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FINAL REPORT

Verification Study

Assessment of Potential Ground – Water Pollution at Naval Air Station, Pensacola Pensacola, Florida

Prepared for

SOUTHERN DIVISION,
NAVAL FACILITIES
ENGINEERING COMMAND
Charleston, South Carolina

[illegible] & MILLER, INC.
GROUNDWATER CONSULTANTS

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VERIFICATION STUDY

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July 26, 1984

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INTRODUCTION

In January 1984, Geraghty & Miller, Inc., (G&M) was retained by the Naval Facilities Engineering Command, Southern Division (Navy) to provide hydrogeologic consulting services at the Naval Air Station (NAS) in Pensacola, Florida. Specifically, G&M was to assist the Navy in performing Phase II (Confirmation Study) of the Navy Assessment and Control of Installation Pollutants (NACIP) program. This program is designed to identify contamination of Navy lands resulting from the past operations and to institute corrective measures as needed.

The NACIP program consists of three phases. The first phase is the Initial Assessment Study (IAS) which utilizes record searches and personal interviews to collect and evaluate all evidence supporting the existence of a contamination problem at an installation. The second phase, the Confirmation Study, involves on-site investigations to confirm or refute the existence of contamination, and to quantify the extent of the problem if contamination is present. The third and final phase is the implementation of corrective actions and remedial measures to control or mitigate the contamination.

The Confirmation Study consists of two parts, verification and characterization. During verification, the presence or absence of potential contaminants in ground water at each of the sites recommended for study in the IAS is assessed. Based on these findings, the characterization phase is initiated in order to determine the nature and extent of contamination at sites requiring additional study.

The results of the verification study and recommendations for further characterization at selected sites is presented in this report. The locations of the 18 sites studied are shown in Figure 1; the site identification numbering system used in the IAS report has been retained and extended to additional sites in this study.

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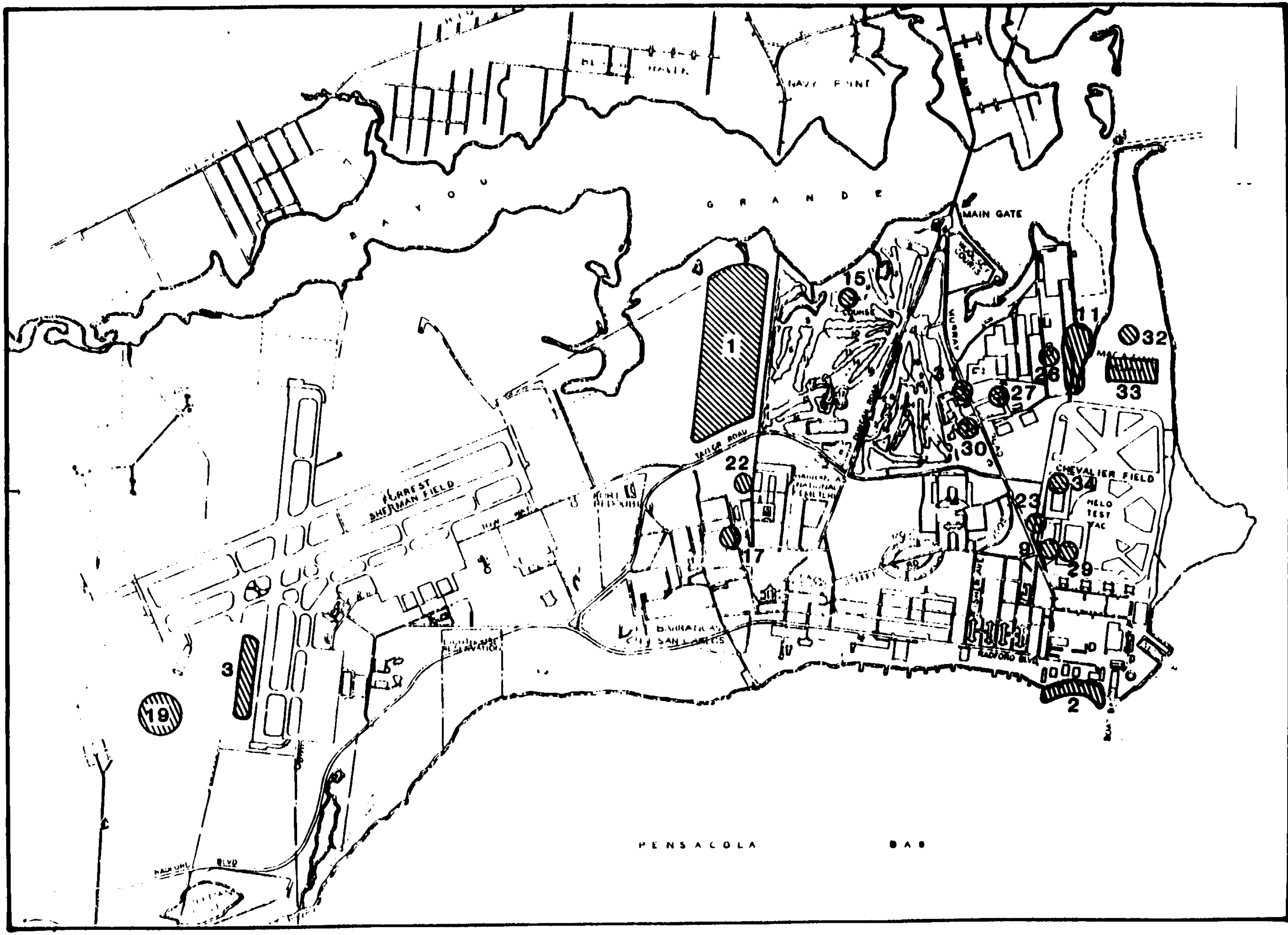

Figure 1. Locations of Sites Evaluated During the Verification Phase of the Confirmation Study.

APPROACH

In evaluating the sites of the verification study, the overriding consideration was the risk to human health and the environment. The factors which were taken into account in preparing recommendations for further study at specific sites, as outlined in FAC 17-4.245(7)b, include: (1) size of the contaminant plume, (2) toxicity of the contaminants and their concentrations, (3) rate and direction of plume movement in relation to sources of water supply, (4) rate of attenuation of the plume, (5) current and projected future use of adjacent ground and surface waters affected by the plume, and (6) costs of further study or clean-up in comparison to the benefits to the public of such actions.

For sites where characterization studies are recommended, the proposed programs of monitor-well installation and sampling are designed to provide sufficient data for determining the need for long-term monitoring or corrective action, and for the design of corrective measures, if necessary. For other sites, although low levels of contaminants may have been found, no further actions were recommended because of the limited benefits to the public in view of the costs for additional study or clean-up.

BACKGROUND

Sites Studied

An IAS was conducted at NAS Pensacola during 1982 and 1983 and based on this study, 13 sites were recommended for further evaluation. After discussions with the Florida Department of Environmental Regulation (FDER), four more sites were added to the Confirmation Study, including two active and two inactive sites. The two active sites (industrial sludge drying beds, and the phenol and polishing ponds) were included in order to comply with ground-water monitoring requirements for the base, as required by Chapter 17-4.245 of the Florida Administrative Code (FAC). Furthermore, while this study was being conducted, a leak occurred in a solvent pipeline located in the west-central part of Chevalier Field and this site has also been included in this study.

Project Setting

NAS Pensacola is located on a peninsula in southern Escambia County, immediately southwest of the City of Pensacola. Based at the station are various housing, training, and support activities and a Naval Air Rework Facility (NARF), a large industrial complex for major repair and rework of aircraft engines and frames. The naval base at Pensacola has a long history, during which there have been many activities involved with hazardous materials, some of which are now inactive and largely without records of past operations. Solid wastes have been disposed of primarily at two landfill areas, one north of Chevalier Field (Site No. 11) and the other west of the golf course (Site No. 1). Liquid wastes from the NARF operations were discharged to storm sewers until 1973 when an industrial sewer system and wastewater-treatment plant were installed. Other activities involved with hazardous materials include pesticide application, transformer storage, transport and storage of fuel, and firefighting training.

Potable water for the base is primarily supplied by the well field located at Corry Station several miles north of NAS Pensacola, but is supplemented when needed by three wells at NAS Pensacola, the locations of which are shown in Figure 2. Construction details of the water-supply wells at NAS Pensacola are given in Table 1.

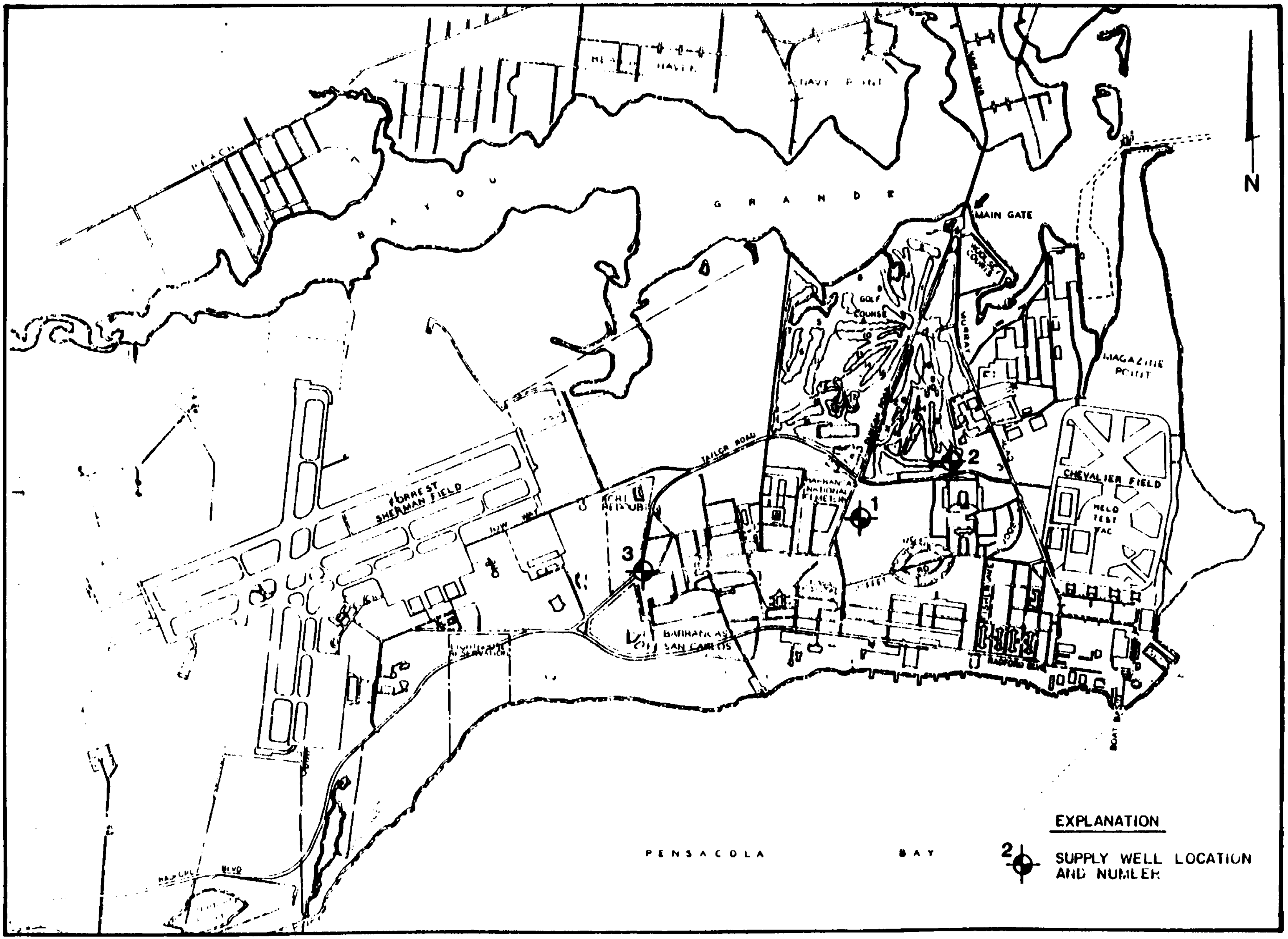

Figure 2. Locations of Water-Supply Wells at NAS Pensacola.

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Table 1. Construction **Details** of Water-Supply Wells at NAS Pensacola.

Well Number	#1 6	#2	#3 1802				
Year Drilled	1942	1942	1969				
Depth Drilled	174'-6"	178'	240'				
Length, outside casing	106'	114'	180'				
Diameter. outside casing	24"-100' 12"-106'	24"-110' 12"-114'	30"-180'				
Material, outside casing	steel	steel	steel				
Depth to static water level	23'	24'	45'				
Normal suction lift (wkng. level)	32'	38'	69'				
Normal yield, GPM	650	650	1,120				
Test yield, GPM	u/k	u/k	u/k				
Type of grout	cement	cement	cement				
Drilling method	rotary	rotary	rotary				
Type of strainer	bronze	bronze	S.S.				
Depth to top of strainer	106'	114'	185'				
Protection from	yes	yes	yes				
Is inundation of well possible?	no	no	no				
Salt intrusion noted in past?	no	no	no				
Has the well ever been contaminated?	no	no	no				
Pump manufacturer's name	Layne Bowler	Layne Bowler	Layne Bowler				
Model number	RKLC	RKLC	12 RK				
Capacity GPM	750	750	750				
Check valve present in line?	yes	yes	yes				
Date of last servicing	routine	maint.	program				
Maintenance schedule (day/mo.)	daily	daily	daily				

WORK PERFORMED

The work done in the course of this study began with the collection and assimilation of existing data and literature pertinent to the project, attendance at a meeting with the FDER and the preparation of a Plan-of-Action (December 1983), which contained details of the proposed verification study. The field work began in March 1984 and included the items described below.

Borings

In addition to the 37 borings drilled during the construction of the monitor wells, sixty-one borings were drilled at various sites for the sole purpose of (1) delineating subsurface hydrologic units, (2) delineating areas of detectable petrochemical contamination, or (3) obtaining soil samples for chemical analyses. Drilling was done by the mud rotary or solid-flyte auger method and in some cases with a hand auger. The descriptions and locations of the borings are contained in the individual site evaluations. Lithologic logs of the borings are contained in Appendix A.

Monitor Wells

Thirty-seven ground-water monitor wells were installed at locations which are included in the individual site evaluations. The construction details of a typical monitor well is shown schematically in Figure 3 and construction

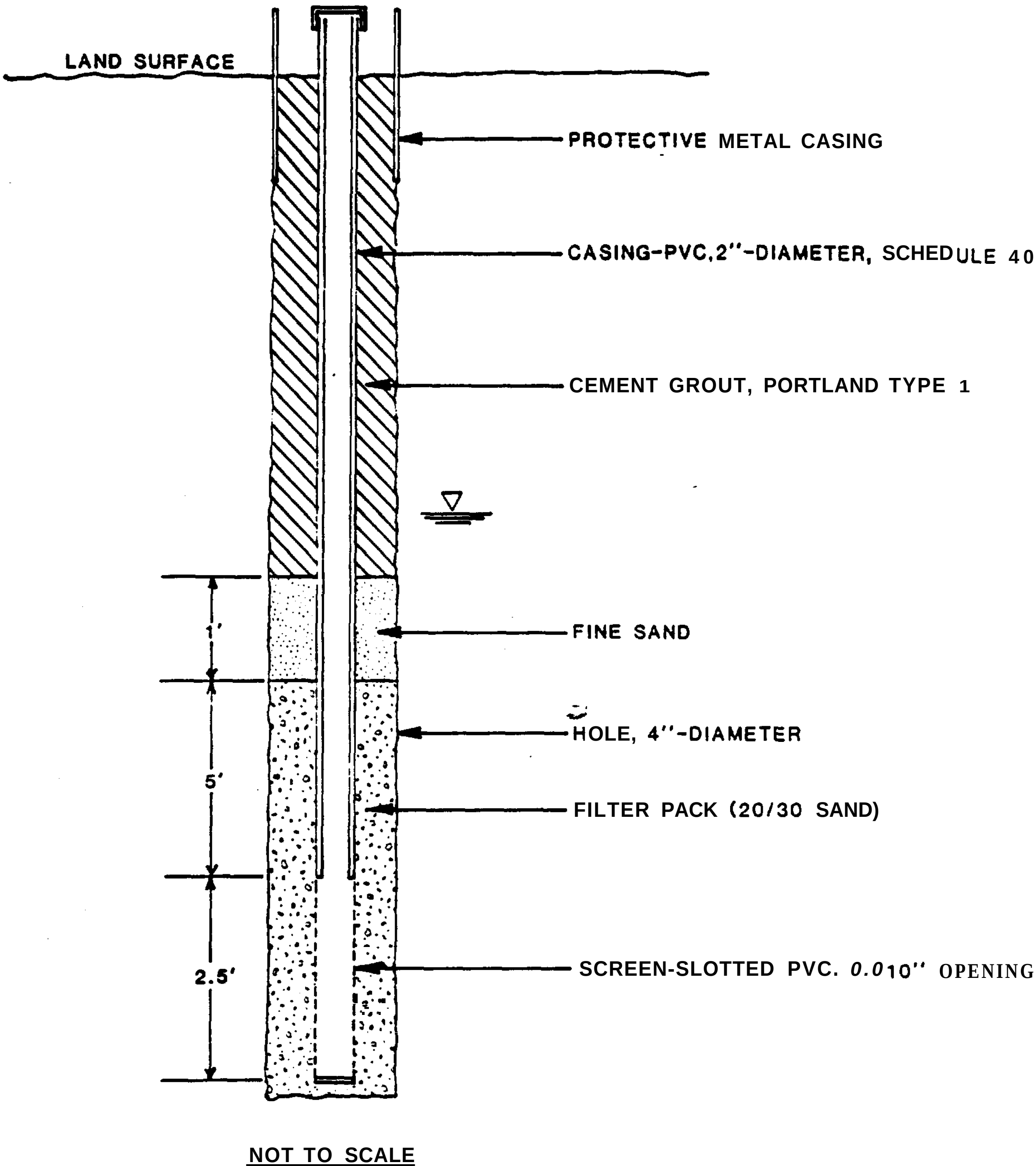

Figure 3. Schematic Diagram Showing Typical Construction Details of the Monitor Wells.

details for each monitor well are presented in Table 2. Drilling for all but one of the monitor wells was done by the mud-rotary method using a 4-inch-diameter drag bit; because of its inaccessible location, monitor well No. 37 was installed using a hand auger. The casing and screen consist of 2-inch-diameter, schedule 40 PVC and were joined by threaded fittings so that no PVC bonding cement was used. Each well was developed for approximately 1 to 2 hours by alternately swabbing and pumping to remove drilling mud and other fine sediment from the filter pack. The PVC casing is protected at the surface by a 4-inch x 4-inch galvanized steel security casing with hinged, locking cap, which prevents unauthorized access to the well. In order to avoid cross-contamination between wells, the drilling equipment was thoroughly cleaned before drilling each well.

Piezometers

Ten shallow piezometers were installed at the wastewater treatment plant in order to better define ground-water flow directions in that area. The piezometers consisted of 10 foot sections of 1-inch-diameter PVC pipe, the bottom six feet of which were slotted. The piezometers were jetted into the ground except at the first location (P-1) where coarse fill material required predrilling. Construction details of the piezometers are also included in Table 2.

Table 2. Construction Details of Monitor Wells and Piezaneters Installed by G&M at NAS Pensacola

Well Designation	Surface Elevation (ft msl)	Top of Casing Elevation (ft msl)	Total Depth Drilled (ft)	Screened. Interval (ft)	Depth to Filter Pack (ft)
Monitor Wells					
GM-1	28.4	29.69	26.3	23.8 - 26.3	18.5
GM-2	22.5	24.87	20.2	17.7 - 20.2	13.0
GM-3	18.7	20.08	18.0	15.5 - 18.0	11.5
GM-4	10.2	11.36	17.0	14.5 - 17.0	10.5
GM-5	7.4	8.25	12	9.3 - 11.8	5.5
GM-6	6.0	6.40	12	9.7 - 12.2	5.7
GM-7	7.6	8.92	11.5	8.8 - 11.3	4.8
61-8	5.7	6.30	11.5	9.5 - 12.0	5.5
GM-9	5.0	5.83	11.5	9.3 - 11.8	5.3
61-10	5.4	6.01	11.5	9.5 - 12.0	5.5
GM-11	5.5	6.18	11.5	9.3 - 11.8	5.5
a-12	4.8	5.91	11.5	8.8 - 11.3	4.8
GM-13	4.7	5.27	11.5	9.5 - 12.0	5.5
GM-14	3.5	4.74	11.4	8.9 - 11.4	5.0
GM-15	6.4	7.54	11.5	9.0 - 11.5	5.0
61-16	27.8	28.60	11.5	9.2 - 11.7	5.2
GM-17	27.8	28.61	11.5	9.3 - 11.8	5.3
GM-18	28.0	29.04	11.5	9.1 - 11.6	5.0
GM-19	27.0	28.26	11.5	8.9 - 11.4	5.0
GM-20	28.8	30.03	11.5	8.9 - 11.4	4.9
GM-21	25.2	26.30	11.5	9.0 - 11.5	5.0
GM-22	25.8	26.50	11.5	9.4 - 11.9	5.4
GM-23	25.2	26.15	11.5	9.2 - 11.7	5.2
GM-24	24.3	24.77	11.5	9.6 - 12.1	5.5
GM-25	29.1	30.20	11.5	9.0 - 11.5	5.0
GM-26	3.6	4.48	11.5	9.2 - 11.7	5.2
GM-27	6.0	8.06	18.0	15.5 - 18.0	11.5
GM-28	8.6	10.82	20.0	17.9 - 20.4	13.9
GM-29	7.0	7.91	11.5	9.2 - 11.7	5.2
GM-30	5.1	6.14	11.5	9.2 - 11.7	5.0
GM-31	19.1	20.49	11.5	8.8 - 11.3	4.9
GM-32	18.3	19.36	11.5	9.1 - 11.6	5.1
GM-33	14.0	15.25	11.5	9.0 - 11.5	5.0
GM-34	15.2	16.15	11.5	9.1 - 11.6	5.0
GM-35	15.0	16.15	11.5	9.0 - 11.5	5.0
GM-36	5.4	7.75	20.0	17.7 - 20.2	13.8
GM-37	3.0	4.61	3.5	0 - 3.5	-
Piezaneters					
P-1	4.8	6.49	8.5	2.5 - 8.5	N.A.
P-2	5.5	7.82	7.9	1.9 - 7.9	N.A.
P-3	4.4	6.13	8.4	2.4 - 8.4	N.A.
P-4	4.2	6.60	7.8	1.8 - 7.8	N.A.
P-5 (destroyed)			7.7	1.7 - 7.7	N.A.
P-6	4.0	6.01	8.2	2.2 - 8.2	N.A.
P-7	5.7	7.32	8.5	2.5 - 8.5	N.A.
P-8	5.4	6.95	8.6	2.6 - 8.6	N.A.
P-9	6.0	9.14	8.1	2.1 - 8.1	N.A.
P-10	4.7	6.01	9.0	3.0 - 9.0	N.A.

N.A. = Not applicable

Surveying

After completion of the monitor wells and piezometers, the elevation of the top of the PVC casing of each was measured by a certified surveyor. The top of casing serves as a reference point from which all water-level measurements will be made. Top of casing and ground-surface elevations, referenced to mean sea level, are presented in Table 2.

Sampling and Analysis

Five surface water, 32 ground water, 18 soil, and 14 sediment samples were collected for chemical analysis. Soil samples were obtained either with a split-spoon sampler or from hand auger cuttings. The twelve bottom sediment samples taken from Pensacola Bay and Bayou Grande were obtained using a clam-shell type sediment sampler lowered from a boat.

Ground-water samples were collected from the monitor wells by first evacuating 3 to 5 volumes of water from the well using a peristaltic pump, and then collecting a ground-water sample using a bottom-entry PVC bailer.

Field measurements of temperature, pH and specific conductance of water samples were made at the time of sample collection. Organic samples were preserved on ice until delivery to the laboratory and inorganic samples were delivered to the laboratory within 24 hours of sampling. Laboratory analyses of all samples were conducted by approved, qualified laboratories. Chemical analyses of soil and sediment samples were done using non-destructive extraction procedures.

HYDROGEOLOGIC SETTING

Geologic Framework

The geologic sequence of sediments underlying NAS Pensacola is illustrated in Figure 4, which is a composite geologic column constructed from published data and logs of borings and wells in the area. The uppermost sediments extending to a depth of up to 400 feet (ft), comprise the so-called "sand and gravel aquifer." It is underlain by the relatively impermeable Pensacola clay, below which lies the Floridan aquifer, which consists of thick layers of limestone and shale extending to a depth of about 1700 ft.

Topography and Drainage

NAS Pensacola is located on a peninsula, bounded on the north by Bayou Grande, on the east and south by Pensacola Bay. The central part of the peninsula is gently rolling with surface elvations as high as 40 ft msl (mean sea level). The prominent bluff, on which Fort Barrancas was built, roughly parallels the south shoreline and then turns northward along the west edge of Chevalier Field. Seaward from the bluff is a marine terrace, a low, nearly level surface at approximately elevation 5 ft msl. The bluff and terrace constitute a wave-cut bench formed during the Silver Bluff sea level stage.

Because of the sandy soil, a high proportion of rainfall infiltrates into the ground and consequently there are few

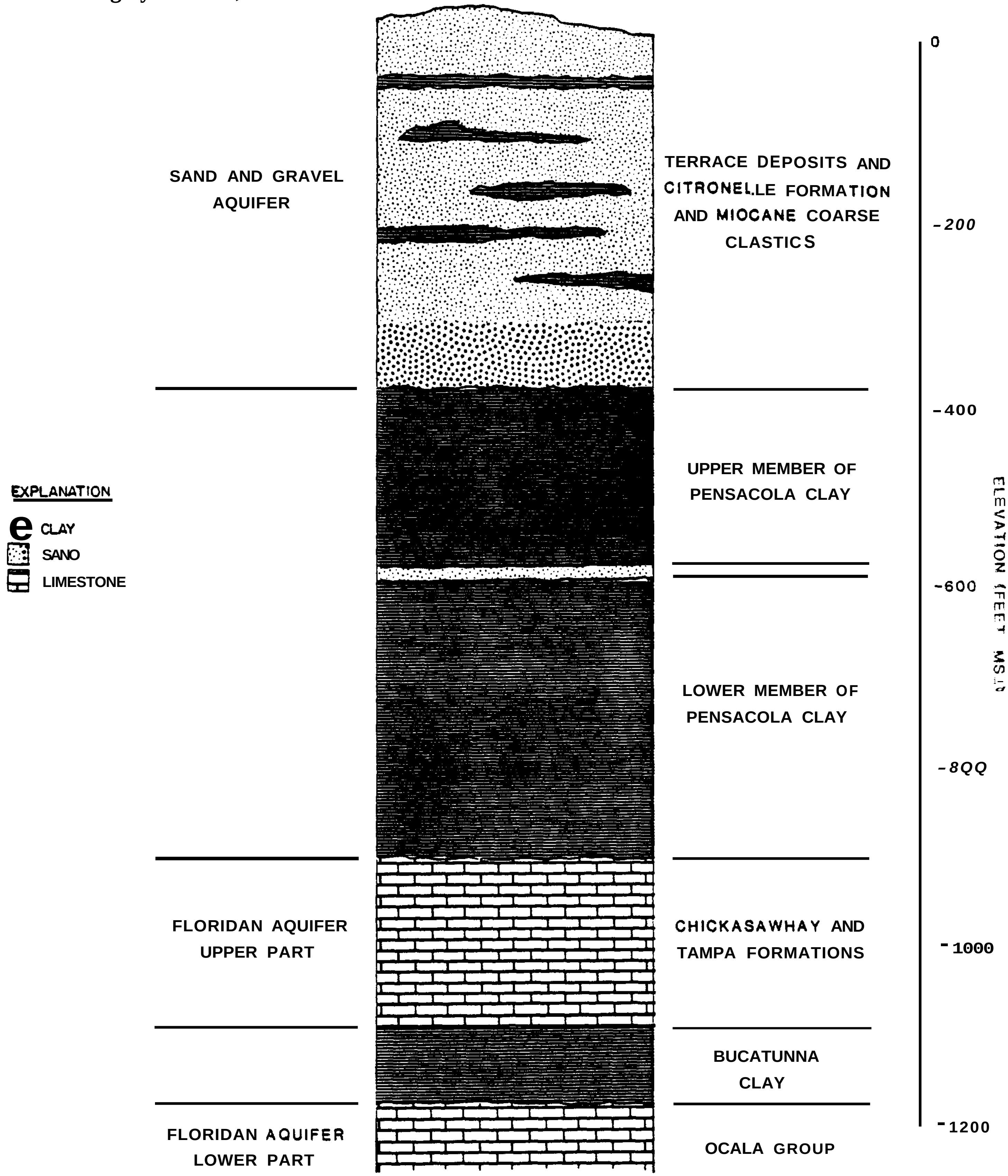

Figure 4. Generalized Geologic Column for the NAS Pensacola Area.

streams, Much of the surface drainage has been constructed or modified to accommodate structures on base. Essentially, the only areas served by storm sewers are Forrest Sherman Field and the highly developed area in the southeast part of the base.

Ground-Water System

Sand and Gravel Aquifer

Regional Occurrence

The sand and gravel aquifer is comprised of three units which have similar hydraulic properties and sometimes are indistinguishable including the upper Miocene coarse clastics, the Citronelle formation, and marine terrace deposits. The aquifer consists of poorly-sorted, fine to coarse sands with gravel and lenses of clay which range from a few inches to as much as 60 ft in thickness. In some areas, the formation also contains wood fragments of all sizes, occurring mostly in layers which may be as much as 25 ft thick (Marsh, 1966). Logs of borings and wells drilled on base do not indicate the presence of wood fragments although dark organic horizons are found in some areas.

