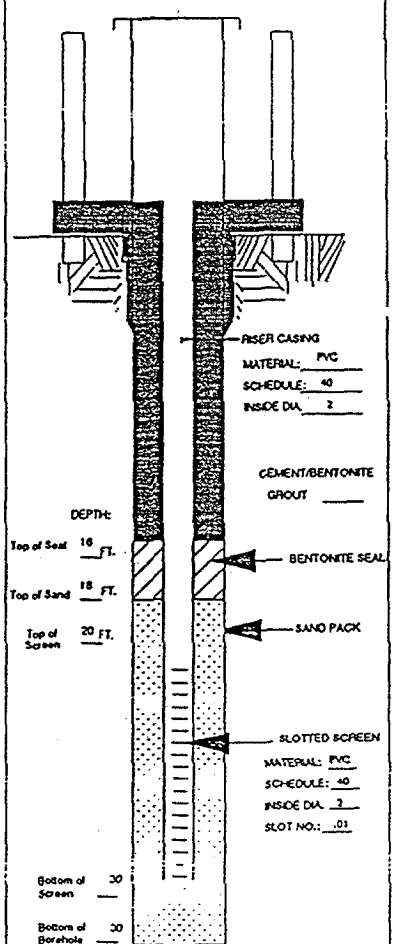
MW-5	96.53	86.53	101.53	Not Surveyed
MW-6	82.53	72.53	101.61	Not Surveyed
MW-7	96.74	86.74	101.74	Not Surveyed
MW-8	81.70	71.70	101.70	Not Surveyed
MW-9	97.08	87.08	101.08	Not Surveyed
MW-10	80.98	70.98	100.98	Not Surveyed
MW-11	96.63	86.63	101.63	Not Surveyed
MW-12	81.54	71.54	101.54	Not Surveyed
MW-13	98.20	88.20	100.20	Not Surveyed
MW-14	83.18	73.18	100.18	Not Surveyed
MW-15	96.29	86.29	100.29	Not Surveyed
MW-16	79.65	69.65	99.65	Not Surveyed
MW-17	94.70	84.70	98.70	Not Surveyed
MW-18	79.74	69.74	99.74	Not Surveyed
MW-19	96.36	84.36	100.36	Not Surveyed
MW-20	80.47	70.47	100.47	Not Surveyed