The formation contains lensatic zones within the sand which are cemented by iron oxide minerals. These lenses, known locally as "hardpan", have low permeabilities, and along with the clay lenses, are responsible for the

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occurrence of perched water tables and artesian conditions in the aquifer.

Most of the wells in the Pensacola area, including the supply wells at NAS Pensacola are screened within a depth interval of about 150 to 350 ft. Water from this zone at NAS Pensacola is undesirable because of high iron content and therefore the three supply wells tapping the upper part of this unit are used only to supplement the supply from Corry Field. Tables C-1, C-2, and C-3 in Appendix C present water quality analyses for the supply wells at NAS Pensacola. Table C-2 includes a scan for organic priority pollutants in which only traces of dieldrin were reported; subsequent duplicate resampling analyses in which no organic priority pollutants were detected.

Site Specific

Logs of borings from various locations at NAS Pensacola show that sands extend from ground surface to an elevation of approximately -35 ft msl below which is a 15 ft thick marine clay, the continuity of which is uncertain. Underlying the clay is more sand with numerous clay lenses, the depths and dimensions of which are not well defined. Locations of previous borings made at NAS Pensacola are shown in Figure 5 and lithologic logs of those borings are included in Appendix B.

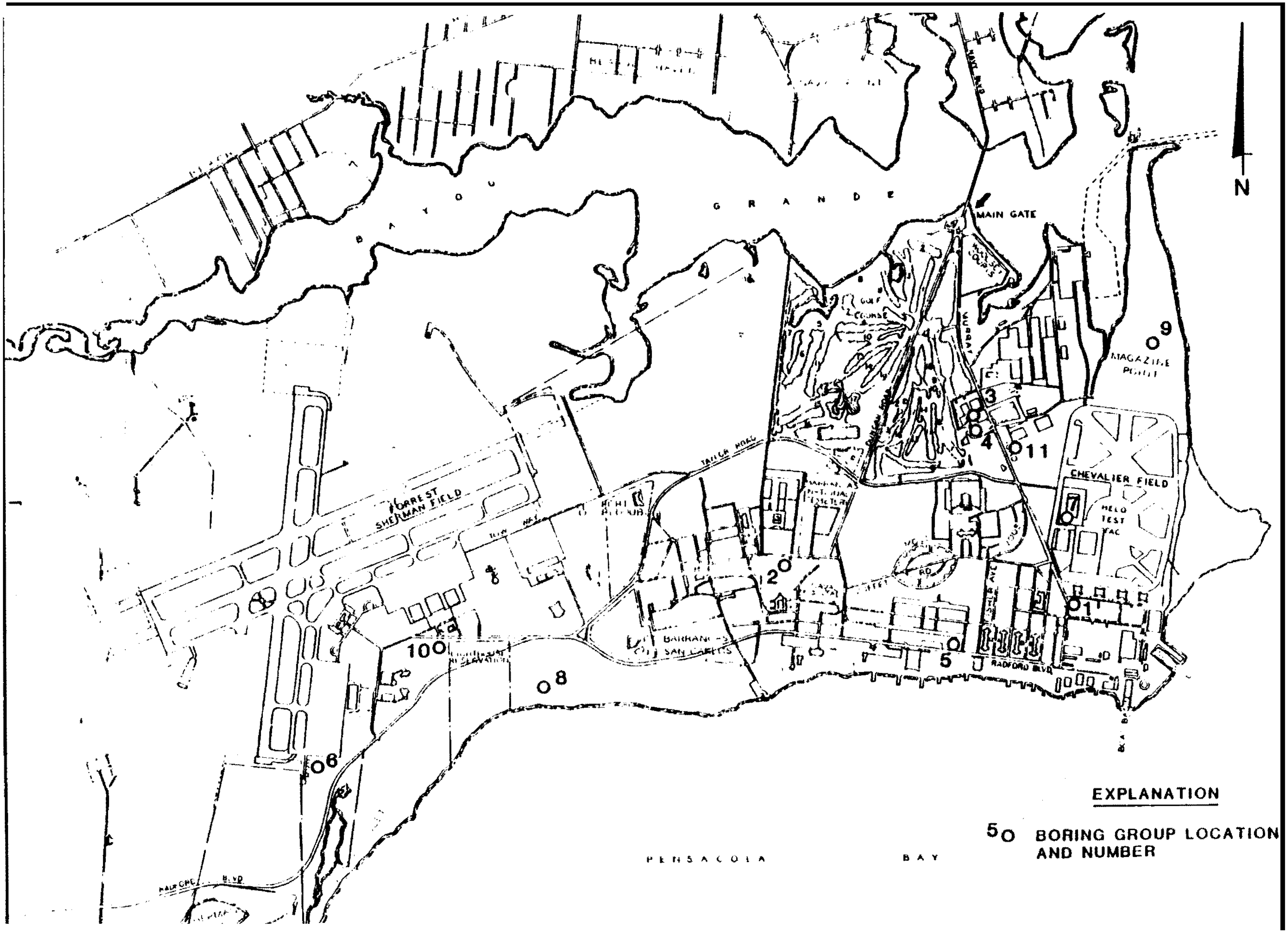

Figure 5. Locations of Previous Borings at NAS Pensacola.

Presented in Figures 6 and 7 are geologic cross sections showing the uppermost hydrologic units at the NAS Pensacola. Although the marine clay shown in these cross sections has been encountered at widely scattered boring locations across the base, its continuity is uncertain. Clay lenses are present within the lower sands; however, the data are insufficient to establish their depths and dimensions.

Horizontal movement of ground water in the surficial sand is generally from topographic highs to areas of discharge such as streams or the nearby surface-water bodies such as Pensacola Bay. In areas where monitor wells were installed, ground-water flow patterns have been delineated and are included in the individual site evaluations. Although the coastline is normally a discharge zone with upward movement of deep ground water, pumpage from the lower sands may have created a downward gradient, at least locally, from the surficial sand through the marine clay.

Laboratory permeameter tests have been conducted on surficial sand samples from the tank farm area and the permeability of the surficial sand in other parts of the base has been estimated from in-situ slug tests and grain-size analyses. Hydraulic conductivities from these analyses, which are summaried in Table 3, range from 2.4×10^{-3} to 2.2×10^{-2} cm/sec (centimeters per second). Hydraulic properties of the marine clay and lower sands have not been determined.

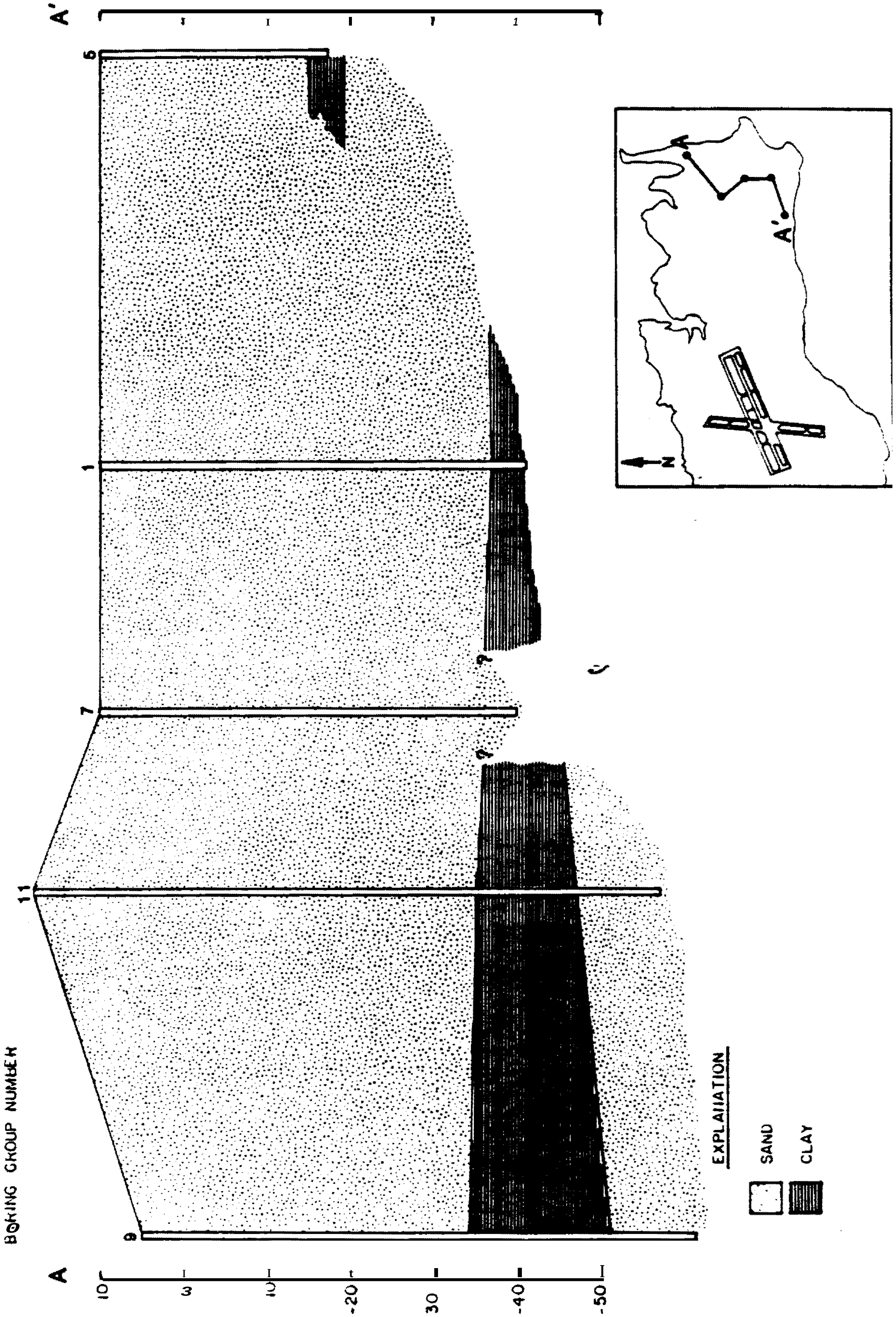

Figure 6. Geologic Cross-Section A-A'.

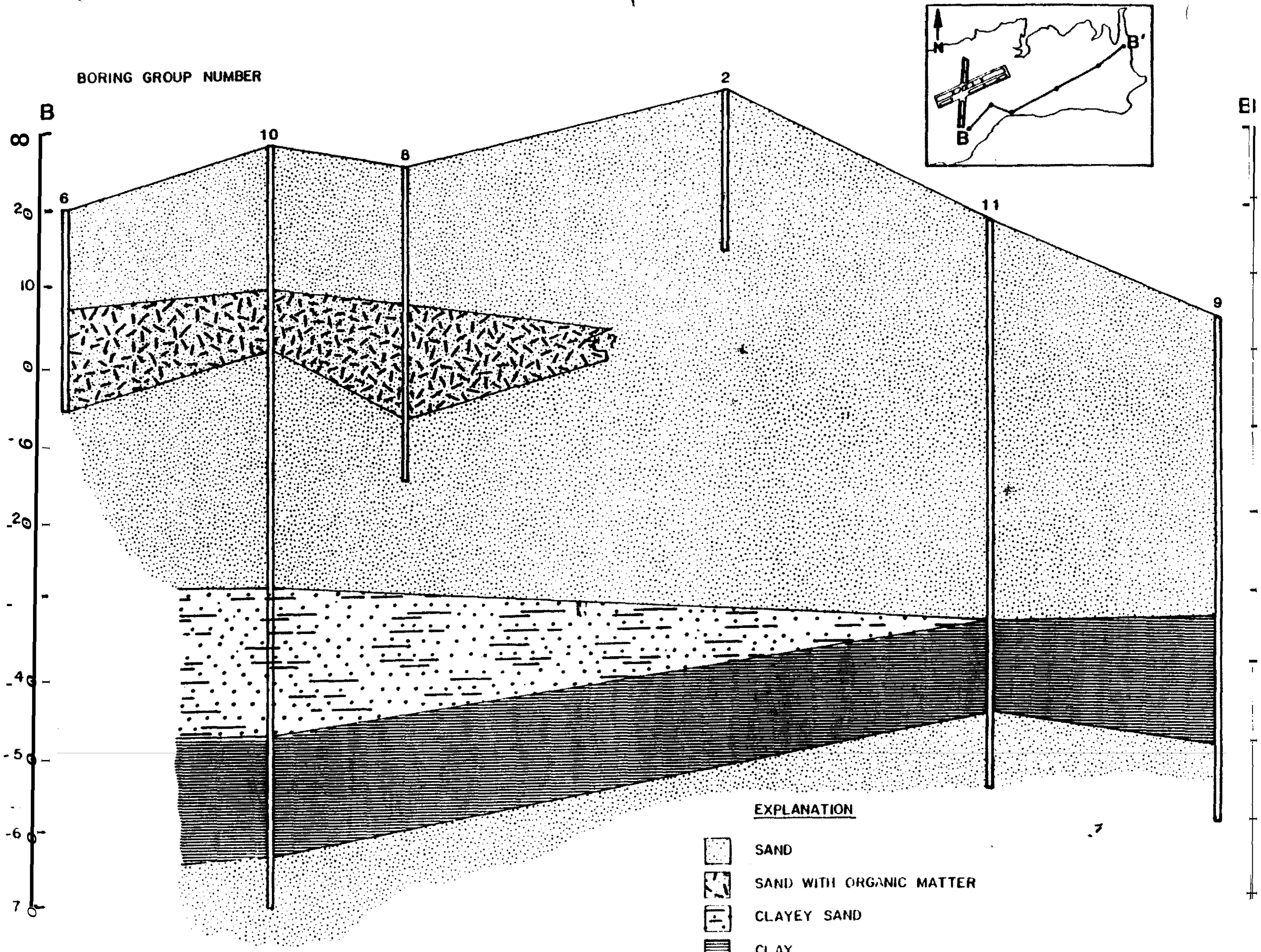

Figure 7. Geologic Cross-Section B-B'.

Table 3. Estimates of Hydraulic Conductivity for Surficial Sand at NAS Pensacola

Source	Hydraulic Conductivity (cm/sec)	Directional Component	Type of Analysis	Location	Boring or Well Number	Deptr (ft)
Thompson, 1984	4.1×10^{-3}	Vertical	Constant head permeameter	Fuel Farm	B-1	[illegible]
Thompson, 1984	2×10^{-2}	Vertical	Constant head permeameter	Fuel Farm	B-1	[illegible]
Thompson, 1984	2.4×10^{-3}	Vertical	Constant head permeameter	Fuel Farm	B-2	[illegible]
Thompson, 1984	1×10^{-2}	Vertical	Constant head permeameter	Fuel Farm	B-2	14
Thompson, 1984	6.8×10^{-3}	Vertical	Constant head permeameter	Fuel Farm	B-3	[illegible]
Missimer, 1983	2.2×10^{-2}	Nondirectional	Grain-size analysis	Wastewater Plant	?	[illegible]
Geraghty & Miller, 1984 (this study)	1.96×10^{-2}	Horizontal	Slug injection	Wastewater Plant	GM-12	[illegible]
Geraghty & Hiller, 1984 (this study)	8.5×10^{-3}	Horizontal	Slug injection	Fuel farm pipeline (Site 19)	GM-18	10
Geraghty & Miller, 1984 (this study)	6.1×10^{-3}	Horizontal	Slug injection	Sanitary Landfill (Site 1)	GM-5	[illegible]

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Floridan Aquifer

The deep limestone layers comprise the regionally extensive Floridan aquifer, which in this area is divided into an upper and lower part separated by the Bucatunna clay. The upper Floridan aquifer is an important source of water in areas east of Escambia County; however, in the Pensacola area, it is highly mineralized and not used as a water supply. The lower Floridan aquifer is also highly mineralized and is, in fact, designated for use as an injection zone for waste disposal in this area.

SANITARY LANDFILL (SITE 1)

Background

The landfill northeast of Fort Redoubt was used from the early 1950's until 1976. During this time, nearly all solid waste generated on base, in addition to waste from outlying Navy installations, was disposed of here, including the hazardous materials listed in Table 4. During its early use, wastes were burned before being covered. The area of active landfilling at this site shifted over the years, as shown in Figure 8.

In 1974, a drain tile was found to be discharging leachate from the landfill into a pond on the golf course, creating an odor nuisance and concern about health risks. The drain outlet was temporarily plugged, causing the water table to rise and leachate to appear at the surface, eventually resulting in the closing of the landfill. At this time, seven monitor wells were installed at the approximate locations shown in Figure 9 and the ground water was sampled and analyzed, partial results of which are presented in Tables C-4 and C-5 in Appendix C. In 1982, the IAS team sampled the leachate discharging at the east edge of the landfill and sediment from ponds north and east of the landfill. These sampling locations are shown in Figure 8 and chemical analyses are presented in Table C-6 in Appendix C.

Table 4. Partial List of Material Disposed of in the Sanitary Landfill.

Approximate Date	Item	Total Amount Disbosed	Comments
1950s-1976	Ketone soaked rags		
1950s-1976	PCB and Transformer Oil Soaked Rags	6,500 ft^3	
1950s-1976	Paint Chips		Contaminated with paint strippers
1962-1976	Paint Sludge From Water Wall Paint Booth	170,000 lbs.	
1950s-1962	Paint Sludge	5,200 gals.	Burned at North end of site
1950s-1976	Dry Air Filter Pads from Paint Booths	11,963 ft^3	
1960-1964	Compressed Gas Cylinders	200	
1973	Asbestos From Building Demolition		
1967	Wood Soaked With Plating Solutions	[illegible],667 ft^3	Contaminated with Chrome, Nickel, Lead, Cadmium, Tin and Other In-organic Chemicals
	Pesticide Rinseate		
	Garbage	64,800 Tons	
	Wastes From OLFs Corry, Ellison, Saufleg, Baron, and Whiting		
	Containers From Paints, Pesticides, Oils, Strippers, Plating Chemicals, Solvents, Thinners, etc.		
1950s-1976	Mercury		

From NEESA, 1983

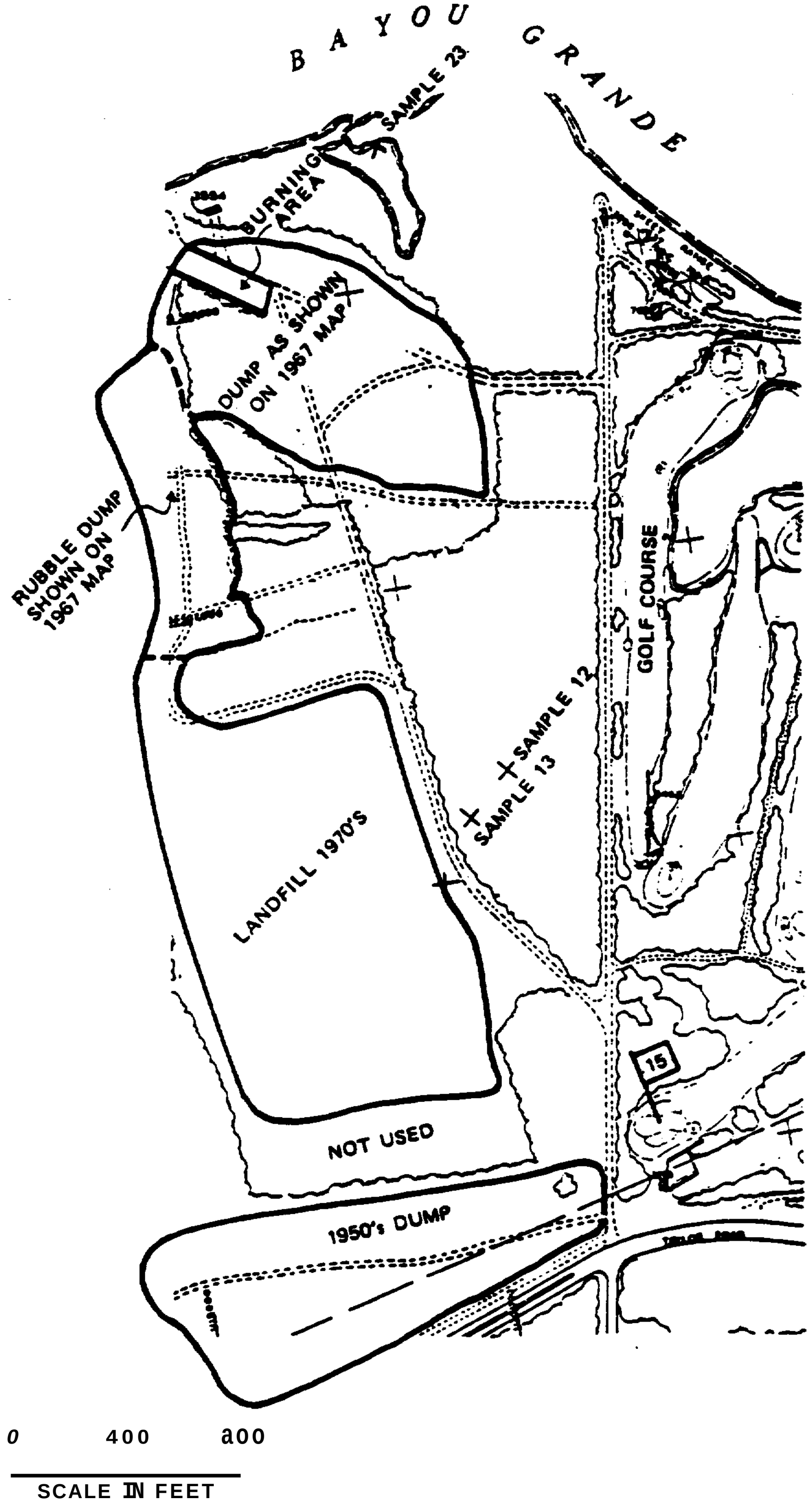

Figure 8. Historical Use of Sanitary Landfill and Locations of IAS Sampling Points.

From NEESA, 1983.

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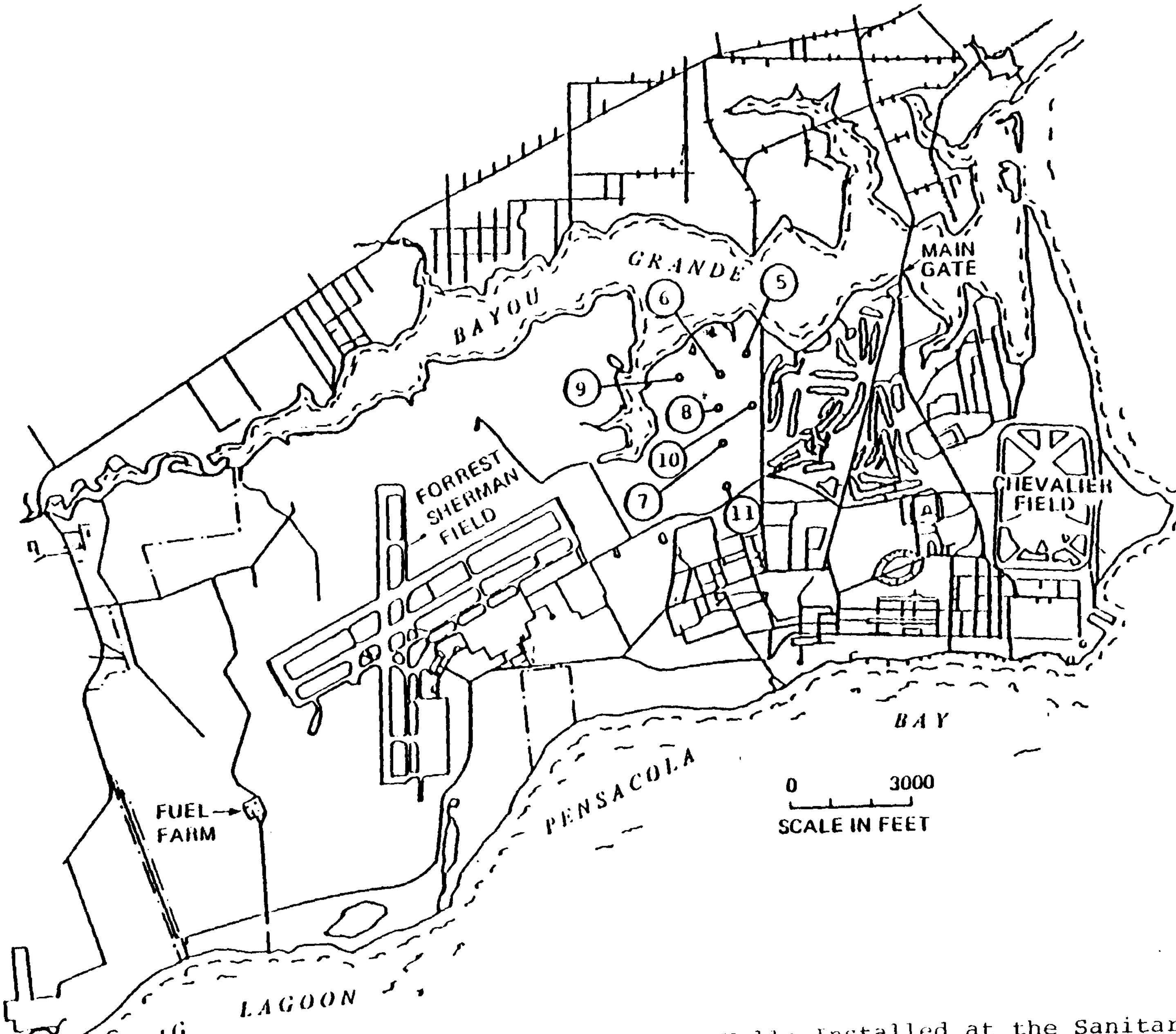

Figure 9. Locations of Monitor Wells Installed at the Sanitary Landfill in 1974.

From NEESA, 1983

The 1974 monitor wells consist of galvanized steel pipe attached to 5-foot-long well screen, which were reportedly driven to a depth of 4 ft below the water table. During the current study, only 6 of these wells were located and none were found to be satisfactory for sampling.

Findings and Recommendations

Figure 10 shows the locations of new monitor wells installed at the landfill and a water-table contour map constructed from water-level elevations at the monitor wells. It shows that shallow ground water moves northward toward Bayou Grande as well as eastward toward the golf course ponds and toward an arm of Bayou Grande to the west. Hydraulic conductivity of the shallow sand was determined from a slug test at GM-5 to be 6.1×10^{-3} cm/sec. Assuming a hydraulic gradient of 0.008 and an effective porosity of 0.35 for the surficial sand, the horizontal seepage velocity for the shallow ground water at this site is about 140 ft/yr (feet per year).

In the verification study, ground-water samples from the eight new monitor wells were analyzed for acid and base/neutral organics, volatile organics, pesticides, PCBs, metals, cyanide and field parameters, the results of which are included in Table C-7 in Appendix C. Concentrations of metals are low and none exceeded FDER's drinking water standards. Comparison of current concentrations with those of 1974 and 1975 (Tables C-4 and C-5 in Appendix C) show that

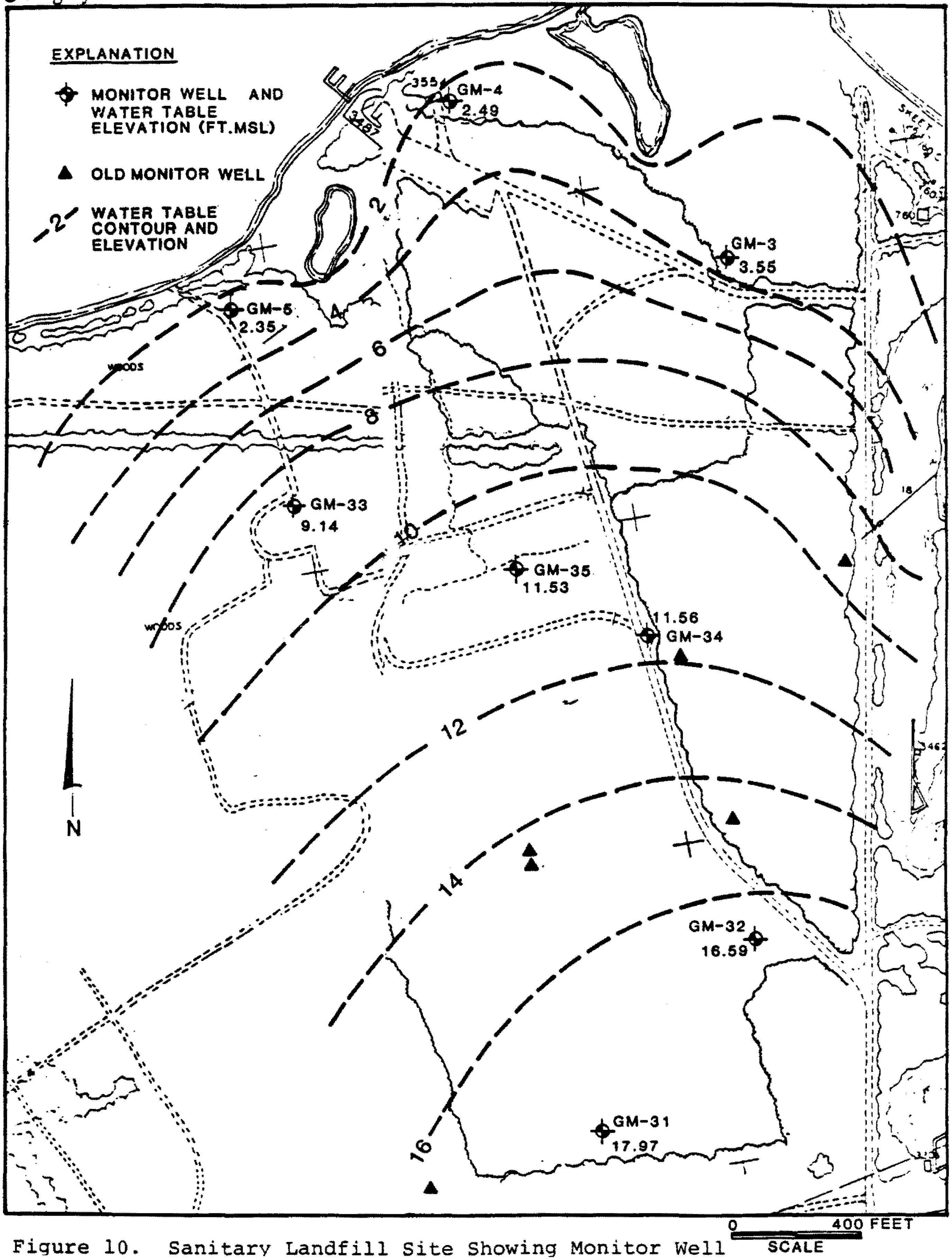

Figure 10. Sanitary Landfill Site Showing Monitor Well Locations and Water Table Contours for April 6, 1984.

previously high levels of zinc and cyanide have decreased. The originally high zinc concentrations may have been the result of leaching from the galvanized casings of the old monitor wells, while the decrease in cyanide may be attributable to biodegradation and oxidation to cyanate. Specific conductance levels are low (less than 600 umhos/cm), and pH values fall within the normal range for shallow ground water. The highest concentrations of organic constituents occur generally in the. central part of the landfill area. Virtually all of the organics found are VOCs (volatile organic compounds). No PCBs or pesticides were detected and, except for the 47 ppb (parts per billion) of naphthalene at GM-35, only trace or near-trace levels of acid and base/neutral compounds were detected.

The findings show that ground water at the sanitary landfill has been affected by past disposal practices as indicated primarily by the VOC concentrations detected. Leachate originating in the landfill moves north and northwestward toward Bayou Grande or northeastward toward the golf course ponds, where it is discharged to surface waters. To determine what concentrations of constituents may be discharging into these surface waters, it is recommended that monitor wells be installed at the locations shown in Figure 11.

The potential for downward movement of ground water through the marine clay and into the lower sands should also

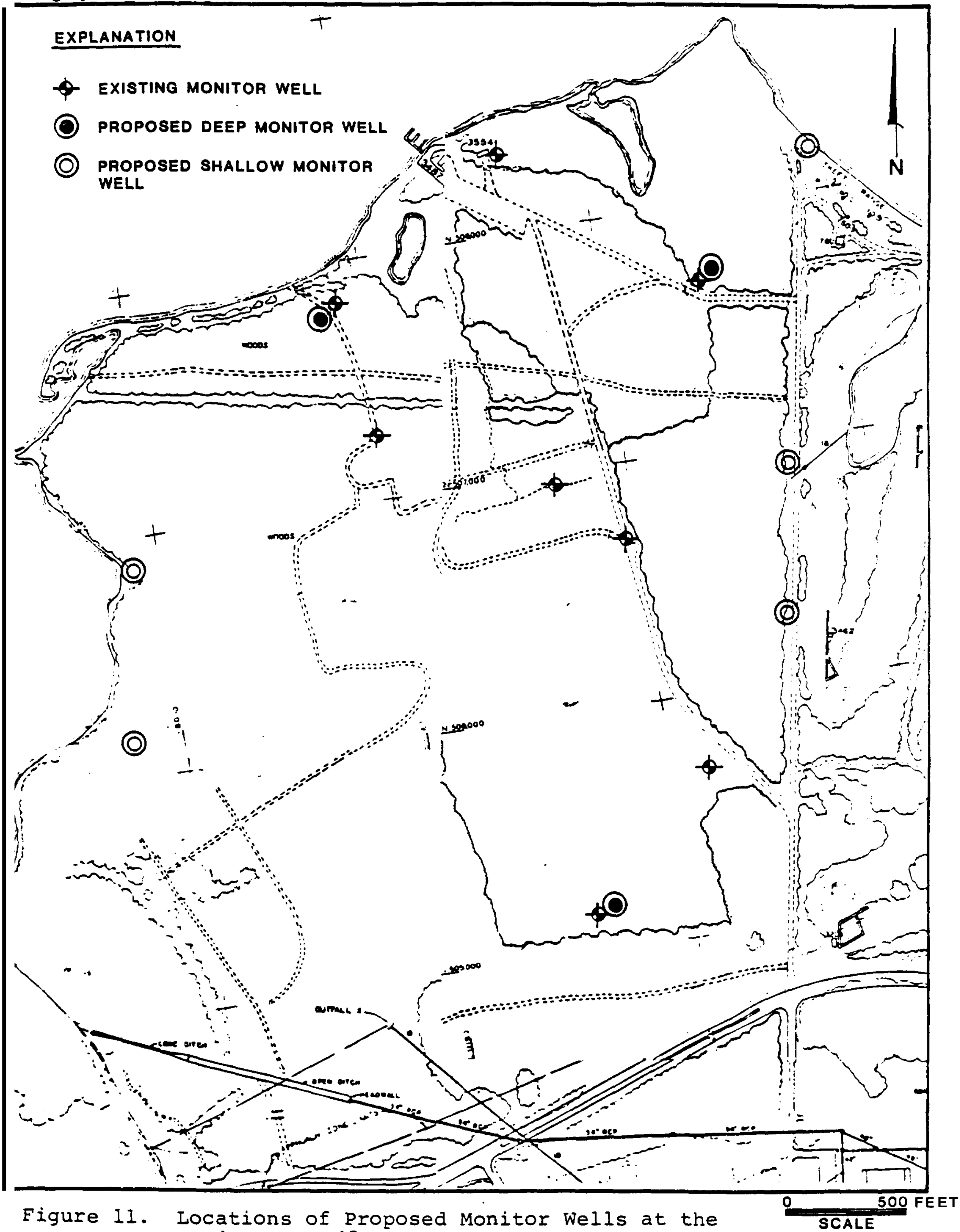

Figure 11. Locations of Proposed Monitor Wells at the Sanitary Landfill.

be determined. Therefore, it is recommended that three deep monitor wells be installed into the lower sand, one each adjacent to GM-3, GM-5 and GM-31 (Figure 11). Water-level measurements from the deep wells can then be compared to those of the adjacent shallow wells to indicate the vertical direction of ground-water flow through the clay as well as the hydraulic gradient. Samples of the clay should be tested by permeameter to determine their vertical hydraulic conductivity. A comparison of water levels of the three deep wells will show the direction of horizontal flow in the lower sand and short-term pumped drawdown tests conducted on the shallow monitor wells will provide additional data on the hydraulic properties of the surficial sand. Ground water from the proposed monitor wells will be analyzed for EPA's organic priority pollutants and the existing G&M monitor wells will be resampled and analyzed for VOCs, pH, and specific conductance.

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WATER FRONT SEDIMENTS (SITE 2)

Background

From 1938 until 1973, when the industrial sewer system was installed, industrial wastes from NARF activities were discharged to Pensacola Bay via the storm sewers. Outlets for most of the storm sewers draining the NARF facilities are located in the southeast corner of the base. Wastes included paints, thinners, paint strippers, paint chips, ketones, solvents and metal plating chemicals including chromium, cadmium, lead, nickel, and cyanide. Sediment 'samples from the bay, near the sewer outlets, were collected by the IAS team and analyzed for total metals (Cd, Cr, Hg, Ni, and Pb); however, only minor amounts were found.

Findings and Recommendations

In the verification study, six additional bottom sediment samples were taken approximately 300 feet off-shore in water depths of about 30 ft, at locations shown in Figure 12. Samples were analyzed for EP toxicity, the results of which are presented in Table C-8 in Appendix C. Negligible concentrations of metals were detected, and therefore no further study is recommended at this site.

Geraghty & Miller, Inc.

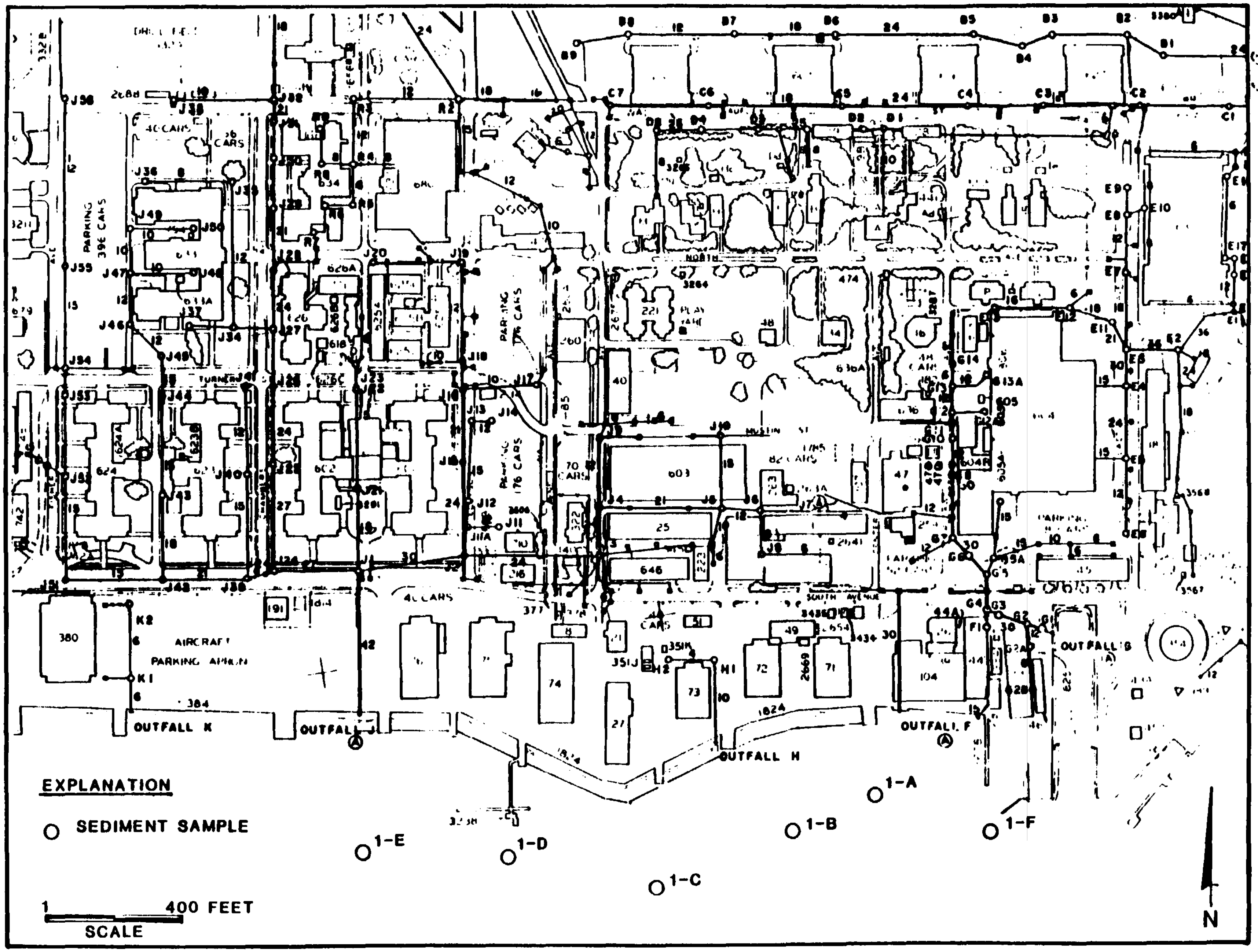

Figure 12. Locations of Waterfront Sediment Sampling Points (Site 2).

CRASH CREW TRAINING AREA (SITE 3)

Background

From 1955 until the present, an area adjacent to runway 36 at Forrest Sherman Field has been used for fire-fighting training. An area of about 10 acres contains at least 9 specific sites at which fires were set, only two of which are still in use. During a typical training session approximately 50 gallons of fuel, which may include JP-4, JP-5, AVGAS, or lube oil, is poured into a shallow-unlined depression, ignited and extinguished using AFFF (aqueous film forming foam), a solution which may contain of any of several foaming agents used by the Navy.

A shallow ditch parallelling the runway contains the catch basins of an underlying storm drain system. As shown in Figure 13, one storm drain begins near GM-22, and leads northward and another begins near GM-23 and leads southward. Inverts of these drains are 5 to 6 feet below the water table (as measured in April) and leakage into the drains appears to be depressing the overlying water table and affecting the direction of ground-water flow.

Findings and Recommendations

Eighteen shallow borings were drilled at locations shown in Figure 13 and inspected to determine if free oil was present on the water table. Six monitor wells were then installed around the burn sites, and ground-water samples

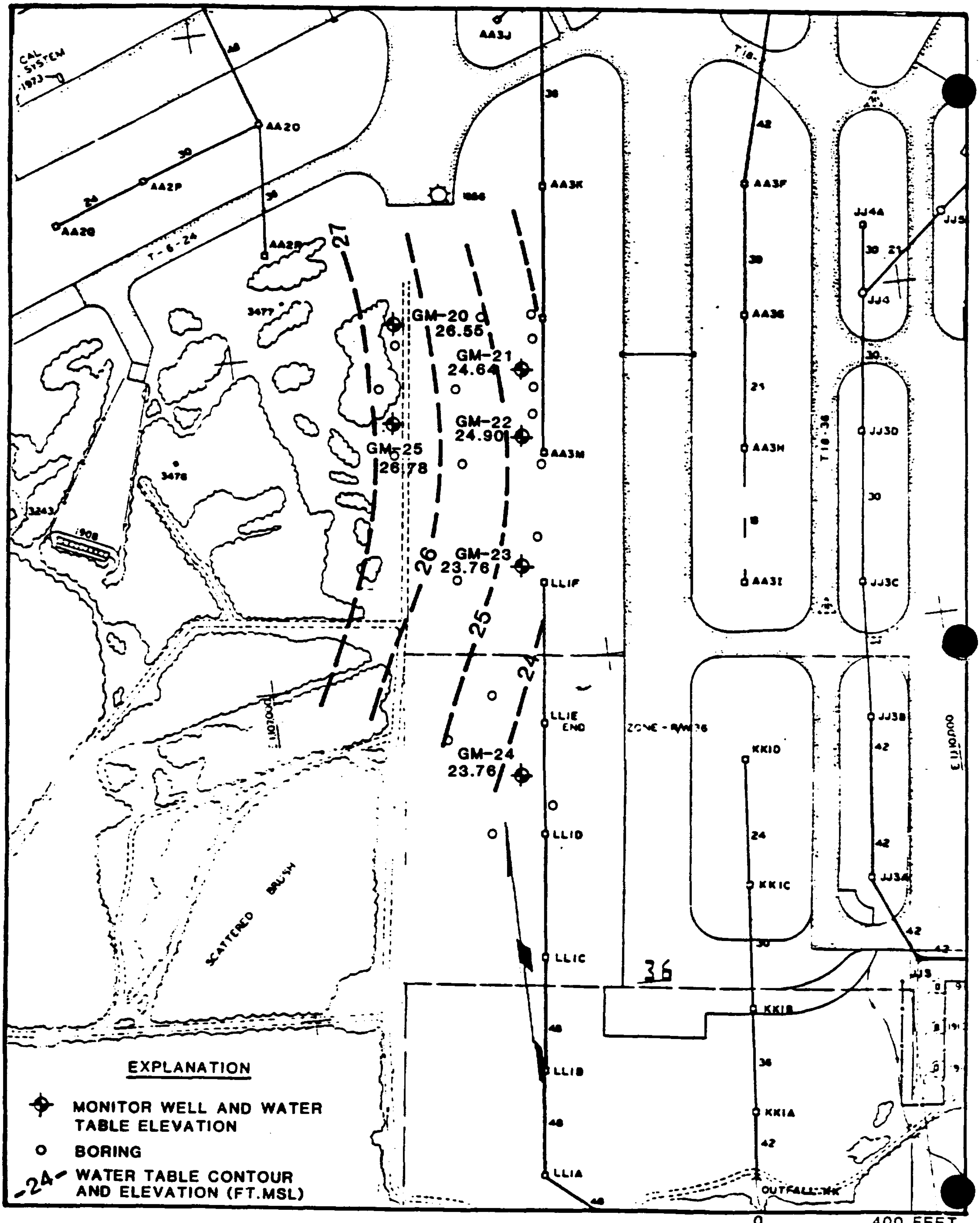

Figure 13. Crash Crew Training Site Showing Locations of Monitor Wells and Borings and Water Table Contours for April 7, 1984.

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were collected and analyzed for VOCs, the results of which are presented in Table C-9 in Appendix C. No free fuel was found floating on the water table at any of the borings or monitor well locations and VOCs were detected in low concentrations at only three of the monitor wells.

The Navy Civil Engineering Lab (NCEL) in Port Hueneme, California is conducting a separate study of possible ground-water contamination at this site. Soil samples were collected from the unsaturated zone at GM-21, GM-22, and GM-23, and sent to the NCEL for that purpose. In its investigation, the NCEL will collect and analyze additional ground-water samples from the wells at this site.

Because of the low concentrations of VOCs found, the remoteness of the area, and the work being performed by NCEL, no further studies by the NACIP team are recommended at this site. The results of the NCEL study will be presented in the report containing the findings of the characterization studies.

SOUTHWEST CHEVALIER FIELD (SITES 9, 23, 29, and 34)

Background

The four sites shown in Figure 14 in the southwest part of Chevalier Field are combined because of proximity to each other. Site 9 was used for disposal of domestic trash and refuse from 1917 until the 1930's. At site 23, there were two separate fuel leaks; Navy special fuel oil was spilled in 1965 and diesel fuel marine was spilled in 1968 or 1969. The leaks were repaired but no attempt was made to recovery the fugitive oil. In 1981, at site 29, several excavation workers received skin burns from contact with a black liquid in the soil south of *Building 3460. It is not known what chemical caused the burns; however an industrial waste sewer line is near the site and is the assumed source of the chemical. During May 1984, a leak occurred in a pipeline carrying a solvent detergent solution used to clean aircraft. The leak was at the north end of Building 3557 (Site 34), and involved the loss of about 45,000 gallons of the solution. The solution contains 1.7% chlorinated aromatic hydrocarbon solvent, or about 750 gallons of solvent.

F and Recommendations

Four monitor wells were installed to the south and west of the area containing these four sites, at locations shown in Figure 14. Water-level data from these wells indicate that shallow ground water is moving toward the paved ditch

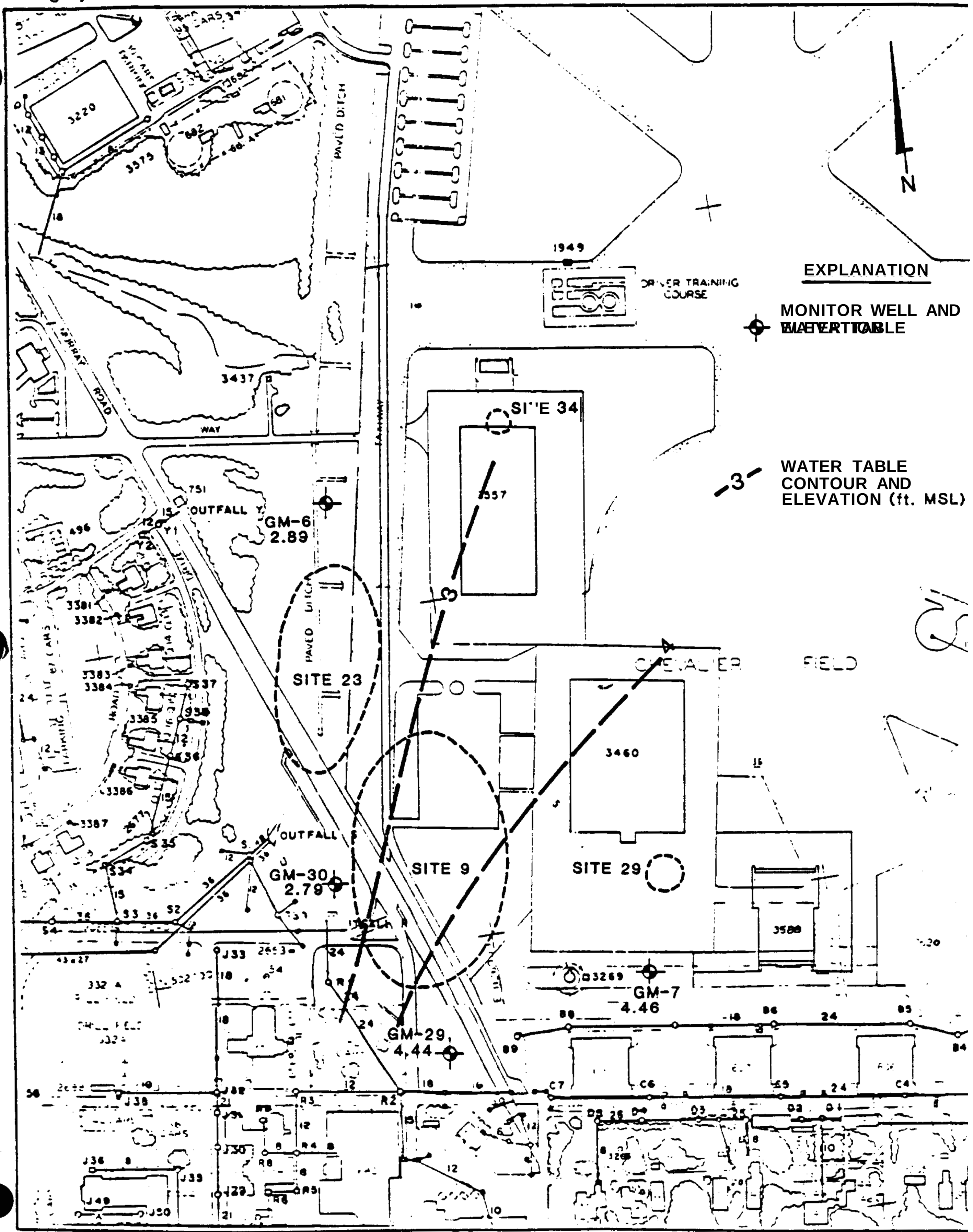

Figure 14. Southwest Chevalier Field Showing Monitor Well Locations and Water Table Contours for April 7, 1984.

west of Chevalier Field. VOCs were not detected in ground water samples from the monitor wells (Table C-10 in Appendix C); however, VOCs were found in low concentrations in the ditch downstream from the site (see Figure 15 and Table C-11 of Appendix C).

No VOCs were detected in the ground-water samples, suggesting that the contaminants are very localized or have since been purged from the ground-water system. Therefore, no further study is recommended at sites 9, 23, and 29. However, at the solvent spill (Site 34), three additional shallow monitor wells should be installed at the approximate locations shown in Figure 16. Adjacent to one of the shallow wells, a deep monitor well should also be installed below the marine clay. These four new wells and GM-6 should be sampled at least quarterly for VOCs. Surface-water samples should also be collected periodically from the ditch and analyzed for VOCs. Water levels should be measured at all of the monitor wells in the area during each sampling period to ascertain ground-water flow directions. A specific-capacity test should be conducted at one of the shallow monitor wells to determine the hydraulic properties of the surficial sand and the vertical permeability of the marine clay should be determined by permeameter test.

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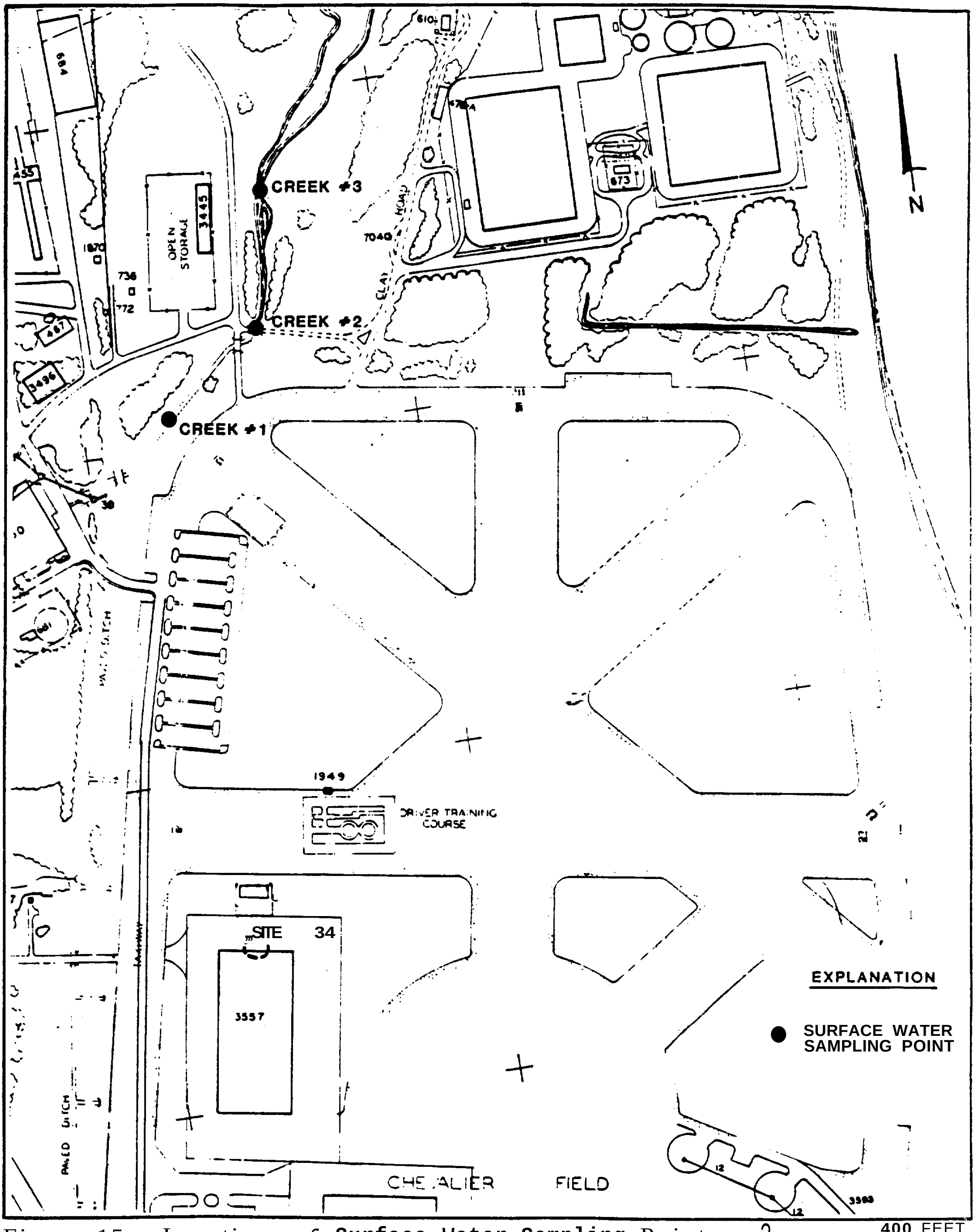

Figure 15. Locations of **Surface-Water Sampling** Points in **Creek West** of **Chevalier Field.**

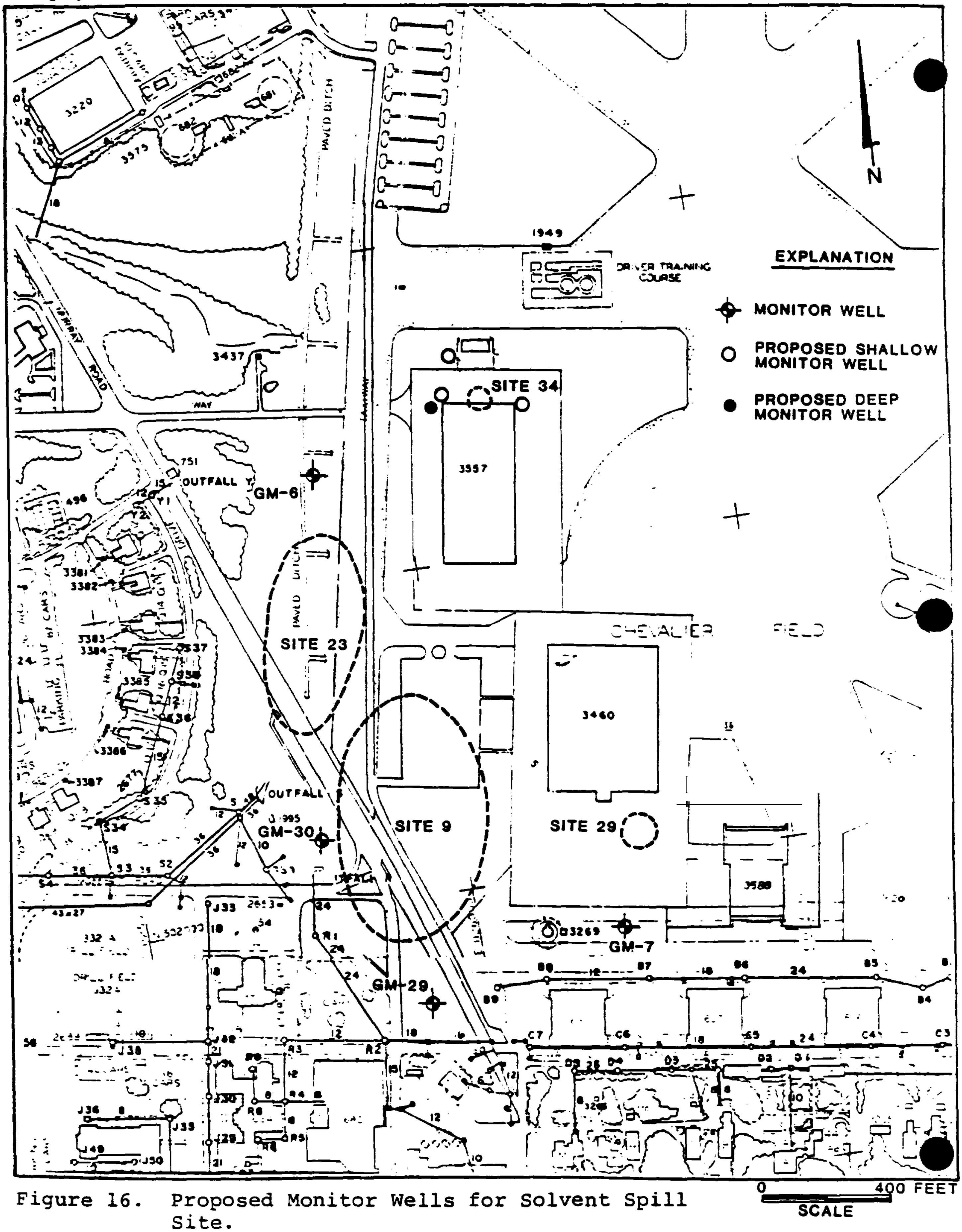

Figure 16. Proposed Monitor Wells for Solvent Spill Site.