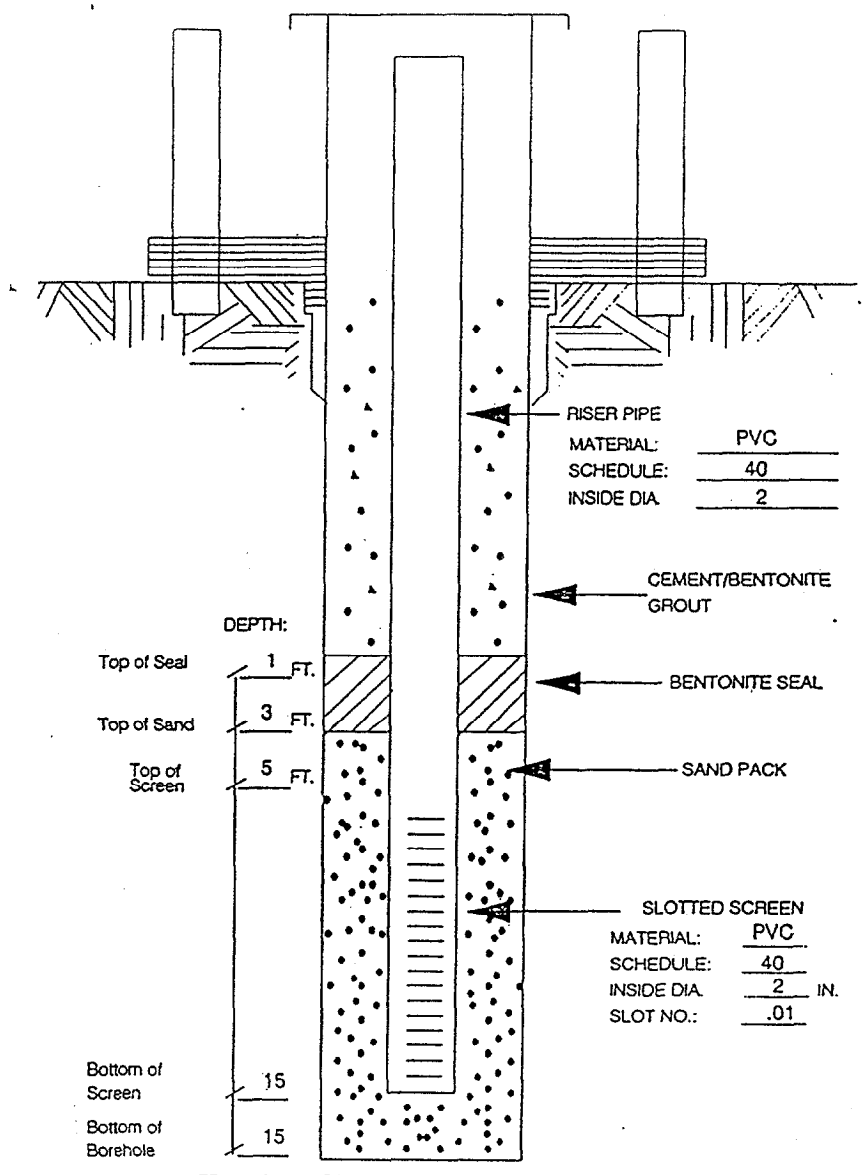
Note: The data provided in the table above is based on a survey completed by Robert H. Davis, RLS Surveyors and Planners in 1992. The elevations noted are calculated from a temporary benchmark with an assumed elevation of 100.00 feet. Actual elevations of the land surface would be approximaetly 30 feet above mean sea level.

O'Brien & Gere Engineers, Inc.	Boring Log/Protective Casing Well	Report of Boring No. MW-2 Sheet 1 of 1
Location: TT61-66 Client: Navy Drilling Type: Hollow Stem	SAMPLER Type: 2" O.D. Split Spoon Hammer: 140# Fall: 30"	Ground Water Depth File No.
Boring Co.: ATEC Foreman: Tim Williams OBG Geologist T. Bickerstaff		Dates: Started: 12/13/91 Ended: 12/13/91

Depth	Sample Depth	Blows /6"	Penetr/ Recovery	PID Value	Sample Description
0	0-2	7/7/6/7	24/10		Black topsoil with sand. Roots.
2	2-4	4/3/5/4	24/24		Pinkish-gray silt with clay and sand, very moist.
4	4-6	3/3/3/4	24/24		Pinkish-gray silt with clay and sand. Very moist. Tip is wet.
9	9-11	3/3/3/4	24/24		Interbedded gray clay with course gray sands.
14	14-16	6/6/7/9	24/		Coarse gray sand with clay.
19	19-21	2/1/2/3	24/20		Greenish-gray, coarse sand with clay, fading to coarse, gray sand with clay, orange.
24	24-26	7/8/9/11	24/24		Gray, medium sand with streaks of greenish-gray.