NORTH CHEVALIER FIELD DISPOSAL AREA (SITE 11) AND SUPPLY DEPARTMENT OUTSIDE STORAGE (SITE 26)

Background

From the late 1930's until the mid 1940's, industrial waste and general refuse were disposed of and burned in a low swampy area along an arm of Bayou Grande north of Chevalier Field (Site 11). Approximately 24 cubic yards per day of waste including various types of waste oils were disposed of in this area. A sediment sample from the arm of Bayou Grande collected during the IAS study was found to contain the following concentrations of total metals (milligrams per kilogram): cadmium, 140 mg/kg; chromium, 8900 mg/kg; mercury, 2.0 mg/kg, nickel, 27 mg/kg; and lead, 650 mg/kg. The metals found in this sample could have been leached from the landfill or they might have been deposited in the Bayou via the drainage ditch to the south.

Until 1964, a 30 by 30 ft area on the south side of Building 684 was used by the Supply Department to store incoming paint strippers and acids (Site 26). Containers of these materials were placed outside on steel matting where leaks sometimes occurred. During the IAS, soil samples were taken to depths of 24 inches at 3 locations at the site and analyzed for EP toxicity (metals). Results of the analyses show no samples exceeding EP toxicity limits.

Findings

Five monitor wells were installed at Site 11 and one well was installed east of Site 26 (Figure 17). Ground-water samples were analyzed for metals and VOCs, the results of which are presented in Table C-12 in Appendix C. In addition, five sediment samples and two surface water samples from the small Bayou were collected at locations shown in Figure 18 and analyzed, the results of which are also contained in Table C-12. The quality of ground water sampled at the monitor well locations is relatively good. Specific conductance is relatively low and concentrations of metals do not exceed the FDER's primary drinking-water standards. VOCs were found only at GM-15, GM-26, and GM-28 and at these locations no constituent was found in a concentration greater than 22 ppb. The EP toxicity levels for the sediment samples from Bayou Grande are quite low although the surface-water samples contained concentrations of chromium, lead, iron, silver, nickel, copper, and manganese, which are somewhat higher than typical values for sea water. Water levels in the monitor wells indicate that ground water flow is eastward toward the Bayou.

Seven borings, the locations of which are shown in Figure 17, were made to determine the composition of the fill as well as its lateral and vertical extent. Borings east of the creek encountered construction debris while to the west, domestic trash and oily sludge were found to a depth of 15 to

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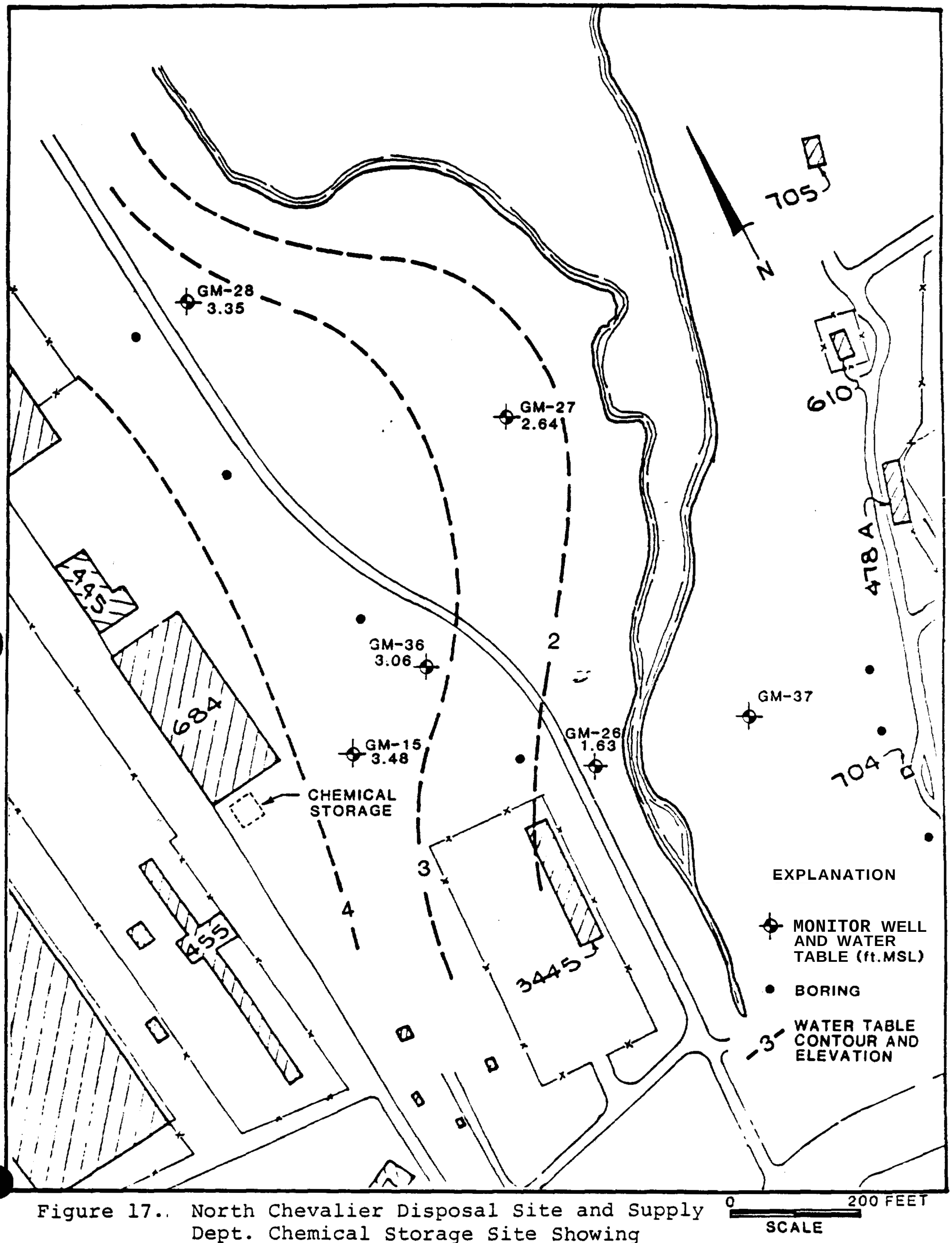

Figure 17. North Chevalier Disposal Site and Supply Dept. Chemical Storage Site Showing Locations of Borings and Monitor Wells and Water Table Contours for April 7, 1984.

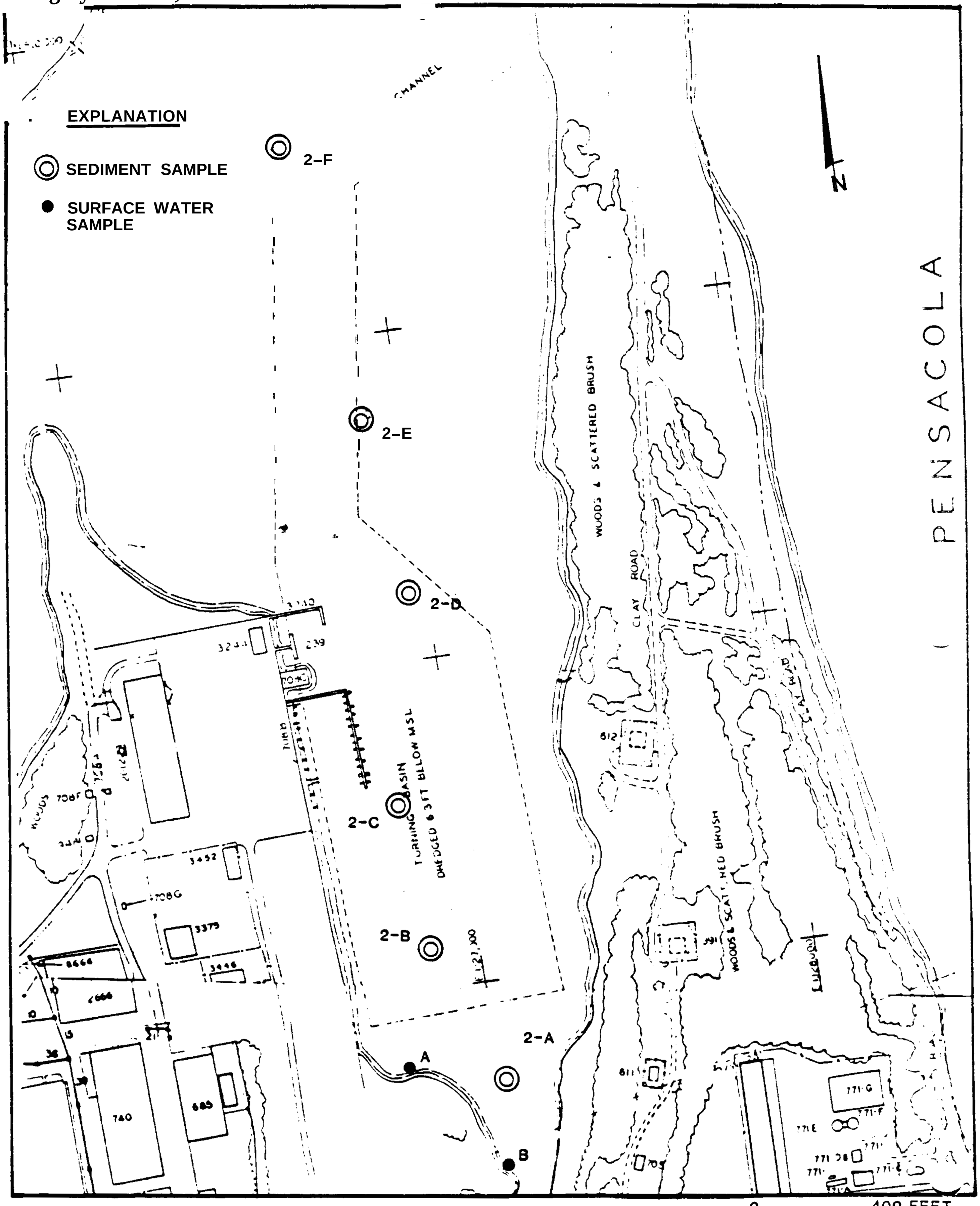

Figure 18. Locations of Sediment and Surface-Water Sampling Points in Bayou Grande.

20 ft. The distribution of oily sludges in the fill appears to be erratic. The fill area extends west of the dirt road; however, the actual westward extent could not be determined because of inaccessibility to the drill rig. Figure 19 shows a minimum area of fill inferred from the comparison of present topography with a 1930 topographic survey.

Recommendations

It is recommended that 5 additional shallow monitor wells be installed near the shoreline at the approximate locations shown in Figure 20 in order to determine the composition of ground water entering the Bayou. A deeper monitor well, screened below the marine clay, will be installed adjacent to GM-26 in order to determine the vertical direction of ground-water movement and to detect any possible contaminants in the lower sand. Monitor wells should be sampled and analyzed for VOCs and metals.

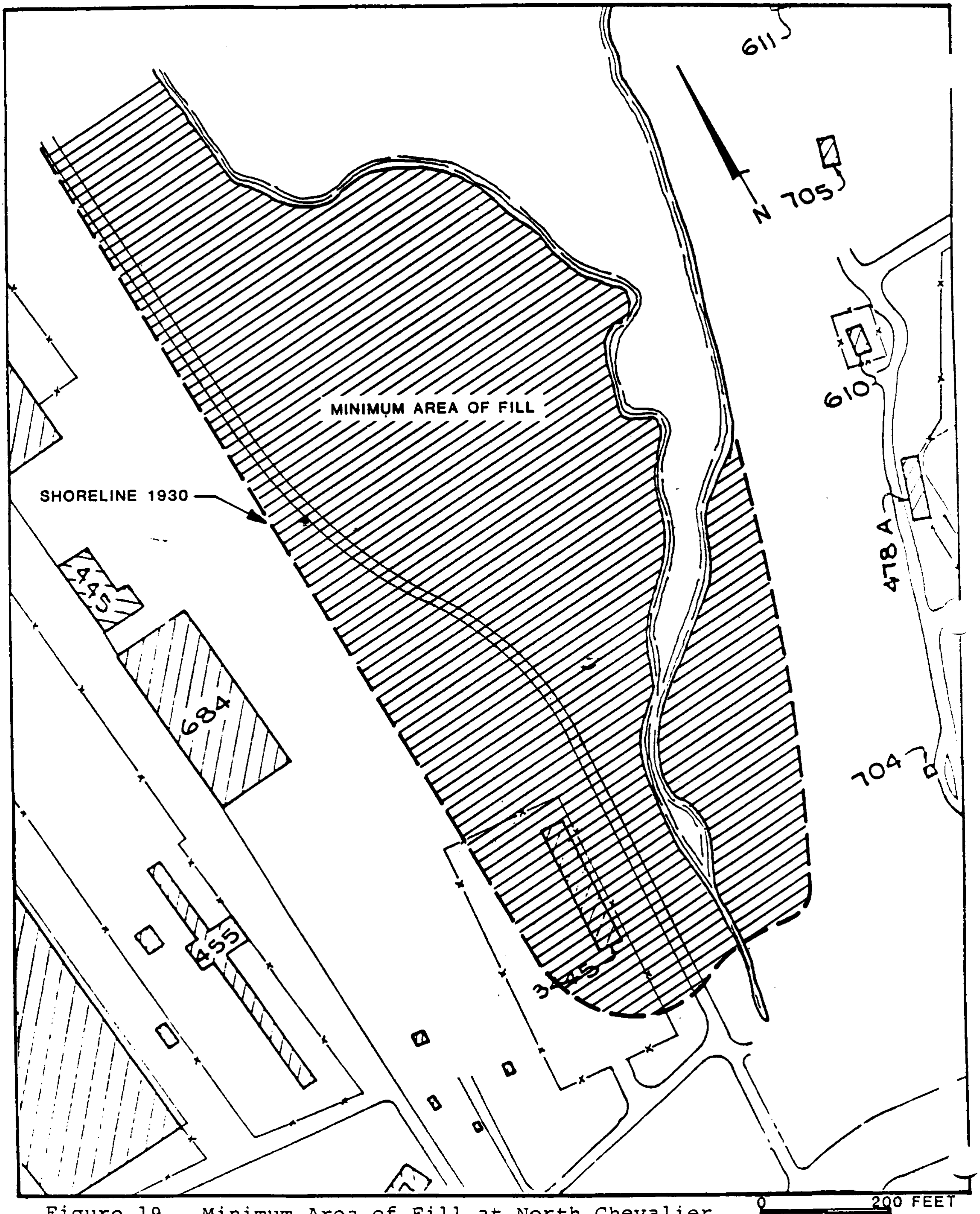

Figure 19. Minimum Area of Fill at North Chevalier Disposal Area as Inferred From 1930 Shoreline.

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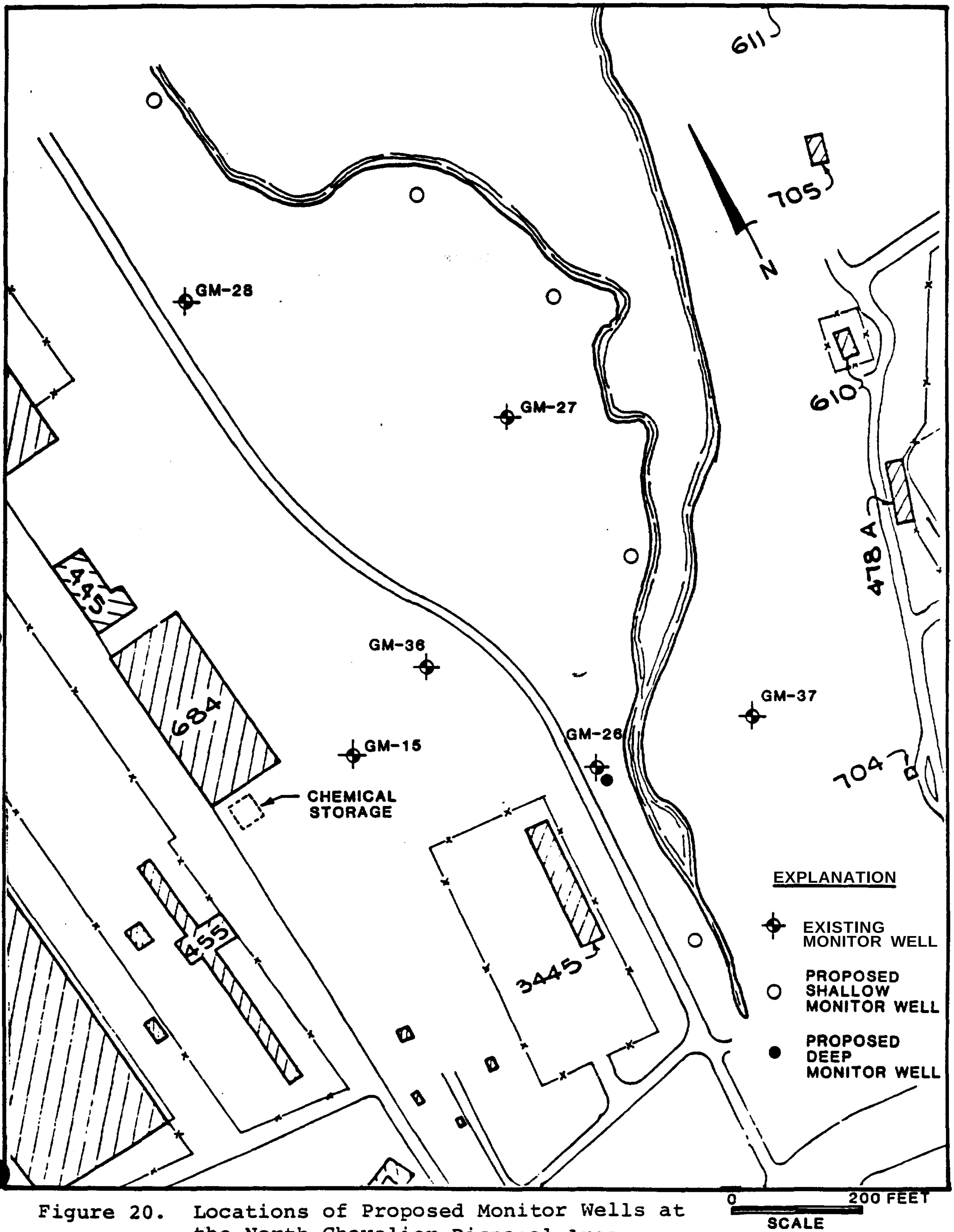


Figure 20. Locations of Proposed Monitor Wells at the North Chevalier Disposal Area.

PESTICIDE RINSEATE DISPOSAL AREA (SITE 15)

Background

This site, which is located in the golf course maintenance area, was used between 1963 and 1979 for disposal of rinse water from the cleaning of pesticide mixing and spray equipment. During cleaning operations, dilute rinseate solutions, reportedly containing organic phosphates, chlorinated hydrocarbons, carbaryl and carbamates, were poured directly onto the ground. Pesticides were stored outside just east of Building 2692 and equipment was rinsed on an asphalt wash pad located near the northwest corner of Building 2640 (see Figure 21).

Findings and Recommendations

Soil samples were collected from depths of 1 inch, 12 inches, and 24 inches at 3 points in these two areas. The samples were analyzed by extraction procedure for pesticides and arsenic. As shown in Table C-13, arsenic and organic pesticides were detected in the soil samples and show a rather consistent decrease in concentration with depth. The arsenic levels exceed the EP toxicity standard of 5 ppm, which defines a hazardous waste. In order to define the area of contaminated soil, approximately 10 more shallow borings will be needed to collect soil samples for arsenic analysis. In addition, two shallow monitor wells should be installed downgradient from the site and ground-water samples collected

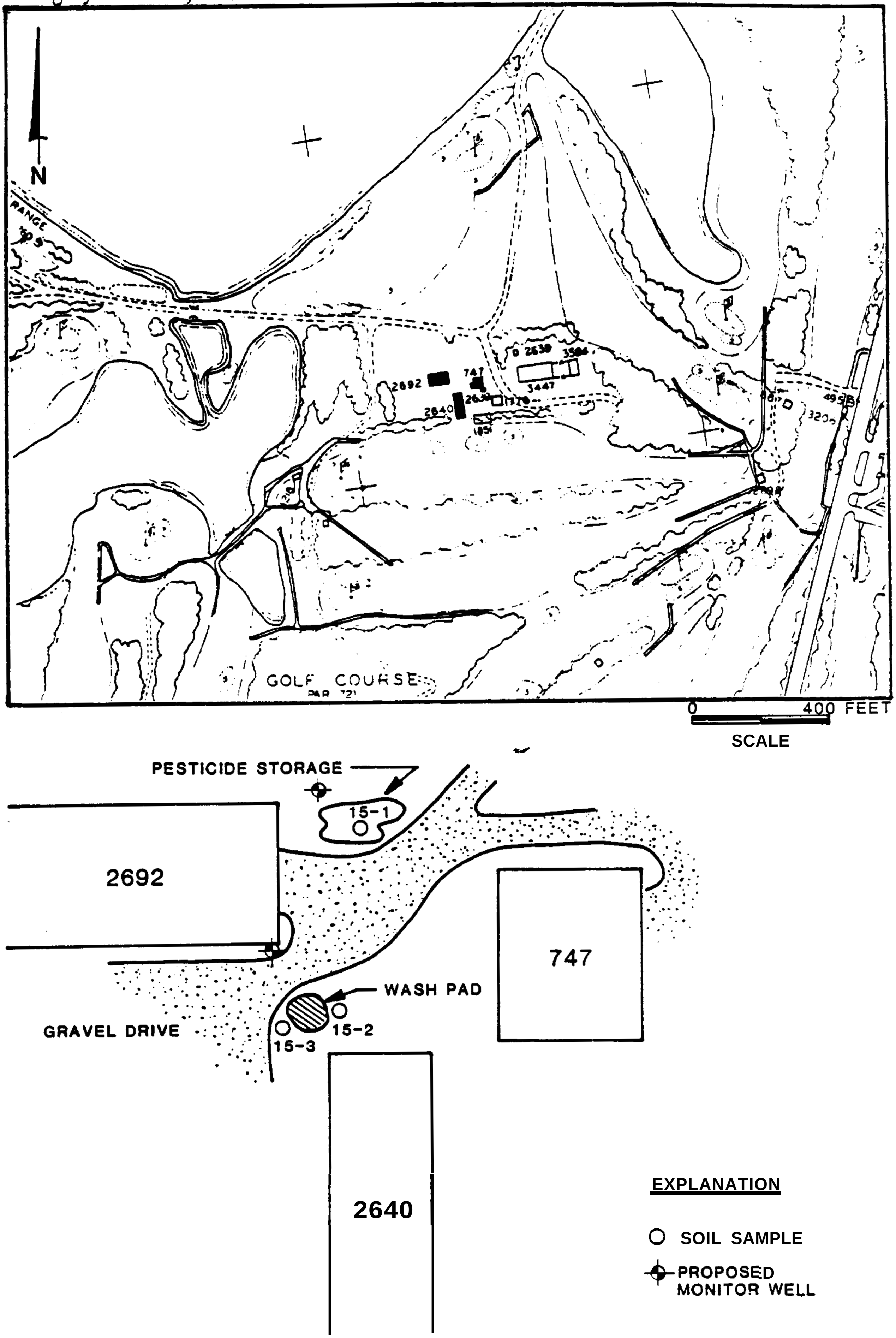


Figure 21. Pesticide Rinseate Area Showing Locations of Soil Sampling Points.

and analyzed for pesticides and arsenic. From the topography, it is apparent that shallow ground-water flow is north or northwestward toward Bayou Grande.

TRANSFORMER STORAGE YARD (SITE 17)

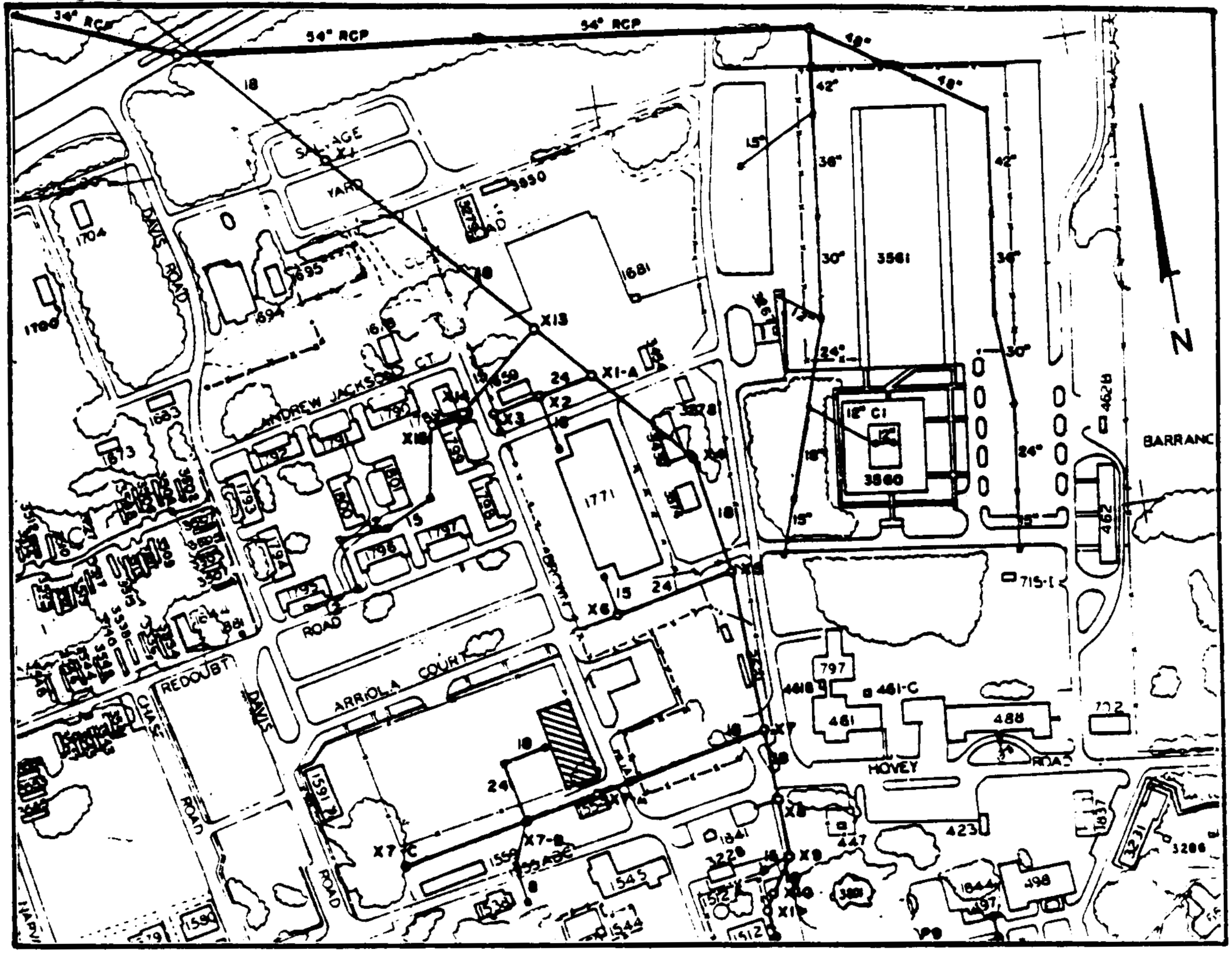
Backaround

This site was used from 1964 until 1976 as a storage area for 200 to 300 transformers, some of which contained PCBs. The storage area is paved with asphalt which slopes toward a catch basin inlet to a storm sewer, A black oily residue on the pavement was found by the IAS team to contain high levels of PCBs as well as other chlorinated hydrocarbons. The oily residue was scraped from the pavement, drummed and properly disposed of off-base,

Findings and Recommendations

Three borings were drilled through the pavement at locations shown in Figure 22 and soil-samples were collected just below the pavement and at depths of 12 inches and 24 inches. Samples were analyzed by extraction procedure for PCBs, the results of which are shown in Table C-14. The sample nearest to the catch basin was found to contain up to 9 ppm of Arochlor 1260.

The fact that PCBs were found in the soil only near the catch basin suggests that they have not permeated through the pavement, but that small amounts may have been washed through joints at the contact between the pavement and the catch basin, and therefore, the affected soil is probably restricted to a small area. Concentrations of PCBs in the



SITE 17
TRANSFORMER STORAGE YARD

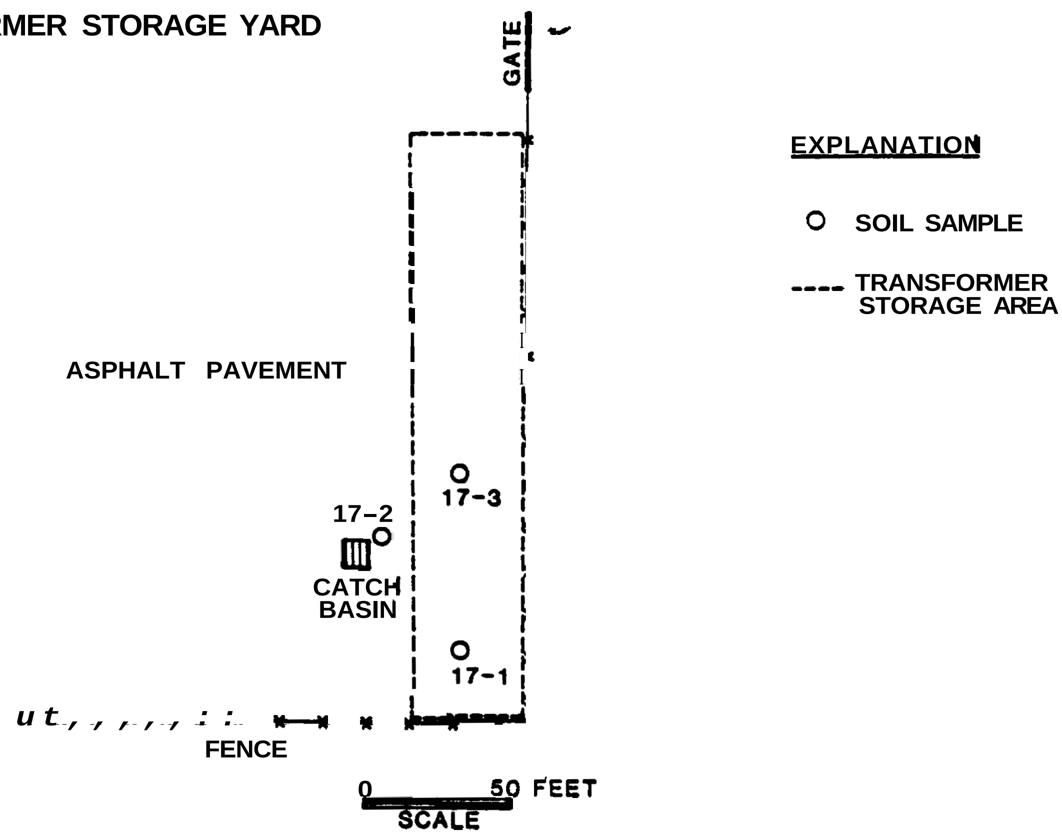


Figure 22. Transformer Storage Yard Showing Locations of Soil Sampling Points.

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soil were below the EP toxicity standard of 50 ppm, which defines a hazardous waste.

Polychlorinated biphenyls are strongly adsorbed by soil materials and are not readily leached by percolating water. They are therefore extremely immobile in soils (Griffin, et al, 1979). Because the decomposition of PCBs by biodegradation and other natural processes is very slow, they will remain in the soil for some time. It is therefore recommended that the presence of PCBs in the soil should be noted in the base master development plan; however, no further study at this site is recommended.

FUEL FARM PIPELINE LEAK (SITE 19)

Background

In 1958, a leak occurred in the pipeline which leads from the fuel farm to the aircraft refueling facility at Forrest Sherman Field, This leak resulted in the discharge of several hundred thousand gallons of JP-4 fuel oil, killing vegetation in an area of about 200 ft by 400 ft. Land surface in the area of the leak is flat and the water table is shallow. At the time of this study, much of the area was under standing water.

Findings and t

Eleven borings were drilled at locations shown in Figure 23 in order to determine the extent of the fuel floating on the water table or detectable by odor, Four monitor wells were then installed to measure the thickness of the free fuel. Fuel odor in the soil samples was detected only within the area of the dead trees. No free product was found floating on the water table at any of the borings or monitor wells and none was observed on the standing water at the surface,

Because the water table is so shallow and in much of the spill area is sometimes above ground level, free product has been exposed to the atmosphere, and in the 25 years since the spill, has apparently evaporated. The water table has a slight gradient toward the south as shown in Figure 23.

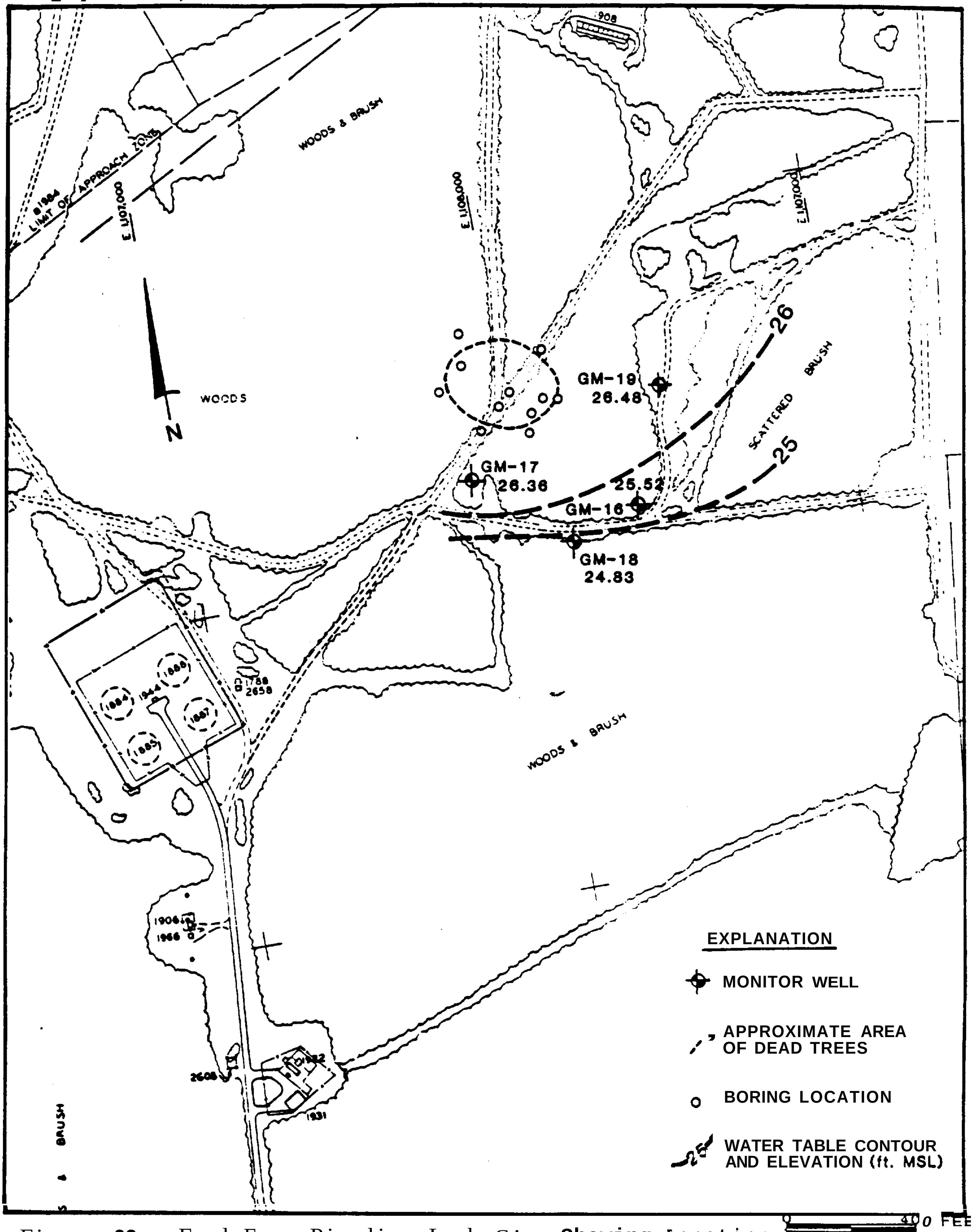


Figure 23. Fuel Farm Pipeline Leak Site Showing Locations of Borings and Monitor Wells and Water Table Contours for April 12, 1984.

Hydraulic conductivity of the shallow sand was determined from a slug test at GM-18 to be 8.5 x 10^{-3} cm/sec. Because the lost fuel has largely been removed by evaporation and biodegradation and because of the remoteness of the area, no further study is recommended for this site,

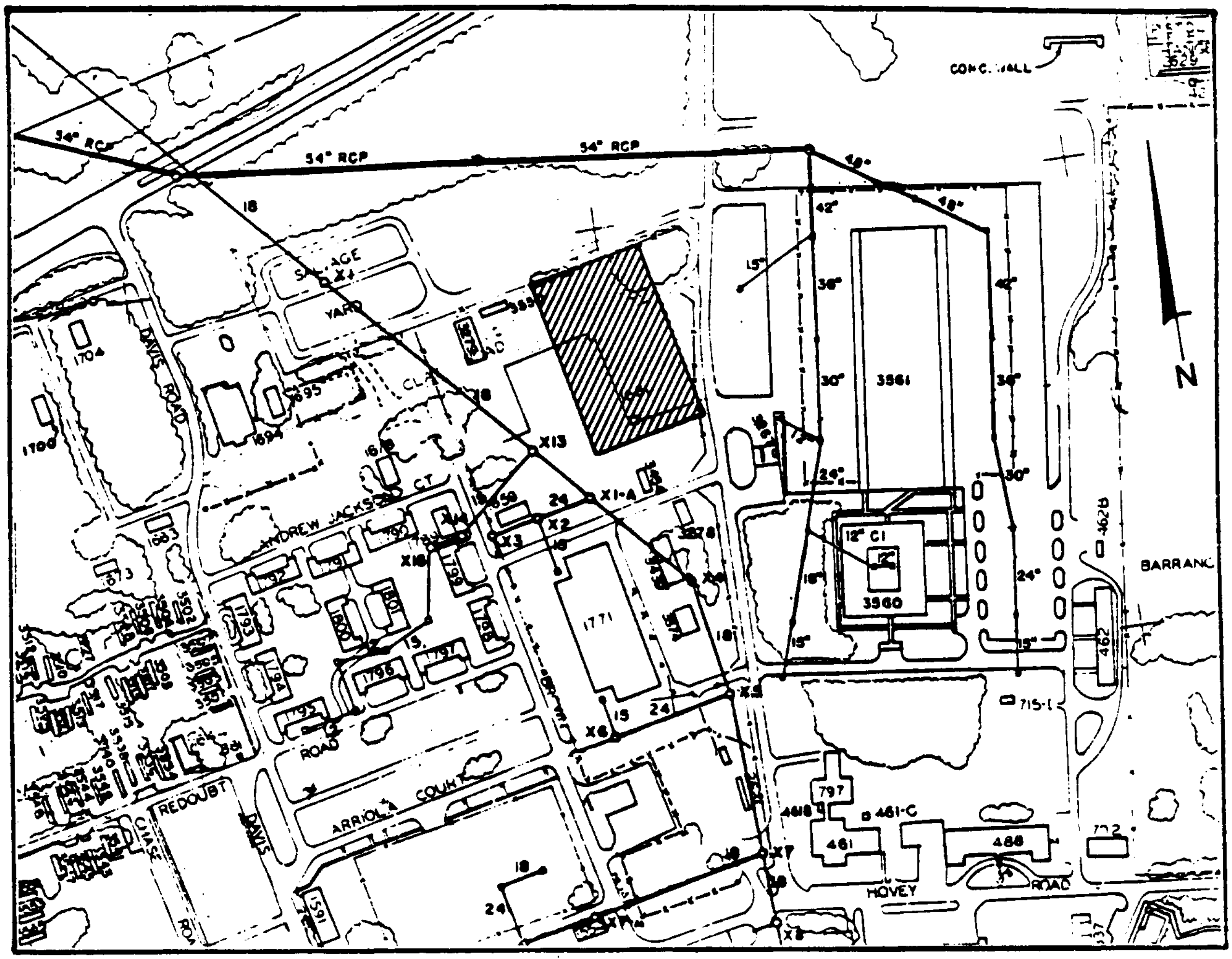
REFUELER REPAIR SHOP (SITE 22)

Background

This site was used between 1958 and 1977 for disposal of residual fuel from refueler trucks in preparation for repair work. Over this period an estimated 19,000 gallons of aviation gasoline and jet fuel were disposed of here.

Findings and Recommendations

Fifteen borings were drilled to determine the extent of fuel in the subsurface. No free product was found at any of the boring locations, although fuel odor was detected in a small area around the loading ramp as shown in Figure 24. The water table at this site is relatively shallow, occurring at a depth of about 4.5 ft at the time of the field work. Most of the fuel lost at this site has apparently evaporated and the remainder is immobilized in the unsaturated zone where it will continue to undergo evaporation and biodegradation; therefore, no further study is recommended for this site.



SITE 22
REFUELER REPAIR SHOP

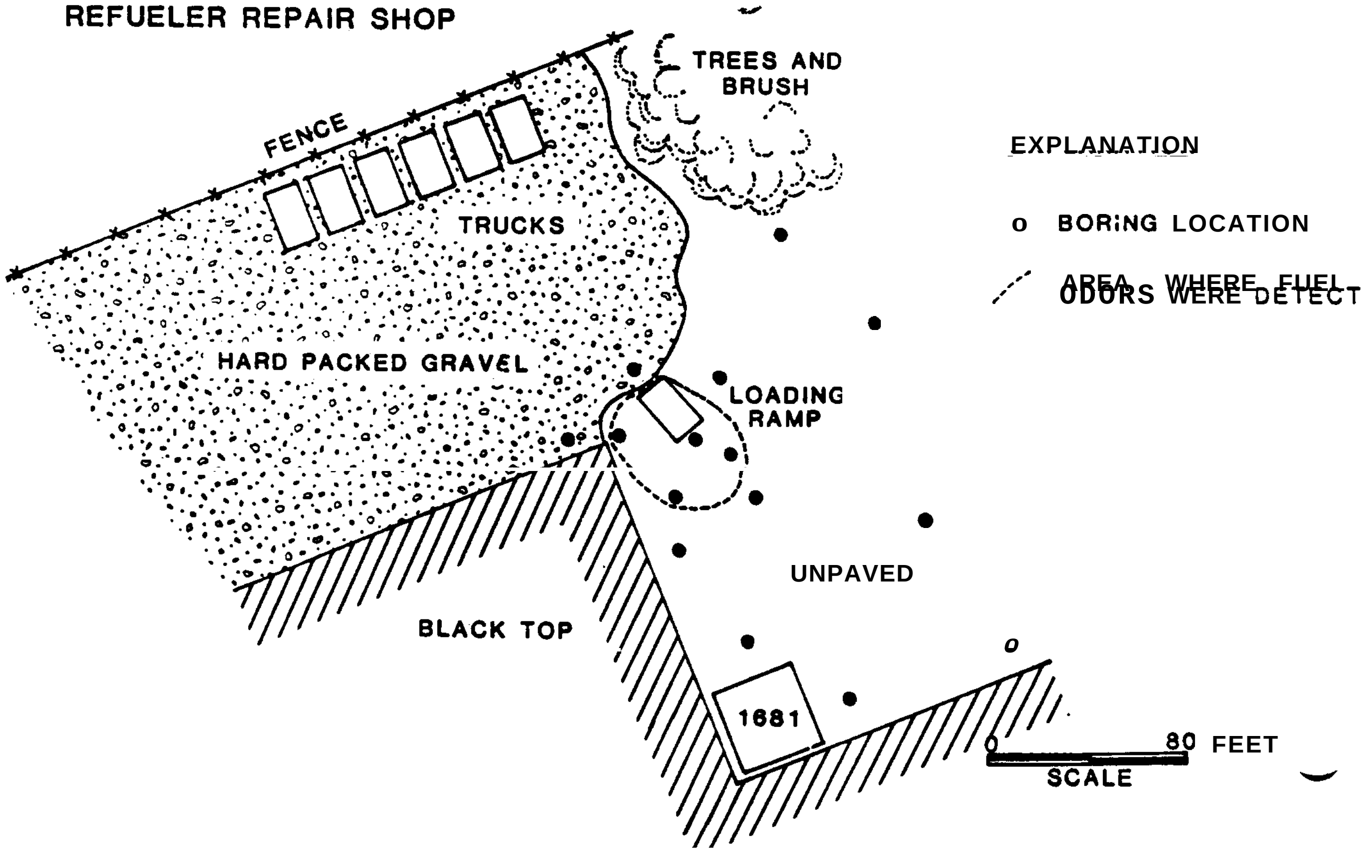


Figure 24. Refueler Repair **Shop Showing** Locations of Borings.

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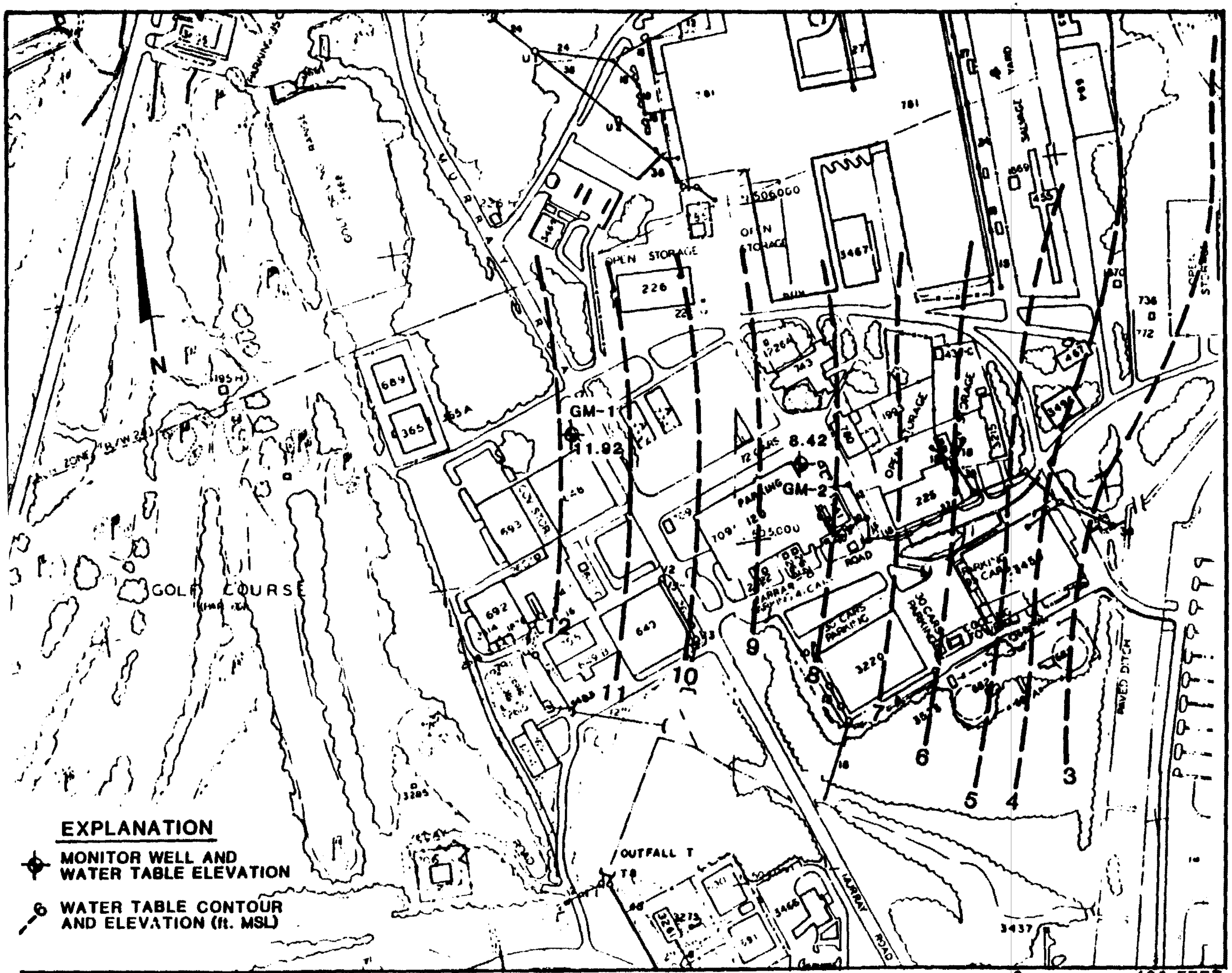
RADIUM DIAL SHOP (SITE 27) AND BUILDING 648 (SITE 31)

Background

Building 709 (Site 27) was used from the 1940's until 1975 for reworking luminous instrument dials. A routine disposal operation in Building 709 was to wash spent cleaning solutions and luminous paint down the drains and into the sanitary sewer. The wastes disposed of included cleaning solutions containing benzene, white pigments, phosphors, small amounts of radium and sometimes acid or caustic solutions.

Building 709 was dismantled in 1976, at which time Radiological Affairs Support Office (RASO) personnel surveyed the site and adjacent area. The drain pipe was found to be contaminated with a dose rate of 1.2 mR/hr (millirems per hour). The drain pipe was excavated and removed to a depth of 18 inches and the remaining underground portion was capped and covered with concrete.

Building 648 (Site 31) has been used for painting operations since 1949. From 1949 until 1973, an estimated 20,000 gallons of waste paint and thinner were poured onto the ground just north of Building 648. An estimated 8,600 gallons of paint sludges from water well paint booths were also dumped adjacent to the building. Paints used at NARF include cellulose nitrate lacquer, zinc chromate, nitrate dope, acetate dope, "day-glow", epoxy and enamel. Lacquer



re 25. Radium Dial Shop and Building 6[illegible] Sites Showing Monitor Well Locations and Water Table Contours for May 19, 1984.

thinner, toluene and M-T-6096 were the main paint thinners used.

Findings and Recommendations

A monitor well was installed near the abandoned sewer drain at Site 27 (Figure 25) and ground-water samples were analyzed for gross alpha and VOCs (Table C-15). The level of gross alpha was found to be below the FDER's primary drinking-water standard; however, various chlorinated hydrocarbons were found in concentrations as high as 29 ppb.

A monitor well (GM-1) was also installed near the northeast corner of Building 648 (Site 31) as shown in Figure 25. Analysis of the ground water (Table C-15) shows low concentrations of five VOCs.

Sites 27 and 31 are combined because of proximity and because site 27 is almost directly hydraulically downgradient from site 31. Land surface and the water table both slope relatively steeply toward the east. Ground-water flow is therefore eastward toward the creek which discharges into Bayou Grande. Assuming a hydraulic conductivity of 1 x cm/sec, an effective porosity of 0.35 for the surficial sand, and a hydraulic gradient of 0.005, the calculated horizontal seepage velocity is 150 ft/yr. At this rate, contaminants from site 31 would have reached the ditch after a travel time of 12 years. It is therefore recommended that three shallow monitor wells be installed west of the ditch at the locations shown in Figure 26. In addition, a deep monitor well screened below the marine clay should be installed adjacent to GM-2 to determine the vertical hydraulic gradient. Ground-water samples from the monitor wells will be analyzed for VOCs. Although supply well No. 2 is 1,300 ft from the nearest of these two sites and is screened nearly 100 ft below the surficial sand, as a precautionary measure, it is recommended that this well be sampled annually for VOCs.

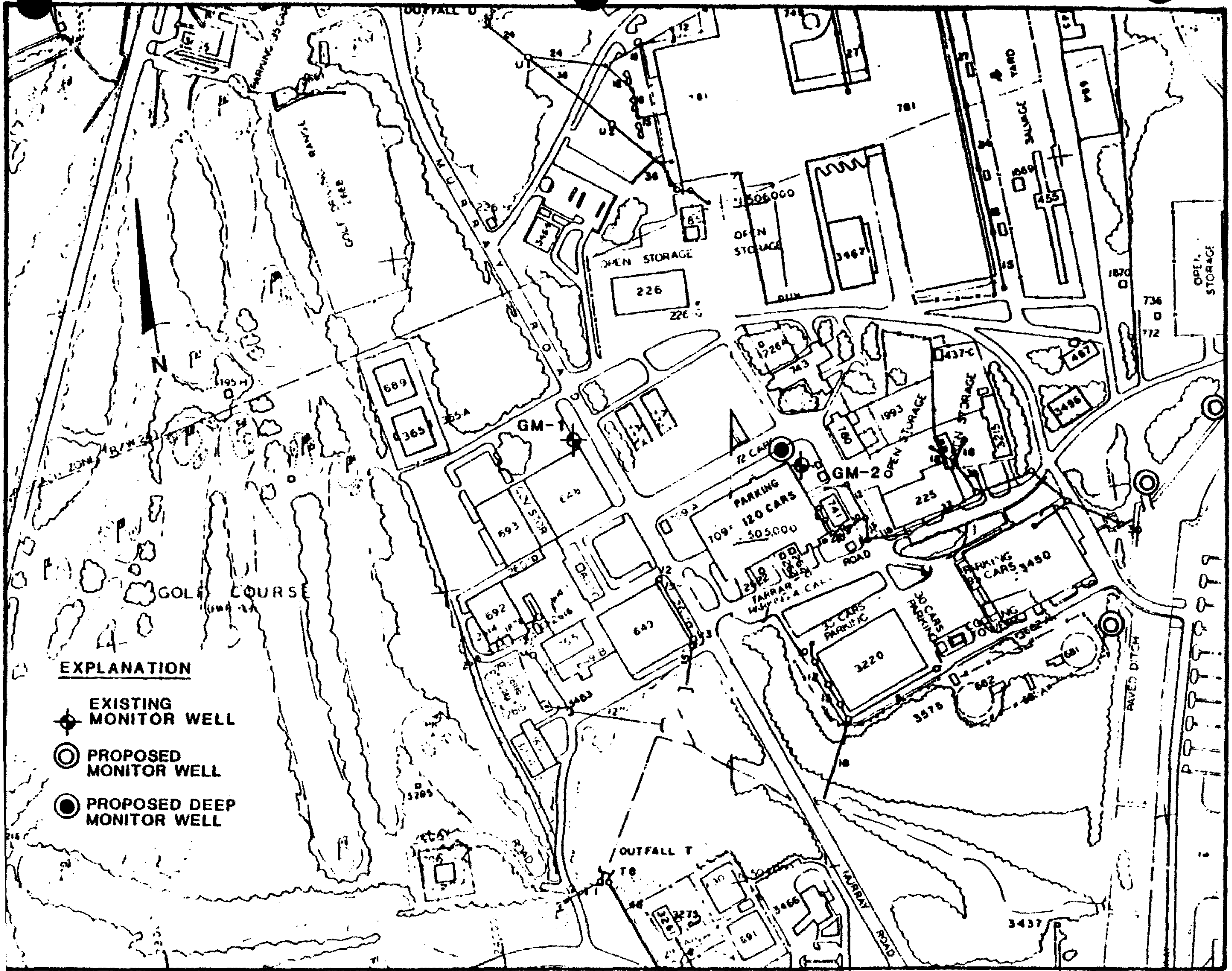


Figure 26. Locations of Proposed Monitor Wells for the Radium Dial Shop and Building 648 Sites.

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SCALE

BUILDING 649/755 (SITE 30)

Backaround

The Building 649/755 complex had two metal plating shops, A tin-cadmium plating shop in Building 649, which operated from the mid 1940's until the early 1960's, consisted of about 15 tanks of 200 to 500 gallon capacity, containing various tin, cadmium, and cyanide solutions. Contents of the tanks were emptied monthly or quarterly into a ditch east of the buildings, which flowed toward Chevalier Field and then north into a reach of Bayou Grande. A 250 gallon tank of trichloroethylene was also drained quarterly into the same ditch. In the early 1960's, the tin-cadmium plating operation was replaced by a magnesium treatment line, which continued into the early 1970's. The 15 tanks at the shop then contained nitric acid, phosphoric acid, caustics, potassium permanganate, various degreasers, and chromate solutions. The tanks on this line were drained monthly or less frequently into the same ditch.

A second plating shop, in Building 755, which operated from the early 1960's until the early 1970's, contained 50 small tanks (50 to 200 gallons) used for nickel, silver, lead, tin, chromium, and other metal plating. The tanks were drained periodically, varying from monthly to annually into the ditch leading to Bayou Grande.

Findings and Recommendations

Four sediment samples from the ditch were collected at the locations shown in Figure 27 and analyzed by extraction procedure for metals and cyanide. As shown in Table C-16, only very low levels of cadmium, magnesium, and copper were found.

Because the ditch is a ground-water discharge zone, pollutants placed in it should have been confined to the course of the ditch. The low levels of metals found in the ditch indicate that the plating wastes discharged to it have been immobilized in the sediments or have been washed downstream into Bayou Grande. Therefore, no further study is recommended for this site.

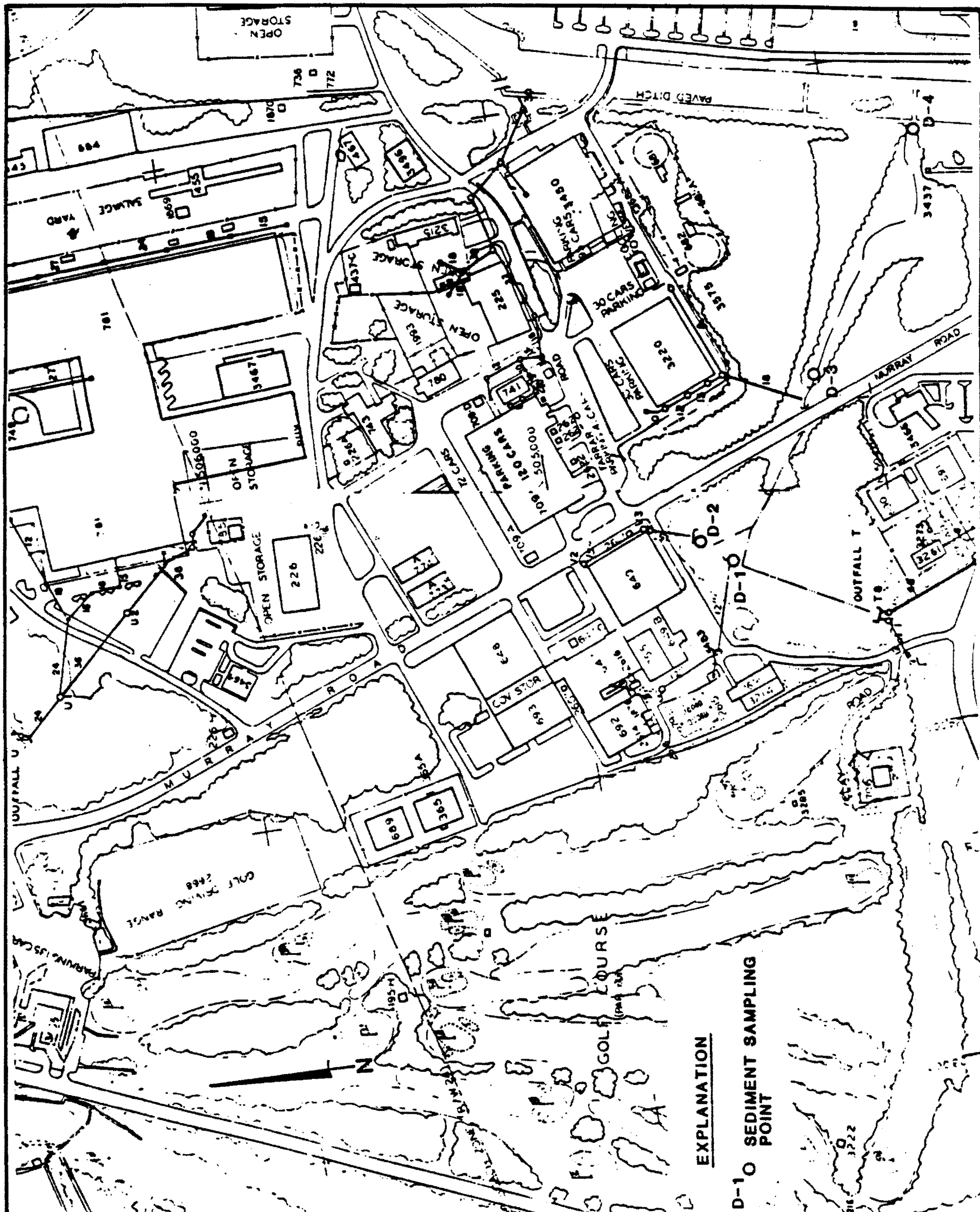

Figure 27. Locations of Sediment Sampling Points of the Bldg. 649/755 Site.