Monitoring Well Specifications





TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Tarawa Terrace

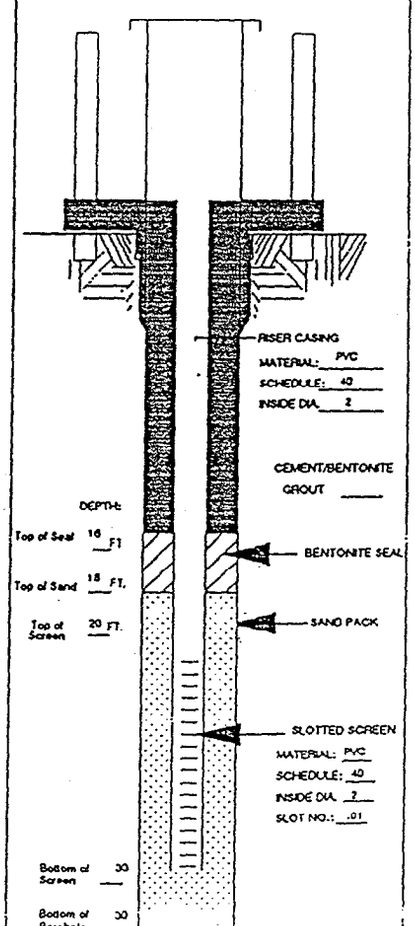
MW-3

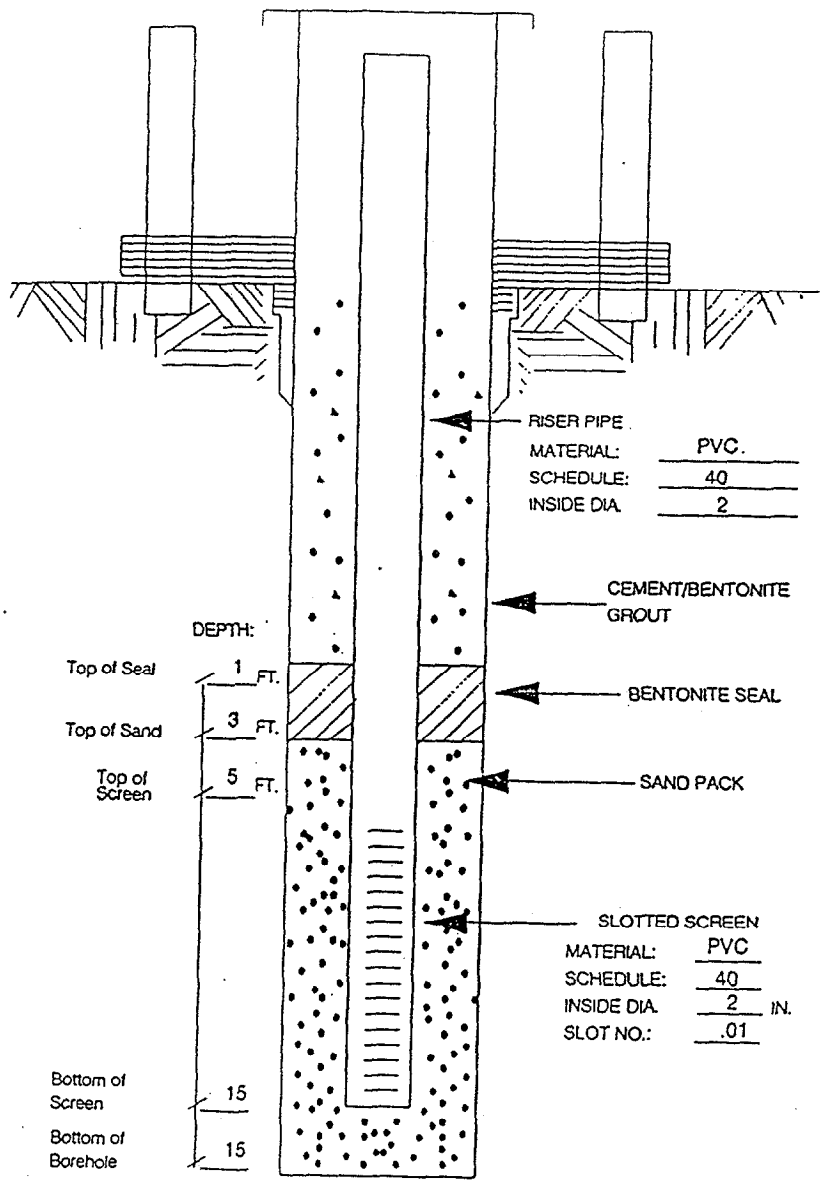
12/12/91

O'Brien & Gere Engineers, Inc.	Boring Log/Protective Casing Well	Report of Boring No. MW-4 Sheet 1 of 1
Location: TT61-66 Client: Navy Drilling Type: Hollow Stem	SAMPLER Type: 2" O.D. Split Spoon Hammer: 140# Fall: 30"	Ground Water Depth File No.
Boring Co.: ATEC Foreman: Tom Sweeting OBG Geologist T. Bickerstaff		Dates: Started: 12/13/91 Ended: 12/13/91

Depth	Sample Depth	Blows /6"	Penetr/ Recovery	PID Value	Sample Description
0	0-2	2/2/2/4	24/10		Black topsoil.
2	2-4	4/5/5/7	24/10		Light brown, medium sand.
4	4-6	2/2/2/4	24/24		Black, tar-like at top, medium to fine sand with clay and silt. Moist.
9	9-11	2/3/4/5	24/24		Interbedded clay and coarse sand laminae with silt, gray. Wet.
14	14-16	2/3/3/5	24/24		Gray, coarse and medium sand.
19	19-21	1/1/4/6	24/24		Coarse, gray sand. Some silt and clay. A few greenish streaks.
24	24-26	3/6/8/9	24/24		Gray, medium sand. 2" laminae of greenish-gray silt in middle of spoon.
29	29-31		24/		Running sands.