INDUSTRIAL SLUDGE DRYING BEDS (SITE 32) AND WASTEWATER TREATMENT PONDS (SITE 33)

Background

The domestic/industrial wastewater treatment plant is included in this study in order to satisfy State requirements for a ground-water monitoring plan (FAC 17-3 and 17-4). The plant includes sludge drying beds and three surface impoundments, consisting of a surge pond, an aerated stabilization pond (phenol pond), and a polishing pond. The surge pond is designated as a RCRA hazardous waste surface impoundment because it receives untreated wastewater from metal plating activities.

In accordance with State and Federal regulations, the consulting firm of Missimer and Associates installed seven shallow monitor wells around the surge pond. Because of a significant deterioration of ground-water quality between upgradient and downgradient wells, a study has been initiated to determine the extent and concentrations of contaminants in the ground water and their rates of horizontal and vertical movement. A proposal for that study, which involves the entire wastewater treatment plant area, is contained in a ground-water quality assessment plan (Geraghty & Miller, Inc., 1984), which has been submitted to FDER.

SUMMARY

Many of the sites investigated in the verification study have been inactive for a number of years, and in that time, ground-water contaminants have been attenuated by the processes of evaporation, biodegradation, and adsorption to minerals and organic matter in the soil. Of the 18 sites included in this study, nine are recommended for further study in the characterization phase. The proposed characterization work is summarized in Table 5.

The studies recommended during the characterization phase are predicated on the basis that contaminants reaching the water table will travel either: (1) laterally through the surficial sand toward surface-water discharge points, or (2) downward into deeper horizons. Therefore, at selected sites, a network of shallow monitor wells has been proposed to monitor contaminant plumes near the points of surface discharge. Similarly, strategically located deeper monitor wells have been proposed to determine the potential for downward movement of contaminants into the lower sands and toward the deeper aquifers from which potable water supplies are drawn.

Chemical analyses of water from the three Navy supply wells show that ground-water quality at these wells has not been affected by activities at the base. However, as a precautionary measure, it is recommended that these wells be sampled periodically for VOCs. The intakes of the wells are

Table 5. Summary of Proposed Work for Characterization Study at NAS Pensacola.

Site & Number	Proposed Monitor Wells	Chemical Analyses: Ground-Water Samples*	Chemical Analyses: Surface-Water Samples*	Chemical Analyses: Soil Samples	Hydraulic	Other
Sanitary Landfill (1)	8	8, VOC 8, Organic Priority Pollutants			In-situ permeability-surficial sand	
N. Chevalier Field Disposal (11) and Supply Dept. Storage (26)	6	11, VOC & Metals				
Pesticide Rinseate Area (15)	2	2, Pesticides & Arsenic		30, Arsenic		
Radium Dial Shop (27) & Bldg 648 (31)	4	6, VOC				
Industrial Sludge Beds (32) & Wastewater Ponds (33)	Proposed work for these sites is detailed in the water quality assessment plan (Geraghty & Miller, Inc., 1984)					
Solvent Spill (34)	4	5, VOC Quarterly	3± VOC Quarterly		In-situ permeability surficial sand; permeameter - marine clay	
Supply Wells		3, VOC Annually				

* Includes existing and proposed monitor-well locations

Note: VOC analysis method 601.
Soil sample analyses for arsenic by extraction procedure.

so far removed from sources of pollution at the surface that, if a plume were to reach a supply well, it would be highly dispersed and concentrations of constituents at the well would increase very slowly from the first detected trace amounts. An annual sampling of the wells is therefore believed to be adequate.

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APPENDIX A

Lithologic Logs of Borings Drilled For the Verification Study

LITHOLOGIC LOG OF MONITOR WELL GM-1.

Description	Depth (ft)	Thickness (ft)
Shell fragments, fill....................	0 - 0.5	0.5
Sand, fine-grained, brown to light brown..	0.5 - 4	3.5
Sand, fine-grained, brown to light brown; thin layers of shell fragments.,....	4 - 12	8
Sand, fine-grained, light brown..........	12 - 16	4
Sand, fine-grained, light brown to white; thin layers of shell fragments....,.......	16 - 26	10

LITHOLOGIC LOG OF MONITOR WELL GM-2.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 2	2
Sand, fine-grained, light brown to gold brown..................................	2 - 10	a
Sand, fine-grained, light brown..........	10 - 16	6
Sand, fine-grained, white................	16 - 20	4

LITHOLOGIC LOG OF MONITOR WELL GM-3.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown,.........	0 - 18	18

LITHOLOGIC LOG OF MONITOR WELL GM-4.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown........,.	0 - 17	17

LITHOLOGIC LOG OF MONITOR WELL GM-5.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown..........	0 - 8	a
Sand, fine-grained, brown................	a - 12	4

LITHOLOGIC LOG OF MONITOR WELL GM-6.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown..........	0 - 8	8
Sand, fine-grained, brown; thin layers of gray and black organic sediment; strong odor....................................	8 - 12	4

LITHOLOGIC LOG OF MONITOR WELL GM-7.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, gray.................	0 - 7	7
Sand, fine-grained, gray to white; layers of gray and black organic sediment........	7 - 11.5	4.5

LITHOLOGIC LOG OF MONITOR WELL GM-8.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, gray to light brown...	0 - 8	8
Sand, fine-grained, gray to light brown; rock fragments; black organic sediment; strong solvent odor........	8 - 11.5	3.5

LITHOLOGIC LOG OF MONITOR WELL GM-9.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, gray to gray-white....	0 - 7.5	7.5
Sand, fine-grained, gray to white; strong solvent odor..............................	7.5 - 11.5	4

LITHOLOGIC LOG OF MONITOR WELL GM-10.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown; solvent odor....................................	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-11.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-12.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-13.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to gray; slight solvent odor......................	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-14.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown to light brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-15.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 8	8
Sand, fine-grained, gray to white; with rock fragments and thin layers of gray-black organic silt....................	8 - 11.5	3.5

LITHOLOGIC LOG OF MONITOR WELL GM-16.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown; slight fuel odor..............................	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-17.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-18.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown; slight fuel odor..................*.......	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-19.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-20.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown to dark brown; plant roots..............................	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-21.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown; chemical odor..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-22.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown; chemical odor..	0 - 11.5	11.5

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LITHOLOGIC LOG OF MONITOR WELL GM-23.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown to light brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-24.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, gray-brown to white; fuel odor.	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-25.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown to light brown..	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-26.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, gray to black; oily; contains rock and brick fragments.	0 - 4	4
Sand, fine-grained, black; oily; rock and brick fragments; thin layers of black organics	4 - 11.5	7.5

LITHOLOGIC LOG OF MONITOR WELL GM-27.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, brown to black; oily..	0 - 2	2
Sand, fine-grained, black to gray-black; oily; contains wood and glass fragments...	2 - 4	2
Sand, fine-grained, black; very oily......	4 - 7	3
Sand, fine-grained, black; very oily; contains paper, pieces of metal, glass fragments................................	7 - 14	7
Sand, fine-grained, brown to black; oily..	14 - 18	4

LITHOLOGIC LOG OF MONITOR WELL GM-28.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown (dredge spoil)....................................	0 - 4	4
Sand, fine-grained, light brown to brown; contains some rounded pebbles.............	4 - 6	2
Sand, fine-grained, light brown to gray-brown; contains rock fragments; fuel odor......................................	6 - 8	2
Sand, fine-grained, gray; fuel odor..	8 - 11.5	3.5
Sand, fine-grained, brown................	11.5 - 14	2.5
Sand, fine-grained, brown to black; oily..	14 - 20	6

LITHOLOGIC LOG OF MONITOR WELL GM-29.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown; contains some rock fragments......................	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-30.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown...	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-31.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown..	0 - 8	8
Sand, fine-grained, gray to white.........	8 - 11.5	3.5

LITHOLOGIC LOG OF MONITOR WELL GM-32.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown...,.......	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-33.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown...........	0 - 11.5	11.5

LITHOLOGIC LOG OF MONITOR WELL GM-34.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown; contains some rock fragments......................	0 - 8	8
Sand, fine-grained, light brown.	8 - 11.5	3.5

LITHOLOGIC LOG OF MONITOR WELL GM-35.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to gold brown..................................	0 - 4	4
Sand, fine-grained, light brown to gray...	4 - 6	2
Sand, fine-grained, gray to gray-brown....	6 - 10	4
Sand, fine-grained, gray..................	10 - 11.5	1.5

LITHOLOGIC LOG OF MONITOR WELL GM-36.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, black; oily...........	0 - 6.5	6.5
Sand and rocks; oily......................	6.5 - 8	1.5
Sand, fine-grained, brown; oily...........	8 - 16.5	8.5
Sand, fine-grained, gray to white.........	16.5 - 20	3.5

LITHOLOGIC LOG OF MONITOR WELL GM-37.

Description	Depth (ft)	Thickness (ft)
Sand, fine-grained, light brown to brown; plant roots............................	0 - 3.5	3.5

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APPENDIX B

Lithologic Logs of Previous Borings at NAS Pensacola

Boring Group No. 1

Boring No.	Depth, ft	Description
1 (elev, 8.8)	0- 0.5	Red clayey sand fill, cohesionless and medium dense (SC)
	0.5- 3.0	Brown and tan slightly silty sand, cohesionless and medium dense (SM/SP)
	3.0-14.0	Light can to white sand, cohesionless and medium dense to dense (SP)
	14.0-19.0	White sand, cohesionles and very dense
	19.0-28.0	Light gray sand, cohesionless and very dense (SP)
	28.0-35.0	Dark gray sand, cohesionless and very dense (SP)
	35.0-44.0	Brown sand with brown organic stain, cohesionless and dense (SP)
	44.0-47.0	Gray sad, cohesionless and dense (SP)
	47.0-51.0	Blue marine clay, cohesive and of medium consistency (OH)
2 (elev, 9.0)	0- 2.0	Brown to tan slightly silty sand, cohesionless and medium dense (SM/SP)
	2.0- 8.5	White sand with small pieces of brick at 3 ft, cohesionless and loose to medium dense (SP)
	8.5-19.0	White and light tan sand, cohesionless and dense (SP)
	19.0-29.0	Light gray sand, cohesionless and dense to very dense (SP)
	29.0-35.5	Dark gray sand, cohesionless and very dense (SP)
	35.540.0	Brown sand with brown organic stain, cohesionless and dense (SP)
	40.0-47.0	Gray sand, cohesionless and dense (SP)
	47.0-49.0	Blue marine clay, cohesive and of medium consistency (OH)

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Boring No.	Depth, ft	Description
3 (elev, 8.5)	0- 0.5	Red clayey sand fill (SC)
	0.5- 2.5	White slightly silty sand, cohesionless and medium dense (SM/SP)
	2.5-13.0	Tan to white sand, cohesionless and medium dense to very dense (SP)
	13.0-23.0	White sand, cohesionless and dense (SP)
	23.0-28.0	Light gray sand, cohesionless and very dense (SP)
	28.0-38.0	Dark gray sand, cohesionless and very dense (SP)
	38.0-47.0	Light gray sand, cohesionless and very dense to dense (SP)
	47.0-51.0	Blue marine clay, cohesive and of medium consistency (OH)
4 (elev, 8.2)	0- 0.25	Red clayey sand fill (SC)
	0.25- 2.5	Light tan to white slightly silty sand, cohesionless and medium dense (SM/SP)
	2.5-19.5	White sand, cohesionless and medium dense to dense (SP)
	193- 27.0	Light gray sand, cohesionless and very dense to dense (SP)
	27.0-35.0	Dark gray sand, cohesionless and very dense (SP)
	35.0-38.0	Light brown sand with light brown organic stain, cohesionless and dense (SP)
	38.0-43.0	Light tan to gray sand, cohesionless and very dense (SP)
	43.0-46.5	Dark gray watery sand, cohesionless and medium dense (SM/SP)
	46.5-51.0	Blue marine clay, cohesive and of medium consistency (OH)

Boring Group No. 1
(Continued)

Boring No.	Depth, ft	Description
5 (elev, 8.8)	0- 1.0	Brown slightly silty topsoil (SN)
	1.0- 9.0	Light tan to white slightly silty sand, cohesionless and medium dense to loose (SM/SP)
	9.0-19.0	Light tan to white sand, cohesionless and dense (SP)
	19.0-28.0	Light gray sand, cohesionless and dense (SP)
	28.0-32.0	Dark gray sand, cohesionless and very dense to dense (SP)
	32.0-39.0	Light gray sand, cohesionless and very dense (SP)
	39.0-44.0	Light tan sand, cohesionless and very dense (SP)
	44.0-48.5	Dark gray sand, cohesionless and dense (SP)
	48.5-51.0	Blue marine clay, cohesive and of medium consistency (OH)

Boring Group No. 2

Boring No.	Depth, ft	Description
1	0- 0.75	Loose red sand with roots (topsoil) (SP)
	0.75-14.5	Loose tan to white sand (SP)
	14.5-21.0	Loose brown sand with organic stain (SP)
2	0- 0.67	Loose tan sand with roots (topsoil) (S?)
	0.67- 1.16	Loose red sand (SP)
	1.16-13.5	Loose tan to white sand (SP)
	13.5-21.0	Loose brown sand with organic stain (SP)

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Boring Group No. 3

Soring No.	Depth, ft	Description
1	0- 0.5	Brown sand with roots (SP)
	0.5-34.5	Brown to tan fine sand (SP)
	34.5-41.0	Tan to brown fine sand with slight organic stain (SP)
2	0- 0.5	Brown sand with grass roots (SP)
	5-31.0	Brown to tan fine sand (SP)
3	0- 0.5	Brown sand with roots (SP)
	0.5-31.0	Brown to tan fine sand (SP)
4	0- 0.25	Asphalt
	0.25-25.0	Tan to white and tan sand (SP)
	25.0-31.0	White sand (SP)
5	0- 0.25	Asphalt
	0.25- 0.9	Sand shell
	0.9-21.0	Tan to white and tan sand (SP)
	21.0-31.0	White sand (SP)

Boring Group No. 4

Boring No.	Depth, ft	Description
1	0- 0.17	Asphalt
	0.17- 0.66	Red slightly clayey sand (SC)
	0.66-17.5	Tan sand (SP)
	17.5-21.0	Gray sand (SP)
2	0-17.0	Tan sand
	17.0-21.0	Gray sand (SP)

Boring Group No. 5

Boring No.	Depth, ft	Description
1	0-29.0	Brown to vhite to gray sand (SP)
	29.0-32.5	Gray marine clay and sand
2	0- 2.0	Gray and brown sand
	2.0- 3.0	Gray sand with wood, bricks, and organics
	3.0-17.5	White sand (SP)
	17.5-24.8	Gray sand (SP)
	24.5-26.9	Gray clay and sand (SC/OH)

Boring Group No. 6

Boring No.	Depth, ft	Description
1	0- 0.5	Gray sand with decaying leaves and roots-topsoil (SM)
	0.5- 9.0	Tan sand (SP)
	9.0-13.0	Gray sand (SP)
	13.0-25.0	Brown sand with organic stain (SM)
2	0- 0.5	Gray sand with decaying leaves and roots-topsail (SM)
	0.5-26.0	Tan to white sand

Boring Group No. 7

Eorfng No.	Depth, ft	Description
1	0- 1.0	Concrete
	1.0-10.0	Tan to gray sand (SP)
	10.0-17.5	Gray sand with wood (SP)
	17.5-50.0	Gray sand (SP)

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Boring Group No. 8

Boring No.	Depth, ft	Description
1 (elev, 30.5)	0– 3	Tan sand (SP)
	3– 9	White to tan sand (SP)
	9-18	White sand (SP)
	18-41	Brown sand with organic stain (SP)
2 (elev, 27.5)	0- 6	Tan to light tan sand (SM/SP)
	6-14.5	Light tan and gray sand (SP)
	14.5-17.5	Gray sand (SP)
	17.5-33	Dark brown sand with brown organic stain (SM/SP)
	33 -41	Dark gray sand (SP)
3 (elev, 6.9)	0- 3	White to tan sand (SP)
	3-17	Tan sand (SP)
	17-22	Brown sand (SP)
	22-27	Brown sand with light organic stain (SP)
	27-41	Brown sand (SP)
4 (elev, 6.75)	0- 3	White to tan sand
	3-24	Tan sand (SP)
	24-32	Brown sand with organic stain (SP)
	32–41	Brown sand (SP)

Boring Group No. 9

Boring No.	Depth, ft	Description
1	0- 3	Loose brown fine sand
	3- 5.5	Very loose tan fine sand
	5.5- 9	Very firm tan fine sand
	9-16	Dense white fine sand
2	0- 4.5	Very loose brown fine sand
	4.5- 6.5	Loose tan fine sand
	6.5-16	Fcry firm tan to white fine sand
3	0- 2	Very loose brown fine sand (SP)
	2- 7	Firm to very firm white sand (SP)
	7- 9.5	Dense white fine sand (SP)
	9.5-16	Very firm to firm white to light brown fine sand (SP)
4	0- 2.5	Loose brown fine sand (SP)
	2.5-13	Very firm to dense white sand (SP)
	13-16	Finn light brown sand
5	0- 3.5	Very loose to loose brown fine sand (SP)
	3.5-12	Very firm to dense white fine sand (SP)
	12-23	Very firm white to light grey fine sand (SP)
	23-33.5	Dense white fine sand (SP)
	33.5-39.5	Firm brown fine sand (SP)
	39.5-55.5	Firm blue-gray sandy marine clay with thin sand seams and pieces of shell throughout
	55.5-59	Firm to very firm gray fine sand (SP)
	59-66	Very dense white fine sand (SP)

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Boring No.	Depth, ft	Description
6	0- 3	Brown slightly silty sand (SM)
	3- 3.5	Loose tan fine sand (SP)
	3.5-17	Very firm light brown to white fine sand (SP)
	17-39	Dense white fine sand with occasional very fine sand seams (SP)
	39-43	Soft blue-gray sandy marine clay with shell fragments (CH)
	43-56	Firm blue-gray very sandy marine clay with thin clayey sand scams (CH)
	56-66	Very dense gray fine sand (SP)
7	0- 3	Loose and very loose brown slightly silty fine sand (SM)
	3-16	Very firm to dense white fine sand (SP)
	16-28	Firm to very firm white sand (SP)
	28-39.5	Very firm to dense light brown to white fine sand (SP)
	39.5-59	Soft to firm blue-gray slightly sandy marine clay with shell fragments (CH)
	59-62.5	Very dense grey medium to fine sand (SP)
	62.5-66	Very dense white fine sand
8	0- 2.5	Loose brown and tan slightly silty fine sand (fill) (SP/SM)
	2.5- 6	Loose tan sand (SP)
	6- 9.5	Very firm to dense brown and tan sand (SP)
	9.5-16	Dense white sand (SP)

Boring Group No. 10

Boring No.	Depth (ft)	Description
Generalized from 4 borings (elev, 28)	0-19	loose and loose tan and gray and tan sand SP
	19-27	Medium dense black, gray, white, brown and tan sand (SP) with traces of organics (SM/SP)
	27-58	Dense and very dense brown, black and gray sand (SP) with traces of clay and organics (SM/SP and SC/SP)
	58-63	Very loose and loose grey silty clayey sand with shell (SC, SC/SP)
	63-77	Medium dense to very dense gray silty clayey sand some brown sand and shell (SC, SC/SP and SM)
	77-90	Medium dense sandy clay with some shell (SM)
	90-93	Blue gray marine clay, stiff (OH)
	93-100	Very dense to medium dense gray, slightly clayey sand (SM)

Boring Group No. 11

Boring No.	Depth (ft)	Description
Generalized from 3 borings (elev, 18)	0-10	Loose tan and gray sands (SP)
	10-53	Medium and dense tan and gray sands (SP)
	53-65	Marine clay with shell (OL) and loose silty clayey sand with shell (SM/SC)
	65-75	Medium dense to dense gray sand (SP)

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APPENDIX C

Chemical Analyses

Table C-1. Water-Quality Field Measurements for Supply Wells at NAS Pensacola

	Well #1	Well #2	Well X3 (Hovey Rd)
Sampling Date	3-15-84	3-15-84	3-15-84
Temperature (°C)	22.5	23.0	23.0
pH	6.92	7.00	5.80
Specific Conductance (umhos/cm)	98	110	130

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Table 2. Concentrations of Volatile Organic Compounds (Method 624[1])

Client: Geraghty & Miller — Project No.: 84-297

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2] Mainside #1 8401284	Mainside #2 8401285	Mainside Hovey Rd. 8401286
(2v) acrolein				
(3v) acrylonitrile				
(4v) benzene				
(6v) carbon tetrachloride				
(7v) chlorobenzene				
(10v) 1.2-dicnluroethane				
(11v) 1,1,1,-trichloroethane				
(13v) 1,1-dichloroethane				
(14v) 1,1,2-trichloroethane				
(15v) 1,1,2,2-tetrachloroethane				
(16v) chloroethane				
(19v) 2-chloroethylvinyl ether				
(23v) chloroform				
(29v) 1,1-dichlurocthylene				
(30v) trans-1,2-dichloroethylene				
(32v) 1,2-dichloropropane				
(33v) trans-1.3-dichloropropene				
cis-1,3-dichloropropene				
(38v) ethylbenzene				
(44v) methylene chloride				
(45v) chloromethane				
(46v) bromomethane				
(47v) bromoform				
(48v) bromodichloromethane				
(49v) fluorotrichloromethane				
(50v) dichlorodifluoromethane				
(51v) chlorodibromomethane				
(85v) tetrachloroethylene				
(86v) toluene				
(87v) trichloroethylene				
(83v) vinyl chloride				
Detection Limit		1	1	1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the detection limit are listed as trace levels (TR). Acrolein and acrylonitrile are 100 and 10 times the detection limit respectively.

Note: **Wells sampled March 1984.**

Table 3A. Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty & Miller Report No.: 84-297

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] Mainside #1 8401284	Mainside #2 8401285	Mainside Hovey Road 8401286
KID COMPOUNDS				
(21A) 2,4,6-trichlorophenol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2,4-dichlorophenol				
(34A) 2,4-dimethylphenol				
(57A) 2-nitroynenol				
(58A) 4-nitrophenol				
(59A) 2,4-dinitrophenol				
(60A) 4,6-dinitro-2-methylphenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		I	1	1
BASE/NEUTRAL COMPOUNDS				
(1B) acendpntnene				
(5B) benzidine				
(8B) 1,2,4-tricnlorobenzene				
(9B) nexachlorobenzene				
(12B) hexachloroethane				
(18B) bis (2-cnloroethyl) ether				
(20B) 2-chloronapnfhrlene				
(25B) 1,2-dicnlorobenzene				
(26B) 1,3-dichlorobenzene				
(27B) 1,4-dichlorobenzene				
(28B) 3,3'-dichlorobenzidine				
(35B) 2,4-dinitrotoluene				
(36B) 2,6-dinitrotoluene				
(37B) 1,2-diphenylhydrazine				
(39B) fluoranthene				
(40B) 4-chlorophenyl phenyl ether				
(41B) 4-bromophenyl phenyl ether				

0000254

Table 38. Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] Mainside #1 8401284	Mainside #2 8401285	Mainside Hovcy Road 8401286
BASE NEUTRAL COMPOUNDS (cont'd)				
(42B) bis (2-cnloroiropropyl) ether				
(43B) bis (2-chloroethoxy) methane				
(52B) hexachlorobutadiene				
(53B) hexachlorocyclopentadiene				
(54B) isophorone				
(55B) naphthalene				
(56B) nitrobenzene				
(62B) N-nitrosodiphenylamine				
(63B) N-nitrosodipropylamine				
(66B) bis (2-ethylhexyl) phthalate				
(67B) benzyl Butyl phthalate				
(68B) di-n-butyl phthalate				
(69B) di-n-octyl phthalate				
(70B) diethyl phthalate				
(71B) dimethyl phthalate				
(72B) benzo(a)anthracene				
(73B) benzo(a)pyrene				
(74B) benzo(b)fluoroanthene				
(75B) benzo(k)fluoroanthene				
(76B) cnrysenc				
(77B) acenaphthylene				
(78B) anthracene				
(79B) benzo(yhi)perylene				
(80B) fluorene				
(81B) phenanthrene				
(82B) dibenzo(a,h)anthracene				
(83B) ideno(1,2,3-cd)pyrene				
(84B) pyrene				
Detection Limit		1	1	1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

Table 4. Concentration of Pesticides and PCBS (Method 608[1])

Client: Geraghty and Miller

Report No.: 84-297

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] Mainside #1 8401284	Mainside #2 8401285	Mainside - Hovey Road 8401286
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin		0.13	.24	
(91P) chlordane				
(92P) 4,4'-DDT				
(93P) 4,4'-DDE				
(94P) 4,4'-DDD				
(95P) endosulfan-alpha				
(96P) endosulfan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) heptachlor				
(101P) heptachlor epoxide				
(102P) BHC-alpha				
(103P) BHC-beta				
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) PCB - 1260				
(112P) PCB - 1016				
(113P) toxaphene				
Detection Limit		.01	.01	.01

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal a d Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL. Cincinnati. Ohio.

[2]Concentrations less than the detection limit arc left blank. Concentrations between I and 10 times detection limit are listed as trace levels (TR).

0000255

Table 32 (Continued)

Sample Received: 5/22/84
Analysis Completed: 6/6/84
Results in: ug/l (ppb)
Reported by: MD
Checked by: EL
Client: Geraghty & Miller

ERCO / **ENERGY** RESOURCES CO. INC.
PESTICIDE ANALYSIS

- Data Report -

	Client ID:	Mainside #2	Mainside #1
	ERCO ID:	4083	**4084**
89P	aldrin	ND	ND
90P	dieldrin	ND	ND
91P	chlordane	ND	ND
92P	4,4'-DDT	ND	ND
93P	4,4'-DDE	ND	ND
94P	4,4'-DDD	ND	ND
95P	alpha-endosulfan	ND	ND
96P	beta-endosulfan	ND	ND
97P	endosulfan sulfate	ND	ND
98P	endrin	ND	ND
99P	endrin aldehyde	ND	ND
100P	heptachlor	ND	ND
101P	heptachlor epoxide	ND	ND
102P	alpha-BHC	ND	ND
103P	beta-BHC	ND	ND
104P	gamma-BHC	ND	ND
105P	delta-BHC	ND	ND
106P	PCB-1242	ND	ND
107P	PCB-1254	ND	ND
108P	PCB-1221	ND	ND
109P	PCB-1232	ND	ND
110P	PCB-1248	ND	ND
111P	PCB-1260	ND	ND
112P	PCB-1016	ND	ND
113P	toxaphene	ND	ND

ND = Not **detected** at or above reporting limit of 0.1 ppb.

Table C-2 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, IN.

Table 3. Concentration of Pesticides and PCBs (Method 608[1])

Client: Geragnty and Miller — Report No.: 84-609

Date Samples Received: May 21, 1984 — Reported by: SKD

Date Analysis Completed: June 12, 1984 — Checked by: DJF

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] A 8403468	B 8403469
PESTICIDES AND PCBs			
(89P) aldrin			
(90P) dieldrin			
(YIP) chlordane			
(92P) 4,4'-DDT			
(93P) 4,4'-DDE			
(94P) 4,4'-DDD			
(95P) endosulfan-alpha			
(96P) endosulfan-beta			
(97P) endosulfan sulfate			
(98P) endrin			
(99P) endrin aldehyde			
(100P) heptachlor			
(101P) heptachlor epoxide			
(102P) BHC-alpha			
(103P) BHC-beta			
(104P) BHC-delta			
(105P) BHC-gamma (lindane)			
(106P) PCB - 1242			
(107P) PCB - 1254			
(108P) PCB - 1221			
(109P) PCB - 1232			
(110P) PCB - 1248			
(111P) PCB - 1260			
(112P) PCB - 1016			
(113P) toxaphene			
Detection Limit		0.01	0.01

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati. Ohio.

[2]Concentrations less than the detection limit arc left blank.

Note: A = Well No. 2
B = Well No. 1
Wells sampled May 1984.

0000256

Pioneer LABORATORY, INC.

I.D. # 2366

Table C-3. Water-Quality Analyses for Supply Wells at NAS Pensacola.

System Name: NAS   County: Escambia   Collector: Jim Short

Address: PWC, NAS Pensacola, Florida   System I.D. No: ____   DER District: ____

Sample Site: Well #2 NASP   Raw or Treated: ____   Temperature: ____

Date and Time Collected: 8/27/82 9:00 A.M.   Field Chlorine, mg/l: ____   Field pH: ____

Circle one: 40. Community public water system 41. Non-community public water system 42 Other public water system 43. Private water system

Circle one: 1 Compliance 2 Recheck 3. Other (indicate below parameters to be tested for items 2 or 3).

PRIMARY STANDARDS			SECONDARY STANDARDS			GENERAL	
PARAMETER	METHOD†	RESULT**	PARAMETER	METHOD†	RESULT**	PARAMETER	RESULT**
Arsenic as As		<0.001	Chloride as Cl		4.5	Total Hardness as $CaCO_3$ (c)	66
Barium as Ba		< 0.1	Color*		<1	Total Alkalinity as $CaCO_3$	50
Cadmium as Cd		0.004	Copper as Cu		0.028	N.C.H. as $CaCO_3$ (c)	
Chromium as Cr		<0.001	Corrosivity*		-1.11	Bicarbonate as HCO_3 (c)	
Lead as Pb		0.017	Foaming Agents		<0.05	Calcium as Ca	22.4
Mercury as Hg		< 0.0005	H_2S		<0.05	Magnesium as Mg	
Selenium as Se		<0.001	Iron as Fe		2.05	Carbon Dioxide as CO_2 (c)	
Silver as Ag		<0.01	Manganese as Mn		0.031	Bicarbonate as $CaCO_3$ (c)	
Nitrate as N		0.03	Odor*		< 1	Carbonate as $CaCO_3$ (c)	
Fluoride as F		< 0.01	pH*		7.3	Hydroxide as $CaCO_3$ (c)	
Turbidity,* NTU		< 0.1	Sulfate as SO_4		1	Sodium as Na	22
			TDS		130		
Endrin		**BDL	Zinc as Zn		0.053	pHs* (c)	8.41
Lindane		**BDL	Conductivity		220	Stability Index* 2pHs-pH (c)	
Methoxychlor		**BDL				Saturation Index* pH-pHs (c)	-1.11
Toxaphene		**BDL				INTERPRETATION: Stable	
2,4-D		**BDL				Corrosive	Yes
2,4-5 TP Silvex		**BDL				Scale Forming	
Trihalomethanes			DER reviewer:				
			Action required:				

Notes: *All results in mg/liter except those denoted
†List of methods available on request

(c) = Calculated value
**BDL = Below detection limit, see reverse side

Date and Time Received: 8/27/82 10:00 A.M.   Laboratory ID No.: 81142

Date Reported: 9/20/82   Remarks:

Analysts: ____

Approved by W. F. Bowers
W. F. Bowers
Laboratory Director

(TEST) FORM 32. APR 78

Pioneer LABORATORY, INC.

I.D. # 491

Table C-3 (Continued)

System Name: NAS

County: ESCAMBIA Collector: J. Short

Address PWC, NAS Pensacola, Florida

System I.D. No.: 1170548 DER District NW

Sample Site: Hovey Road

Raw or Treated: Raw Temperature

Date and Time Collected- 3/18/83 12:00 PM

Field Chlorine, mg/l: Field pH:

Circle one: (40. Community public water system) 41. Non-community public water system 42 Other public water system 43. Private water system

Circle one: 1. Compliance 2. Recheck 3. Other (indicate below parameters to be tested for items 2 or 3).

PRIMARY STANDARDS			SECONDARY STANDARDS			GENERAL	
PARAMETER	METHOD†	RESULT**	PARAMETER	METHOD†	RESULT**	PARAMETER	RESULT**
Arsenic as As		<0.005	Chloride as Cl		16.2	Total Hardness as $CaCO_3$ (c)	34
Barium as Ba		<0.1	Color*		<1	Total Alkalinity as $CaCO_3$	34
Cadmium as Cd		<0.001	Copper as Cu		0.009	N.C.H. as $CaCO_3$ (c)	0
Chromium as Cr		<0.001	Corrosivity*		-3.83	Bicarbonate as HCO_3 (c)	41.48
Lead as Pb		<0.01	Foaming Agents		<0.05	Calcium as Ca	8.0
Mercury as Hg		<0.0001	H_2S		<0.05	Magnesium as Mg	3.4
Selenium as Se		<0.005	Iron as Fe		1.15	Carbon Dioxide as CO_2 (c)	80
Silver as Ag		<0.001	Manganese as Mn		0.012	Bicarbonate as $CaCO_3$ (c)	34
Nitrate as N		0.07	Odor*		<1	Carbonate as $CaCO_3$ (c)	0
Fluoride as F		0.13	pH*		5.2	Hydroxide as $CaCO_3$ (c)	0
Turbidity,* NTU		<0.1	Sulfate as SO_4		<1	Sodium as Na	10.5
			TDS		80		
Endrin			Zinc as Zn		0.10	pHs* (c)	9.63
Lindane			Conductivity		120	Stability Index* 2pHs-pH (c)	
Methoxychlor						Saturation Index* pH-pHs (c)	-3.83
Toxaphene						INTERPRETATION: Stable	
2, 4-D						Corrosive	Yes
2, 4-5 TP Silvex						Scale Forming	
Trihalomethanes			DER reviewer:				
			Action required:				

Note: *All results in mg/liter except those denoted
†List of methods available on request

(c) = Calculated value
**BDL = Below detection limit, see reverse side

Date and Time Received: 3/18/83 2:30 PM

Laboratory I.D. No.: 81142

Date Reported: 3/29/83

Remarks:

Analysts:

Approved by W. F. Bowers
W. F. Bowers
Laboratory Director

HRS (TEST) FORM 32, APR 78

0000257

Pioneer Laboratory, Inc.

I.D. # 492

Table C-3 (Continued)

System Name: NAS County: ESCAMBIA Collector: J. Short

Address PWC, NAS, Pensacola, Florida System I.D. No.: 1170548 DER District NW

Sample Site: Well #1 Raw or Treated: Raw Temperature

Date and Time Collected* 3/18/83 12:00PM Field Chlorine, mg/l: Field pH:

Circle one: (40. Community public water system) 41. Non-community public rater system 42 Other public rater system 43. Private rater system

Circle one: 1. Compliance 2 Recheck 3. Other (indicate below parameters to be tested for items 2 or 31.

PRIMARY STANDARDS			SECONDARY STANDARDS			GENERAL	
PARAMETER	METHOD†	RESULT**	PARAMETER	METHOD†	RESULT**	PARAMETER	RESULT**
Arsenic as As		< 0.005	Chloride as Cl		14.2	Total Hardness as $CaCO_3$ (c)	22
Barium as Ba		< 0.1	Color*		< 1	Total Alkalinity as $CaCO_3$	22
Cadmium as Cd		0.002	Copper as Cu		0.023	N.C.H. as $CaCO_3$ (c)	0
Chromium as Cr		0.002	Corrosivity*		-3.87	Bicarbonate as HCO_3 (c)	26.8
Lead as Pb		< 0.01	Foaming Agents		< 0.05	Calcium as Ca	5.6
Mercury as Hg		< 0.0001	H_2S		< 0.05	Magnesium as Mg	1.9
lenium as Se		< 0.005	Iron as Fe		0.34	Carbon Dioxide as CO_2 (c)	65
Silver as Ag		< 0.001	Manganese as Mn		0.015	Bicarbonate as $CaCO_3$ (c)	22
Nitrate as N		0.14	Odor*		< 1	Carbonate as $CaCO_3$ (c)	0
Fluoride as F		0.13	pH*		5.5	Hydroxide as $CaCO_3$ (c)	0
Turbidity,* NTU		< 0.1	Sulfate as SO_4		2	Sodium as Na	10.2
			TDS		62		
Endrin			Zinc as Zn		0.01	pHs* (c)	9.37
Lindane			Conductivity		96	Stability Index* 2pHs-pH (c)	
Methoxychlor						Saturation Index* pH-pHs (c)	-3.87
Toxaphene						INTERPRETATION: Stable	
2, 4-D						Corrosive	Yes
2, 4-5 TP Silvex						Scale Forming	
Trihalomethanes			DER reviewer:				
			Action required:				

re: *All results in mg/liter except those denoted
†List of methods available on request

(c) = Calculated value
**BDL = Below detection limit, see reverse side

Date and Time Received: 3/18/83 2: 30PM

Laboratory I.D. No.: 81142

Date Reported: 3/29/83

Remarks:

Analysts:

W. F. Bowers

Approved by W. F. Bowers Laboratory Director

HRS (TEST) FORM 32, APR 78

Table C-4. Water-Quality Analyses From Monitor Wells at the Sanitary Landfill - Sampled October 1974.

Constituent	Well Number GW05	GW06	GW07	GW08	GW09	GW10	GW11
Total Dissolved Solids	595	432	1435	840	105	70	122
Nitrogen-Ammonia	0.56	9.0	22	9.0	0.00	0.00	0.00
Nitrogen-Nitrate	0.20	0.17	0.36	0.08	0.07	0.23	1.11
Nitrogen-Nitrite	0.00	0.01	0	0	0.00	0.22	0.016
Nitrogen-Total Kjeldahl	0.43	10.8	53	21	0.05	0.40	0.46
Phosphorus-Total	0.11	0.00	0.00	0.02	0.04	0.03	0.02
Sulfate	100	13.5	8	6	6	8	9
Chloride	15	80	233	163	18	13	5
Turbidity	80	153	900	395	26	0	0
COD	29.1	72.8	6250	368	4.8	4.8	9.7
Phenol	0.000	0.002	14.4	1.0	0.000	0.000	0.000
Cyanide	0.76	0.20	4.56	2.44	0.02	0.14	0.02
Cadmium	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Chromium	0.00	0.00	0.11	0.00	0.00	0.00	0.00
Copper	0.03	0.01	0.02	0.02	0.02	0.01	0.01
Iron	2.72	3.77	166	1.83	3.65	0.05	0.02
Magnesium	25.0	9.10	31.5	13.8	0.80	1.16	0.77
Manganese	0.45	0.26	3.58	1.25	0.04	0.05	0.02
Mercury	0.0004	0.0002	0.0017	0.0052	0.00125	0.00015	0.0002
Potassium	13.8	17.0	57.0	25.0	0.24	1.57	0.49
Silver	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc	0.58	25.1	5.3	1.84	11.7	3.80	1.83
Calcium	128.7	4.49	180.75	126.75	0.28	1.67	11.87
Sodium	22.2	87.0	123	90.0	9.00	9.10	5.10
Color	5	60	30	10	15	0	5
Silica	29	9	31	9	17	17	8
Sulfide	<0.1	<0.1	2.0	1.0	02	<0.1	<0.1

Note: concentrations in ppm.

Table C-5. Water-Quality Analyses Fran Monitor Wells at the Sanitary Landfill - Sampled November 1975.

Constituent	Well Number GW05	GW06	GW07	GW08	GW09	GW10	Gw11
Total Dissolved Solids	555	532	1368	1064	64	76	114
Nitrogen-Ammonia	1.30	8.20	27.0	26.8	0.70	0.00	0.00
Nitrogen-Nitrate	0.08	0.20	0.78	0.46	0.20	0.16	1.23
Nitrogen-Nitrite	0.014	0.006	0.028	0.010	0.018	0.006	0.024
Nitrogen-Total Kjeldahl	1.53	12.0	19.3	23.4	0.00	0.00	0.00
Phosphorus-Total	0.20	0.08	0.08	0.09	0.13	0.08	0.10
Sulfate	64	13.5	21.5	22	10.5	47	13
Chloride	26	93	117	65	15	20	12
Turbidity	32	99'	788	188	16	4	16
COD	56.1	149.5	3980	485.4	18.9	9.4	46.7
Phenol	0.000	0.020	46	0.4	0.000	0.000	0.016
Cyanide	-	-	-	-	-	-	-
Cadmium	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chromium	0.00	0.00	0.11	0.00	0.00	0.00	0.00
Copper	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Iron	0.02	0.65	72.0	4.00	15.5	0.00	0.00
Magnesium	0.58	0.11	17.0	16.0	7.00	1.25	1.00
Manganese	0.56	0.62	2.86	0.26	0.01	0.03	0.01
Mercury	-	-	-	-	-	-	-
Potassiun	22.8	50.0	63.0	55.0	0.85	1.70	51.0
Silver							
Nickel							
Zinc	0.09	0.15	0.36	0.04	0.73	0.50	0.44
Calcium	19.55	33.0	15.2	71.0	14.0	77.0	10.0
Sodium	13.0	48.0	62.0	51.0	3.80	4.70	3.10
Color							
Silica	0.13	0.08	32.0	1.82	0.42	0.10	1.53
Sulfide							

Note: concentrations in ppm.

0000259

Table C-6

Results of Chemical Analysis
of
Water and Sediment Samples at the Sanitary Landfill

SAMPLE NO.	DATE OF SAMPLING	TYPE OF SAMPLE	DESCKIPSION OF SAMPLING LOCATION	CADMIUM	CHROMIUM	MERCURY	NICKEL	LEAD
12	28 Jan 82	Water	Leachate, east side of landfill	0	0	0.2*	-	-
13	28 Jan 82	Water	Leachate, upstream, of 12 by 10, east side of landfill	8.7	0	N	-	-
18	28 Jan 82	Sediment	At bridge between Golf Course Pond and Bayou Grande	0.14	2.5	0.016	0.70	26
23	28 Jan 82	Sediment	Pond near Bayou Grande North of Sanitary Landfill	2.3	19	0.2	4.0	51

Note: **Concentrations in ppm**

From NEESA, 1983

Table C-7. Chemical Analyses of Ground-Water Samples From the Sanitary Landfill.

Well No.	Sampling Date	Field Parameters		
		Tempgrature (C)	pH	Specific Conductance (umhos/cm)
GM-3	4/6/84	20	6.5	235
GM-4	4/5/84	19	6.4	420
GM-5	4/5/84	19	5.4	90
GM-31	4/6/84	18	5.7	125
GM-32	4/6/84	19	6.2	235
GM-33	4/5/84	19.5	6.2	595
GM-34	4/6/84	20	6.1	480
GM-35	4/5/84	20	6.0	480

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2] GM-31 / 8401841	GM-3 / 8401819
chloromethane			
dichlorodifluoromethane			
vinyl chloride			
chloroethane			
methylene chloride		55	11,000
trichlorofluoromethane			
1,1-dichloroethene		0.2	
1,1-dichloroethane			
trans-1,2-dichloroethene			
chloroform			
1,2-dichloroethane			
1.1.1-tricklorocthane		21	
carbon tetrachloride			
bromodichloromethane			
1,2-dichloropropane			
trans-1,3-dichloropropane			
trichloroethene			
dibromochloromethane			
1,1,2-trichloroethane			
cis-1,3 dichloropropene			
2-chloroethylvinyl ether			
bromoform			
1,1,2,2-tetrachloroethane			
tetrachloroethene			
chlorobenzene			
Detection Limit		0.1	10

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL. Cincinnati, Ohio.

[2]Concentrations less than the detection limit an left blank.

0000260

. .. Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Clicnt: Geraghty & Miller Report No.: 84-403

Compound	Sample ID: / CAA ID:	GM-4 8401752	GN-5 8401153	01-32 8401154
		Concentration ug/l (ppb)[2]		
chloromethane				
dichlorodifluorwthanr				
vinyl chloride				
chloroethane		0.9	27	
methylene chloridc		1.0	06	23
trichlorofluoromethane				
1,1-dichloroethene				
1,1-dichloroethane			1.0	
trans-1,2-dichloroethene			55	
chloroform				
1,2-dichloroethane				
1,I,1-trlchloroethane		59		
carbon trtrachloride				
bromodichloromethane				
1,2-dichloropropane				
trant-1,3-dichloropropanr				
trichloroethene			07	
dibromochloromethane				
1,1,2-trichloroethane				
cis-1.3 dicnloropropcnr				
2-chloroathylvinyl etnar				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		0.1	0.1	0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cinclnnrtl. Ohio.

[2]Concentrations less than the dctectlon limit are left blank.

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

Concentrations of Volatile Organic Compounds (Method 6011)

Client: Geraghty and Miller - Tampa

Report No.: 84-403

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2]		
		GM-33-4/5 8401755	GM-34 8401756	GM-35 8401757
chloromethane				54
dichlorodifluoromethane				
vinyl chloride				
chloroethane			165	12
methylene chloride		2400		430
trichlorofluoromethane				
1,1-dichloroethene				69
1,1-dichloroethane				32
trans-1,2-dichloroethene				17
chloroform				
1,2-dichloroethane				
11 ,1-trichloroethane			44	
carbon tetrachloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene				
dibromochloromethane				
1.1.2-rricnloroctnane				
cis-1.3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				20
Detection Limit		5	01	01

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

0000261

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa Report No.: 84-418

Compound	Sample ID: / CAA ID:	GM-3 / 8401843	01-31 / 8401844	GM-32 / 8401845
		Concentration - ug/l (ppb)[2]		
ACID COMPOUNDS				
(21A) 2.4.6-trichl orophmol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2,4-dichlorophenol				
(3 U) 2,4-dimethyIphenol				
(57A) 2-nitrophmol				
(58A) 4-nitrophenol				
(59A) 2,4-dinitrophenol				
(60A) 4.6-dlni tro-2-aethyl phenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		2	2	2
BASE/NEUTRAL COMPOUNDS				
(1B) acenaphthene				
(58) benzidine				
(8B) 1,2,4-trichlorobenzene				
(98) hexachlorobenzene				
(128) hexachloroethane				
(18B) bis (2-chloroethyl) ether				
(20B) 2-cnloronrphtnrlcnc				
(25B) 1,2-dichlorobenzene				
(26B) 1,3-dichlorobenzene				
(278) 1,4-dichlorobenzene				
(28B) 3.3' -dichlorobenzidine				
(35B) 2,4-dinitrotoluene				
(368) 2.6-dinitrotoluenc				
(37B) 1.2-dipnenylhydrrzrnr				
(39B) fluorantnene				
(40B) 4-cnlorophenyl pnenyl ether				
(41B) 4-bromophenyl pnenyl ether				

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geragnty and Miller - Tampa Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] 611-3 / 8401843	611-31 / 8401844	GM-32 / 8401845
BASE-NEUTRAL COMPOUNDS (cont'd)				
(42B) bis (2-chloroisopropyl) ether				
(43B) bis (2-chloroethoxy) methane				
(52B) hexachlorobutadiene				
(53B) hexachlorocyclopentadiene				
(54B) isophorone				
(55B) naphthalene				
(56B) nitrobenzene				
(62B) N-nitrosodiphenylamine				
(63B) N-nitrosodipropylamine				
(66B) bis (2-ethylhexyl) phthalate				
(67B) benzyl Duty1 phthalate				
(68B) di-n-butyl phthalate				
(69B) di-n-octyl phthalate				
(70B) diethyl phthalate				
(71B) dimethyl phthalate				
(72B) benzo(a)anthracene				
(73B) benzo(a)pyrene				
(74B) benzo(b)fluoroanthene				
(75B) benzo(k)fluoroanthene				
(76B) chrysene				
(77B) acenaphthylene				
(78B) anthracene				
(79B) benzo(ghi)perylene				
(80B) fluorene				
(81B) phenanthrene				
(82B) dibenzo(a,h)anthracene				
(83B) ideno(1,2,3-cd)pyrene				
(84B) pyrene				
Detection Limit		2	2	2

[1] U.S. EPA, 1982. Methods for Organic Chemical Analysis of municipal a d Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit a n left blank. Concentrations between 1 and 10 times the limit of detection art listed as trace levels (TR).

0000262

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-403

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] GM-4 (4/5) 8401752	GM-5 (4/5) 8401753
ACID COMPOUNDS			
(21A) 2,4,6-trichlorophenol			
(22A) p-chloro-m-cresol			
(24A) 2-chlorophenol			
(31A) 2,4-dichlorophenol			
(34A) 2,4-dimethylphenol			
(57A) 2-nitrophenol			
(58A) 4-nitrophenol			
(59A) 2.4-dinitrophenol			
(60A) 4,6-dinitro-2-methylphenol			
(64A) pentachlorophenol			
(65A) phenol			
Octection Limit		2	2
BASE/NEUTRAL COMPOUNDS			
(1B) acenaphthene			
(5B) benzidine			
(8B) 1,2,4-trichlorobenzene			
(9B) hexachlorobenzene			
(12B) hexachloroethane			
(18B) bis (2-chloroethyl) ether			
(20B) 2-chloronaphthalene			
(25B) 1,2-dichlorobenzene			
(26B) 1.3-dichlorobenzene			
(27B) 1,4-dichlorobenzene		TR(5)	
(28B) 3,3'-dichlorobenzidine			
(35B) 2,4-dinitrotoluene			
(36B) 2.6-dinitrotoluene			
(37B) 1,2-diphenylhydrazine			
(39B) fluoranthene			
(40B) 4-chlorophenyl phenyl ether			
(41B) 4-bromophenyl phenyl ether			

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa Report No.: 84-403

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] GM-4 (4/5) 8401752	GM-5 (4/5) 8401753
BASE NEUTRAL COMPOUNDS (cont'd)			
(42B) bis (2-chloroisopropyl) ether			
(43B) bis (2-chloroethoxy) methane			
(52B) hexachlorobutadiene			
(53B) hexachlorocyclopentadiene			
(54B) isophorone			
(55B) naphthalene		TR(2)	
(56B) nitrobenzene			
(62B) N-nitrosodiphenylamine			
(63B) N-nitrosodipropylamine			
(66B) bis (2-ethylhexyl) phthalate			
(67B) benzyl butyl phthalate			
(68B) di-n-butyl phthalate			
(69B) di-n-octyl phthalate			
(70B) diethyl phthalate			
(71B) dimethyl phthalate			
(72B) benzo(a)anthracene			
(73B) benzo(a)pyrene			
(74B) benzo(b)fluoroanthene			
(75B) benzo(k)fluoroanthene			
(76B) chrysene			
(77B) acenaphthylene			
(78B) anthracene			
(79B) benzo(ghi)perylene			
(80B) fluorene			
(81B) phenanthrene			
(82B) dibenzo(a,h)anthracene			
(83B) ideno(1,2,3-cd)pyrene			
(84B) pyrene			
Detection Limit		2	2

[1]U.S. EPA, 1982. Methods for Organic Chemical Analysis of Municipal a d Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES. INC.

concentration of Acid/Base/Neutral Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-403

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] GM-33 (4/5) 8401755	GN-34 (4/6) 8401756	GM-35 (4/5) 8401757
ACID COMPOUNDS				
(21A) 2,4,6-trichlorophrnol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2.4-dichl orophenol				
(34A) 2,4-dimethylphenol				TR(8)
(57A) 2-nitrophenol				
(58A) 4-nitrophenol				
(59A) 2.4-dinitrophenol				
(60A) 4,6-dinitro-2-methylphenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		2	2	2
BASE/NEUTRAL COMPOUNDS				
(1B) acenaphthene				
(58) benzidine				
(88) 1,2,4-trichlorobenzene				
(98) hexachlorobenzene				
(128) hcxrchloroethanc				
(188) bis (2-chlorocthyl) ether				
(208) 2-chloronaphthalene				
(25B) 1,2-dichlorobenzene			TR(3)	TR(5)
(26B) 1,3-dichlorobenzene				
(27B) 1,4-dichlorobenzene		15.	TR(9)	TR(10)
(288) 3,3'-dichlorobenzidine				
(35B) 2,4-dinitrotoluene				
(36B) 2.6-dini trotoluene				
(376) 1,2-diphenylhydrarine				
(39B) fluoranthene				
(40B) 4-chlorophenyl phenyl ether				
(41B) 4-bromophenyl phenyl ether				

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Acid/Base/Neutral Extractables (Method 625[1])

client: Geraghty and Miller - Tampa Report No: 84-403

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] GM-33 (4/5) 8401755	GM-34 (4/6) 8401756	GM-35 (4/5) 8401757
BASE NEUTRAL COMPOUNDS (cont'd)				
(42B) bis (2-chloroisopropyl) ether				
(43B) bis (2-chloroethoxy) methane				
(52B) hexachlorobutadiene				
(53B) hexachlorocyclopentadiene				
(54B) isophorone				
(55B) naphthalene		TR(8)	TR(8)	47
(56B) nitrobenzene				
(62B) N-nitrosodiphenylamine				
(63B) N-nitrosodipropylamine				
(668) bis (2-cthylhexyl) phthalate				
(67B) benzyl butyl phthalate				
(68B) di-n-butyl phthalate				
(69B) di-n-octyl phthalate				
(708) diethyl phthalate		TR(2)		TR(3)
(719) dimethyl phthalate				
(72B) benzo(a)anthracene				
(73B) benzo(a)pyrene				
(74B) benzo(b)fluoroanthene				
(75B) benzo(k)fluoroanthene				
(76B) chrysene				
(778) acenaphthylene				
(78B) anthracene				
(79B) benzo(ghi)perylene				
(80B) fluorene				
(81B) phenanthrene				
(82B) dibenzo(a,h)anthracene				
(83B) ideno(1,2,3-cd)pyrene				
(84B) pyrene				
2 methyl naphthalene			14	TR(11)
Detection Limit		2	2	2

[1]U.S. EPA, 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank. Concentrations between 1 and 10 times the limit of detection are listed as trace levels (TR).

0000264

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Pesticides and PCBs (Method 608[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-418

Compound	Sample ID: CAA ID:	GM-3 8401843	GM-31 8401844	01-32 8401845
		Concentration - ug/l (ppb)[2]		
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin				
(91P) chlordane				
(92P) 4,4'-DDT				
(93P) 4,4'-DDE				
(94P) 4,4'-DDD				
(95P) endosulfan-alpha				
(96P) endosulfan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) heptachlor				
(101P) heptachlor epoxide				
(102P) BHC-alpha				
(103P) BHC-beta				
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) PCB - 1260				
(112P) PCB - 1016				
(113P) toxaphene				
Detection Limit		0.1	0.1	0.1

[1]U.S. EPA, 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left Blank.

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Pesticides and PCBs (Method 608[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-403

Compound	Sample ID: / CAA ID:	Concentration - ug/l (ppb)[2] GM-4 8401752	GM-5 8401753
PESTICIDES AND PCBs			
(89P) aldrin			
(90P) dieldrin			
(91P) chlordane			
(92P) 4,4'-DDT			
(93P) 4,4'-DDE			
(94P) 4,4'-DDD			
(95P) endosulfan-alpha			
(96P) endosulfan-beta			
(97P) endosulfan sulfate			
(98P) endrin			
(99P) endrin aldehyde			
(100P) heptachlor			
(101P) heptachlor epoxide			
(102P) BHC-alpha			
(103P) BHC-beta			
(104P) BHC-delta			
(105P) BHC-gamma (lindane)			
(106P) PCB - 1242			
(107P) PCB - 1254			
(108P) PCB - 1221			
(109P) PCB - 1232			
(110P) PCB - 1248			
(111P) PCB - 1260			
(112P) PCB - 1016			
(113P) toxaphene			
Detection Limit		01	01

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

0000265

Table C-7 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

concentration of Pesticides and PCBs (Method 608[1])

Client: Geraghty and Miller - Tampa | Report NO.: 84-403

Compound	Sample ID: / CAA ID:	GM-33 / 8401755	GM-34 / 8401756	GM-35 / 8401757
		Concentration - ug/l (ppb)[2]		
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin				
(91P) chlordane				
(92P) 4,4'-DDT				
(93P) 4,4'-DDE				
(94P) 4,4'-DDD				
(95P) endosul fan-alpha				
(96P) endosul fan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) heptachlor				
(101P) heptachlor epoxide				
(102P) BHC-alpha				
(103P) BHC-beta				
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) PCB - 1260				
(112P) PCB - 1016				
(113P) toxaphene				
Detection Limit		0.1	0.1	0.1

[1]U.S. EPA, 1982. Methods for Oryanic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

Pioneer Laboratory, Inc
11 East Olive Road
Pensacola, Florida 32514
Phone (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I.D. # 760
Date of Order April 9, 1984
Date Completed April 24, 1984
Sample Identification NAS Pensacola, Florida
Water Samples

Table C-7 (Continued)

0000 TU 66

C-27

Sample Identification	Cadmium	Chromium	Lead	Mercury	Silver	Zinc	Nickel
GM-3	0.002	0.003	0.01	<0.0001	L0.001	0.023	0.004
GM-4	0.001	0.004	0.02	<0.0001	0.001	0.008	0.009
GM-5	<0.001	0.002	L0.01	<0.0001	<0.001	0.013	0.001
GM-31	<0.001	0.002	0.02	< 0.001	<0.001	0.028	0.002
GM-32	<0.001	0.001	<0.01	< 0.0001	0.002	0.035	0.005
GM-33	0.001	0.005	<0.01	<0.0001	0.002	0.009	0.008
GM-34	0.002	0.003	0.02	<0.0001	0.031	0.365	0.008
GM-35	0.010	0.003	0.02	40.0001	0.002	0.012	0.006

NOTE: All results are reported in milligrams/liter (mg/l)
< = less than

W. F. Bowers

Approved by W. F. Bowers
Laboratory Director

Pioneer LABORATORY. INC.

I.D. # 8..

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

TO Geraghty & Miller
P.O. Box 771173
Tampa, Florida 33688

REPORTS TO BE MAILED TO:
Ed Morse

Phone
Date of Order: April 12, 1984
Sampled by
Customer's Order Number
Job Name/Number
Job Location: NAS Pensacola, Florida
Job Phone
Starting Date
Date Completed
Date Report Mailed: April 74, 1984

CYANIDE ANALYSIS

SAMPLE IDENTIFICATION	RESULTS
GM-4	<0.001
GM-5	0.010
GM-33	<0.001
GM-34	<0.001
GM-35	(0.001

Notes. Results are reported in milligrams per liter (mg/l)
< = Less Than

Approved by

Analysis by Laboratory Director

Work Authorized by Technician

Table C-7 (Continued)

I.D. = 760

Pioneer LABORATORY, INC

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

TO Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Phon

April 9, 1984
Date of Order

Sampled by

Customer's Order Number

Job Name Number

NAS Pensacola, Florida
Job Location

REPORTS TO BE MAILED TO:

Ed Morse

Water Samples

Job Phone

Starting Date

Date Completed

April 24, 1984
Date Report Mailed

CYANIDE ANALYSIS

Sample Identification	Results
GM-3	<0.001
GM-31	< 0.001
GM-32	<0.001

Notes All results are reported in milligrams per liter (mg/l).
< = less than

Analysis by Approved by

Work Authorized by 0000267

Technician

T... e . C...ic.. Ana..,ses .. Wa...fr Se...ent ..mp....