Monitoring Well Specifications





TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Tarawa Terrace

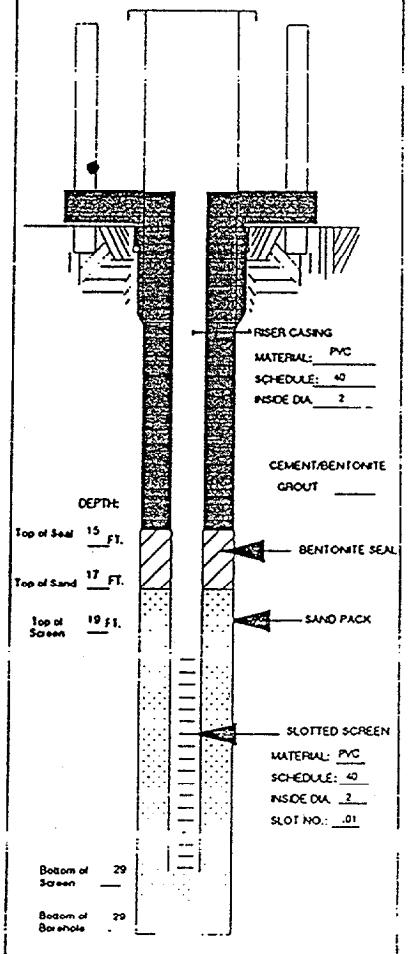
MW-5

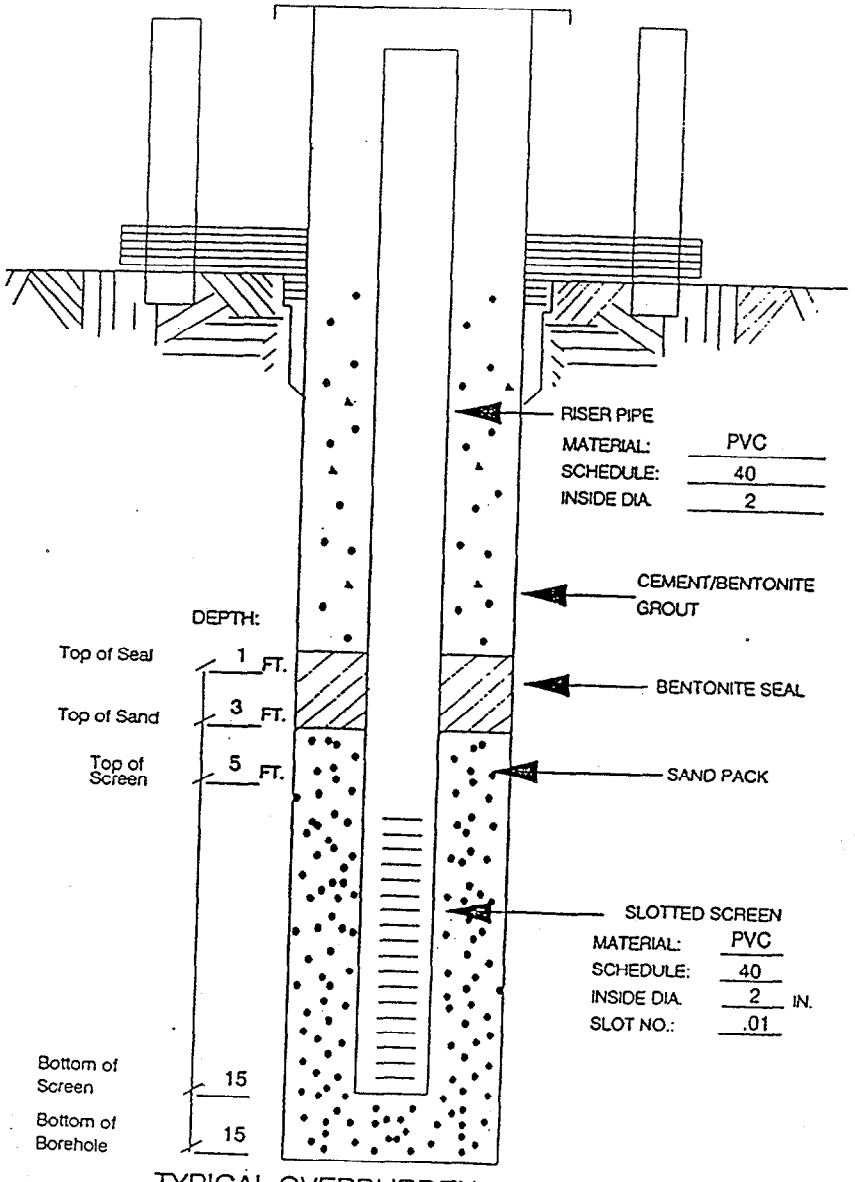
12/12/91

O'Brien & Gere Engineers, Inc.	Boring Log/Protective Casing Well	Report of Boring No. MW-6 Sheet 1 of 1
Location: TT61-66 Client: Navy Drilling Type: Hollow Stem	SAMPLER Type: 2" O.D. Split Spoon Hammer: 140# Fall: 30"	Ground Water Depth File No.
Boring Co.: ATEC Foreman: Tom Sweeting OBG Geologist T. Bickerstaff		Dates: Started: 12/13/91 Ended: 12/13/91

Depth	Sample Depth	Blows /6"	Penetr/ Recovery	PID Value	Sample Description
0	0-2	5/7/11/12	24/20		Dark brown topsoil, heavy clay content.
2	2-4	10/6/6/7	24/20		Dark brown, medium sand with clay mephatic.
4	4-6	1/1/1/2	24/24		Moist, black clay with sand mephatic.
9	9-11	3/5/4/5	24/24		Top 1/2 black clay. Bottom 1/2 wet, greenish-gray, coarse sand with clay.
14	14-16	5/2/3/4	24/21		Gray, coarse sand with clay. Silt at top of sppon mephatic.
19	19-21	9/9/9/11	24/24		MEdium and coarse gray sand.
24	24-26	WOH	24/		Light brown, coarse sand. Running sands.
29	29-31				Running sands.

Monitoring Well Specifications





TYPICAL OVERBURDEN MONITORING WELL

N.T.S.

Tarawa Terrace

MW-1

12/12/91