Pioneer Laboratory, Inc.
11 East Olive Road
Pensacola Florida 32514
Phone (904) 474 1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I.D. # 800
Date of Order April 12, 1984
Date Completed April 25, 1984
Sample Identification NAS Pensacola, Florida
Sediment Samples

E.P. TOXICITY*

C-30

Sample Identification	Arsenic	Barium	Cadmium	Chromium, Cr^{+6}	Lead	Mercury	Selenium	Silver	Nickel
1A	<0.001	<1	<0.01	<0.01	<0.1	<0.0005	(0.001	<0.01	<0.1
1B	0.002	<1	<0.01	<0.01	<0.1	<0.0005	<0.001	(0.01	<0.1
1C	<0.001	<1	<0.01	40.001	<0.1	<0.0005	<0.001	40.01	0.1
1D	40.001	<1	<0.01	<0.01	<0.1	<0.0005	40.001	<0.01	<0.1
1E	0.003	<1	40.01	<0.01	<0.1	<0.0005	<0.001	<0.01	0.1
1F	<0.001	<1	<0.01	<0.01	<0.1	L0.0005	<0.001	<0.01	<0.1

NOTE: E.P. TOXICITY* Material are filtered and subjected to an extraction procedure as specified in Federal Register, Volume 45, Number 98, 1980.

Results are reported in milligrams per liter (mg/l).
= less than.

Approved by W. F. Bowers
Laboratory Director

Table C-9. Chemical Analyses of Ground Water From the Crash Crew Training Site.

Well No.	Sampling Date	Field Parameters		
		Temperature (°C)	pH	Specific Conductance (umhos/cm)
GM-20	4/10/84	19	4.5	180
GM-21	4/10/84	19	5.7	170
GM-22	4/10/84	19	5.0	120
GM-23	4/10/84	19	5.2	<50
GM-24	4/10/84	19	5.9	80
GM-25	4/10/84	19	5.5	100

· ·Table C-9 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-418

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] GM-20 8401830	GM-21 8401831	GM-22 8401832
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride		4.7	6.2	
tricnlorofluoromethane				
1,1-dichloroethene			11.	
1,1-dichloroethane				
trans-1,2-dichloroethene				
chloroform		0.3	0.6	
1.2-dicnloroetnanr		1.0	2.0	
1,1,1-trichloroethane		11	1.0	
carbon tetrachloride				
bromodichloromethane				
1.2-dichloropropane				
trans-1.3-dichloropropane				
trichloroethene				
dibromochloromethane				
11 ,2-trichloroethane				
cis-1,3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		0.1	01	01

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati. Ohio.

[2]Concentrations less than the detection limit arc left blank.

Table C-9 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa | Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2]		
		GM-23 / 8401833	GM-24 / 8401834	GM-25 / 8401835
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride		04		
trichlorofluoromethane				
1,1-dichloroethene				
1,1-dichloroethane				
trans-1,2-dichloroethene				
chloroform				
1,2-dichloroethane				
1,1,1-trichloroethane				
carbon tetrachloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene				
dibromochloromethane				
1,1,2-trichloroethane				
cis-1,3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		**0.1**	**0.1**	**0.1**

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati. Ohio.

[2]Concentrations less than the detection limit are left blank.

Table C-10. Chemical Analyses of Ground Water From Southwest Chevalier Field.

Well No.	Sampling Date	Field Parameters: Tempgrature (C)	pH	Specific Conductance (umhos/cm)
GM-6	4/7/84	22	6.5	105
GM-7	4/7/84	24	7.5	130
GM-29	4/7/84	21	7.2	210
GM-30	4/7/84	21.5	6.4	110

Table C-10 (Continued)

Concentration of Total Organ c Carbon (Method 415.1)

Client ID	CAA ID	TOC mg/l (ppm)
GM-6	8401855	2.5
GM-7	8401856	2.8
GM-29	8401864	5.4
GM-30	8401865	3.9

U.S. EPA Check Standard

Actual	Observed
8.2	8.0

0000270

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

client: Geraghty and Miller - Tampa

Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2] GM-6 8401820	GM-7 8401821	GM-29 8401839	GM-30 8401840
chloromethane					
dichlorodifluoromethane					
vinyl chloride					
chloroethane					
methylene chloride					
trichlorofluoromethane					
1,1-dichloroethene					
1,1-dichloroethane					
trans-1,2-dichloroethene					
chloroform					
1,2-dichloroethane					
1,1,1-trichloroethane					
carbon tetrachloride					
bromodichloromethane					
1,2-dichloropropane					
trans-1,3-dichloropropene					
trichloroethene					
dibromochloromethane					
1,1,2-trichloroethane					
cis-1,3 dichloropropene					
2-chloroethylvinyl ether					
bromoform					
1,1,2,2-tetrachloroethane					
tetrachloroethene					
chlorobenzene					
Detection Limit		0.1	0.1	0.1	0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

Chemical Analyses of Surface-Water Samples From Creek West of Chevalier Field.

I.D. # 800

Pioneer LABORATORY, INC.
11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32514

TO Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Phone:
Date of Order: April 12, 1984
Sampled by:
Customer's Order Number:
Job Name/Number:
Job Location: NAS Pensacola, Florida

REPORTS TO BE MAILED TO:
Ed Morse

Water Samples

Job Phone:
Starting Date:
Date Completed:
Date Report Mailed: April 25, 1984

Analysis	Creek #1	Creek #2	Creek #3
Arsenic, mg/l	0.004	0.001	0.008
Barium, mg/l	40.1	<0.1	co.1
Cadmium, mg/l	0.003	0.003	0.002
Chromium, mg/l	0.017	0.015	0.013
Lead, mg/l	0.02	0.03	0.03
Mercury, mg/l	L 0.0005	0.0007	<0.0005
Selenium, mg/l	(0.001	<0.001	<0.001
Silver, mg/l	0.001	0.003	<0.001
pH, units	6.67	6.66	6.74
Conductivity, micromhos/cm	170	270	650

Notes: mg/l = milligrams per liter < = less than

Analysis by Approved by W. F. Bowers
Laboratory Director

Work Authorized by Technician

0000271

Table C-11 (Continued).

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa   Report No.: 84-403

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2] Creek #1 8402020	Creek #2 8402021	Creek #3 8402022
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride		35	22	33
trichlorofluoromethane				
1,1-dichloroethene		29	3.1	4.1
1.1-dichloroethanc				
trans-1.2-dichloroethenc		0.7	0.7	19
chloroform				
1,2-dichloroethane		3.1	5.4	10
1,1,1-trichloroethane		1.3	1.4	6.9
caroon tetrrchloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene .		32	3.5	41
dibromochloromethane				
1,1,2-trichloroethane				
cis-1.3 dichtoropropenc				
2-chloroethylvinyl ether				
bromoform				
1.1.2.2-tetrachloroethane				
tetrachloroethene				0.8
chlorobenzene				
Detection Limit		0.1	0.1	0.1

[1]U.S. EPA. 1982. Methods for Oryrnic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit arc left blank.

Table C-12. Chemical Analyses of Water and Sediment Samples From the North Chevalier Field Landfill and Supply Department Outside Storage Sites.

Well No.	Sampling Date	Field Parameters		
		Tempgrature (C)	pH	Specific Conductance (umhos/cm)
GM-26	4/7/84	20.5	10.2	295
GM-27	4/7/84	21.5	7.2	195
GM-28	4/7/84	22	9.5	245
GM-36	4/7/84	21	7.3	185
GM-15	4/7/84	21.5	6.8	405

000C272

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa | Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration ug/l (ppb)[2]			
		GM-27 8401837	GM-28 8401838	GM-26 8401836	GM-36 8401842
chloromethane					
dichlorodifluoromethane					
vinyl chloride					
chloroethane					
methylene chloride		·	1.4	0.6	
trichlorofluoromethane					
1,1-dichloroethene					
1,1-dichloroethane					
trans-1,2-dichloroethene			1.9		
chloroform				22	
1,2-dichloroethane					
1,1,1-trichloroethane				8.3	
carbon tetrachloride					
bromodichloromethane					
1,2-dichloropropane					
trans-1,3-dichloropropane					
trichloroethene			1.0	1.4	
dibromochloromethane					
1,1,2-trichloroethane					
cis-1,3 dichloropropene					
2-chloroethylvinyl ether					
bromoform					
1,1,2,2-tetrachloroethane					
tetrachloroethene					
chlorobenzene					
Detection Limit		0.1	0.1	0.1	0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA 600/4-82-057, EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-418

Compound		Concentration ug/l (ppb)[2]
	Sample ID:	08-15
	CAA ID:	8401829
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		3.6
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		0.7
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		1.4
dibromochloromethane		
1,1,2-trichloroethane		
cis-1.3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		5.4
chlorobenzene		
Detection Limit		0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

0000273

Pioneer
PLI LABORATORY, INC.
11 EAST OLIVE ROAD
PENSACOLA FLORIDA 32514
PHONE (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I.D. # 760
Date of Order: April 9, 1984
Date Completed: April 24, 1984
Sample Identification NAS Pensacola, Florida
Water Samples

Sample Identification	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
GM-15	0.013	(0.1	0.013	0.003	0.02	<0.0001	<0.001	0.002
GM-26	<0.001	(0.1	0.001	0.002	<0.01	<0.0001	<0.001	<0.001
GM-27	<0.001	0.2	<0.001	0.002	<0.01	<0.0001	40.001	(0.001
GM-28	<0.001	<0.1	<0.001	0.002	0.02	<0.0001	<0.001	<0.001
GM-36	<0.001	co.1	40.001	0.003	40.01	<0.0001	<0.001	< 0.001

NOTE: All results are reported in milligrams per liter (mg/l)
∠ = less than

Table C-12 (Continued)

Pioneer
LABORATORY INC
11 EAST OLIVE ROAD
PENSACOLA FLORIDA 32514
PHONE (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I D # 800
Date of Order April 12, 1984
Date Completed April 25, 1984
Sample Identification NAS Pensacola, Florida
Sediment Samples

0000274

E.P. TOXICITY*

Sample Identification	Arsenic	Barium	Cadmium	Chromium, Cr^{+6}	Lead	Mercury	Selenium	Silver	Nickel
2A	0.016	<1	0.02	<0.01	<0.1	<0.0005	<0.001	<0.01	<0.1
2B	0.021	<1	0.02	40.01	<0.1	<0.0005	40.001	<0.01	<0.1
2c	0.003	<1	0.03	<0.01	<0.1	<0.0005	(0.001	<0.01	<0.1
2D	0.010	<1	0.01	<0.01	<0.1	40.0005	<0.001	<0.01	<0.1
2E	(0.001	<1	<0.01	<0.01	<0.1	<0.0005	(0.001	<0.01	<0.1
2F	<0.001	<1	<0.01	<0.01	<0.1	<0.0005	<0.001	<0.01	<0.1

NOTE: E.P. TOXICITY* Material are filtered and subjected to an extraction procedure as specififed in Federal Register, Volume 45, Number 98, 1980.

Results are reported in milligrams per liter (mg/l).
= less than

Approved by ... Laboratory ...

Table C-12 (Continued)

Pioneer LABORATORY. INC.

I.D. # 1147

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOU. FLORIDA 32514

TO Geraghty & Miller
P.O. Box 771173
Tampa, Florida 33688

Phone

Date of Order: May 18, 1984

Sampled by

Custom's Order Number

Job Name/Number

NAS

Job Location

REPORTS TO BE MAILED TO
Ed Morse

Job Phone

Starting Date: June, 1984

Date Completed

Date Report Mailed

Analysis For Metals

Metals	Bayou Grande-A	Bayou Grande-B
Arsenic	0.001	0.001
Barium	0.1	0.1
Cadmium	0.015	0.013
Chromium	0.018	0.015
Lead	0.09	0.08
Mercury	0.0001	0.0001
Iron	0.18	0.14
Selenium	0.0001	0.001
Silver	0.020	0.012
Tin	0.18	0.14
Magnesium	470	470
Nickel	0.067	0.061
Copper	0.03	0.024
Manganese	0.051	0.053
Zinc	0.014	0.030

Notes = less than

All analysis reported pp/m

Analysis by

Approved by W. F. Bowers
Laboratory Director

Work Authorized by

Technician

FROM #107 — METRO PRINTING INC HUNTSVILLE AL 35801

Table C-13. Chemical Analyses of Soil Samples From the Pesticide Rinseate Area.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Pesticides and PCBs (Soil Samples)

Client: Geragnty 6 Miller - Tampa　　　　Report No.: 84-418

Compound	Sample ID: / CAA ID:	15-1-Surface 8401846	15-1-1 ft. 8401847	15-1-2 ft. 8401848
		Concentration - ug/gm (pp)1		
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin				
(91P) cnlordane		21.	63	0.41
(92P) 4,4'-DDT		12	0.79	0.01
(93P) 4,4'-DDE		1.2		
(94P) 4,4'-DDD				
(95P) endosulfan-rlpkr				
(96P) endosulfan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) neptachlor		(see note)		
(101P) heptachlor epoxide			0.16	0.03
(102P) BHC-alpna				
(103P) BHC-beta				
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) PCB - 1260				
(112P) PCB - 1016				
(113P) toxapnene				
Detection Limit		01	0.1	0.01

'Concentrations less than the detection limit are left blank.

Heptacnlor is a constituent of chlordane and is present in all samples containing cnloraane.

000275

Table C-13 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Pesticides and PCBs (Soil Samples)

Client: Geraghty & Miller - Tampa | Report No.: 84-418

Compound	Sample ID: / C M ID:	15-2-Surface 8401049	15-2-1 ft. 8401850	15-2-2 ft. 8401851
		Concentration - ug/gm (ppm)[1]		
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin		0.17	0.10	0.01
(91P) chlordane		11	0.59	
(92P) 4,4'-DDT		0.69	0.40	0.01
(93P) 4,4'-DDE			0.19	
(94P) 4,4'-DDD			0.03	
(95P) endosulfan-alpha				
(96P) endosulfan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) heptachlor		(see note)		
(101P) heptachlor epoxide				
(102P) BHC-alpha				
(103P) BHC-beta			0.03	
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) PCB - 1260				
(112P) PCB - 1016				
(113P) toxaphene				
Detection Limit		0.01	0.01	0.01

[1]Concentrations less than the detection limit are left blank.

Heptachlor is a constituent of chlordane and is present in all samples containing chlordane.

Table C-13 (Continued)

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Concentration of Pesticides and PCBs (Soil Samples)

Client: Geraghty & Miller - Tampa

Report No.: 84-418

Compound	Sample ID: / CAA ID:	Concentration - ug/gm (ppm)[1] 15-3-Surface 8401852	15-3-1 ft. 8401853	15-3-2 ft. 8401854
PESTICIDES AND PCBs				
(89P) aldrin				
(90P) dieldrin		0.10	0.44	0.02
(91P) chlordane		0.29	0.06	
(92P) 4,4'-DDT				
(93P) 4,4'-DDE				
(94P) 4,4'-DDD			0.01	
(95P) endosulfan-alpha				
(96P) endosulfan-beta				
(97P) endosulfan sulfate				
(98P) endrin				
(99P) endrin aldehyde				
(100P) heptachlor		(see note)		
(101P) heptachlor epoxide				
(102P) BHC-alpha				
(103P) BHC-beta				
(104P) BHC-delta				
(105P) BHC-gamma (lindane)				
(106P) PCB - 1242				
(107P) PCB - 1254				
(108P) PCB - 1221				
(109P) PCB - 1232				
(110P) PCB - 1248				
(111P) K B - 1260				
(112P) PCB - 1016				
(113P) toxaphene				
Detection Limit		0.01	0.01	0.01

[1]Concentrations less than the detection limit are left blank.

Heptachlor is a constituent of chlordane and is present in all samples containing chlordane.

0000276

Table C-13 (Continued)

Concentrations of Arsenic (Method 203.2)

Client ID	CAA ID	As ug/g (ppm), dry weight	Solids (%)
15-1-surface	8401846	16;14[a]	86.1
15-1-1 ft.	8401847	8.0	93.9
15-1-2 ft.	8401848	3.2	94.3
15-2-surface	8401849	15	80.1
15-2-1 ft.	13401850	19	92.8
15-2-2 ft.	8401851	19	93.7
15-3-surface	8401852	31	92.5
15-3-1 ft.	8401353	1.6	96.3
15-3-2 ft.	8401854	2.4	95.0

[a]Duplicate analyses performed.

Table C-14. Chemical Analyses of Soil Samples From the Transformer Storage Yard.

Pioneer Laboratory, Inc
11 East Olive Road
Pensacola, Florida 32514
Phone (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I.D. # 720
Date of Order April 4, 1984
Date Completed April 18, 1984
Sample Identification NAS Pensacola, Florida
Sediment Samples from Site 17

0000277

C-49

POLYCHLORINATED BIPHENYL ANALYSIS
(PCB)

Sample Identification	Results
17-1 Surface	< 0.200 ppm
17-1 1 ft.	< 0.200 ppm Trace of Arochlor 1260
17-1 2 ft.	< 0.200 ppm
17-2 Surface	< 0.200 ppm Trace of Arochlor 1260
17-2 1 ft.	3.7 ppm of Arochlor 1260
17-2 2 ft.	9 ppm of Arochlor 1260
17-3 Surface	< 0.200 ppm
17-3 1 ft.	< 0.200 ppm
17-3 2 ft.	< 0.200 ppm

NOTE: Results are reported as micrograms per gram on as is basis. (ug/g = ppm)
< = Less Than
Samples 17-4 Surface, 1 ft. & 2 ft. were delivered to lab, but no analysis performed per Ed Morse.

W F Bowers

Approved by W. F. Bowers

Table C-15. Chemical Analyses of Ground Water Samples From the Radium Dial Shop and Building 648 Sites.

Well No.	Sampling Date	Field Parameters Tempgrature (C)	pH	Specific Conductance (umhos/cm)
GM-1	4/10/84	21	7.9	180
GM-2	4/9/84	22.5	8.0	225

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

fable 3 . Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller- Tampa Report No: 84-418

Compound	Sample ID: / CAA ID:	a - 2 (4/9) 8401817	GM-1 (4/10) a401818
		Concentration ug/l (ppb)[2]	
cnloromethane			
aicnlorodifluoromethane			
vinyl chloride			
cnloroethane			
methylene cnloride			21
tricnlorofluoromethane			
1,1-dicnloroethene			01
1,1-dicnloroethane			
trans-1,2-dicnloroethene			
cnloroform		3.1	4.6
1,2-dicnloroethane		29	
1,1,1-tricnloroethane		25	1.7
carbon tetrachloride			
bromodichloromethane			
1,2-dicnloropropane			
trans-1,3-dicnloropropane			
tricnloroetnene		52	
dibromochloromethane			
1,1,2-tricnloroethane			
cis-1,3 dicnloropropene			
2-cnloroetnylvinyl ether			
bromoform			
1,1,2,2-tetracnloroethane			
tetracnloroethene		0.6	0.4
cnlorobenzene			
Detection Limit		01	01

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysts of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati. Ohio.

[2]Concentrations less tnan the detection limit are left blank.

I.D. # 76

Pioneer LABORATORY, INC.

11 EAST OLIVE ROAD PHONE (904) 474-1001
PENSACOLA, FLORIDA 32114

TO Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Phone:
Date of Order: April 9, 1984
Sampled by:
Customer's Order Number:
Job Name/Number: NAS Pensacola, Florida
Job Location: GM-2

REPORTS TO BE MAILED TO:
Ed Morse

Job Phone:
Starting Date:
Date Completed:
Date Report Mailed: April 24, 1984

GROSS ALPHA ANALYSIS

6.5 ± 1.8 pCi/l

Notes:

W. F. Bowers

Approved by W. F. Bowers
Laboratory Director

Analysis by

Work Authorized by

Technician

Table C-16. Chemical Analyses of Sediment Samples From the Building 649/755 Site.

Pioneer PLI LABORATORY, INC
11 EAST OLIVE ROAD
CENSACOLA, FLORIDA 32514
PHONE (904) 474-1001

To: Geraghty & Miller
P.O. Box 271173
Tampa, Florida 33688

Reports To Be Mailed To:
Ed Morse

Lab I D # 800
Date of Order April 12, 1984
Date Completed April 24, 1984
Sample Identification NAS Pensacola, Florida
Sediment Samples

0000279

E.P. TOXICITY*

C-53

Sample Identification	Tin	Cadmium	Magnesium	Chromium, Cr^{+6}	Nickel	Silver	Lead	Copper	Cyanide
D1	<5	0.02	1.0	<0.01	<0.1	<0.01	<0.1	<0.01	<0.001
D2	<5	0.01	0.8	40.01	<0.1	<0.01	<0.1	<0.01	<0.001
D3	<5	0.01	1.7	<0.01	<0.1	40.01	<0.1	<0.01	<0.001
D4	<5	0.05	0.5	<0.01	<0.1	<0.01	(0.1	0.02	<0.001

NOTE: E.P. TOXICITY* Materials are filtered and subjected to an extraction procedure as specified in Federal Register, Volume 45, Number 98, 1980.

Results are reported in milligrams per liter (mg/l)
< = less than

Approved by W. F. Bowers
Laboratory Director

APPENDIX D

PROPOSED GROUND-WATER SAMPLING AND ANALYSIS PLAN FOR NAS PENSACOLA, FLORIDA

TABLE OF CONTENTS

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LIST OF FIGURES

1.0 INTRODUCTION

Chapter 17-4.6(d) of the Florida Administrative Code requires owners and operators of facilities that discharge into the ground water to obtain and analyze .samples from a ground-water monitoring system, The requirement includes the development and implementation of a ground-water sampling and analysis plan which must include procedures and techniques for sample collection,

To comply with these requirements at the U.S. Naval Air Station, Pensacola, Florida, the following "Sampling and Analysis Plan" has been prepared.

2.0 SAMPLE COLLECTION AND SHIPMENT

2.1 Frequency of Sample Collection

The frequency of sampling and the specific chemical analyses to be performed will be determined at the conclusion of the NACIP characterization study.

2.2 Equipment

Sampling equipment needed for collecting representative samples of ground water are presented below.

(1) 100-ft fiberglass or plastic measuring tape with weighted bottom (or) water-level indicator ("m-scope") consisting of an ammeter, electrode, and 100-ft cable;
(2) Several gallons of distilled water and wash bottle;
(3) Clean rags;
(4) Plastic sheeting or large size garbage bags;
(5) Bottom filling PVC bailer and 120-ft nautical rope, peristaltic pump, or submersible pump;
(6) Graduated bucket;
(7) Sample bottles;
(8) Sample bottle labels, waterproof marking pen;
(9) pH meter
(10) Thermometer;
(11) Specific conductivity meter;
(12) Preservatives for water samples;
(13) Field data and chain-of-custody forms, clipboard, pen; and
(14) Optional: ice chest and ice or freezer packs.

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2.3 Sample Collection Method

2.3.1 Procedures for Measuring Water Levels

(a) Place plastic sheeting around well to protect sampling equipment for potential contamination.

(b) After unscrewing casing cap or access plug, measure the depth to water in the well. All measurements are made from top of PVC casing.

- Using the M-scope, drop the probe down the center of the casing and allow cord to go untangled down the well. When ammeter indicates a closed electrical circuit, determine depth to water from top of PVC casing. Record depth to water on field data form (Figure D-1). Subtract this value from elevation at top of PVC casing to find elevation of water level (see Figure D-2 for elevation of top of casing),

(or)

- Using a fiberglass, steel, or plastic 100-ft tape, chalked on the first five feet, drop weighted tape down center of casing. After water is encountered in well, record measurement of tape at top of casing, wind up tape and record the measurement where tape is wet. Subtract the "wet" measurement from the "held" measurement to determine the depth to water. Subtract this value from the elevation at top of PVC casing to find elevation of water level.

- The water-level measurements must be obtained at each sampling point every time water samples are collected.

(c) Clean M-scope or tape bottom with distilled water and wipe dry with clean rag.

Figure D-1. Ground-Water Sampling Data Form

Date: ____________________

Spring/Well Number: ____________________ Time: ____________ to ____________

Sampled by: ____________________ Weatner: ____________________

CROWD-WATER ELEVATION'

A. (1) Length of Tape Held at Top of Outer Casing: ____________ (or) m-scope reading: ____________

(2) Length of Tape Wet: ____________

(3) Depth to Water (1 minus 2): ____________

Water Level Elevation - Subtract Depth to Water from Elevation of Outer Casing: ____________________

Depth to Well Bottom: ____________________

Height of Water Column (h) = ____________________

WATER SAMPLING DATA

4

Volume of water in well:

$\pi r^2 h$ ____________________

____

Amount of water removed from well: ____________________

Method of water removal: ____________________

Was well pumped dry? ____________________

FIELD ANALYSES AND REMARKS

Temperature: ____________________

Specific Conductance: ____________________

pH: ____________________

Physical Appearance: ____________________

Number & Type of Samples Collected: ____________________

____

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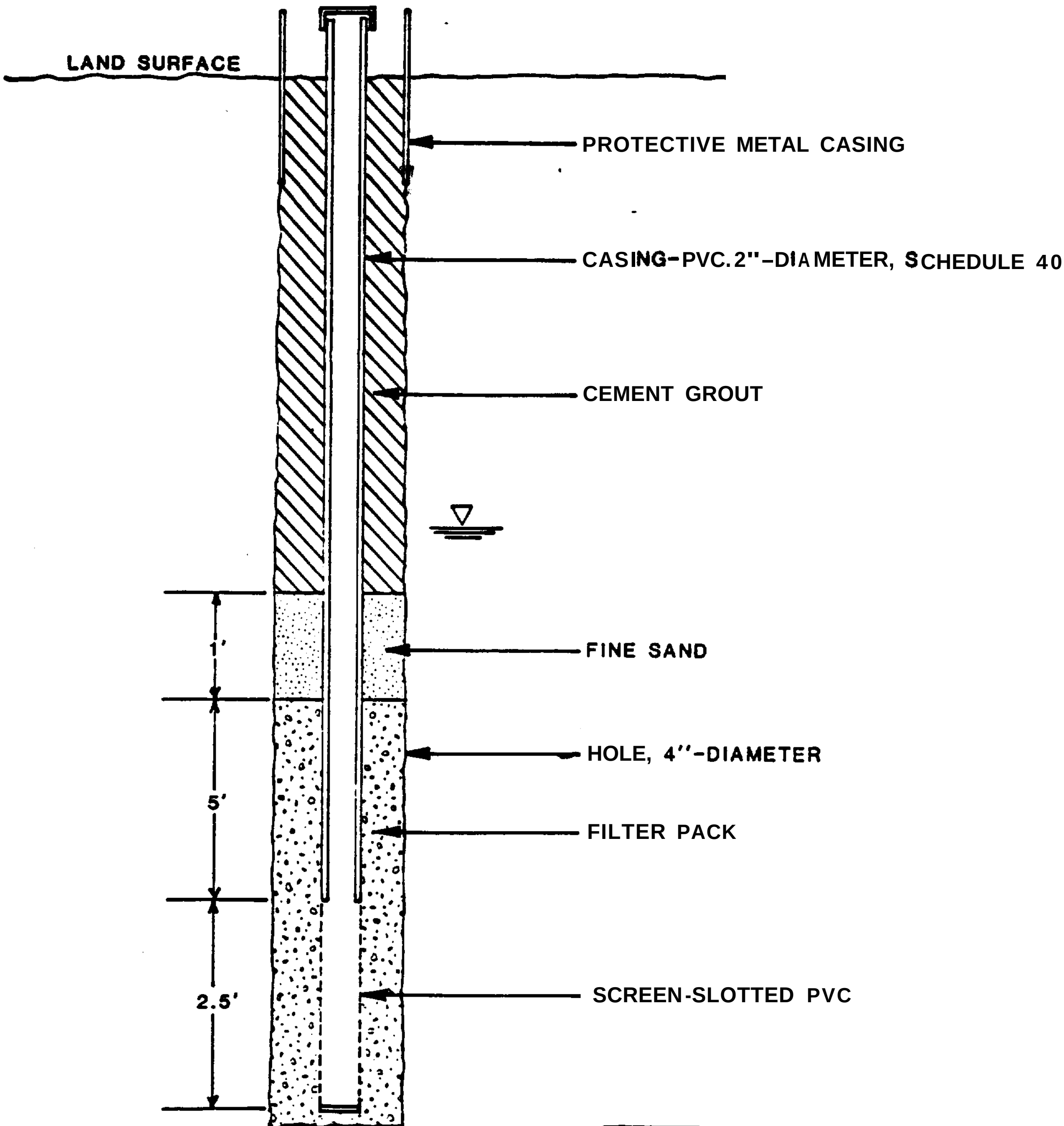

NOT TO SCALE

WELL NUMBER	ELEVATION (FT. MSL)	TOTAL DEPTH (FT.)

MEASUREMENT FROM TOP OF CASING

Figure D-2. Schematic Diagram Showing Construction of Monitor Well.

2.3.2 Procedures for Removing Standing Water in Wells

(a) Remove at least one well volume of standing water using either the peristaltic pump or a hand bailer.

- To find the volume of standing water in the well, use the following calculation:

$$V = 3.14\ r^2 h$$

where V = volume (ft^3)

r = radius of monitor well casing (ft)

h = height of standing water in well (ft)

- The height of standing water in the well is found by subtracting the depth to water measurement from the total depth of the well (refer to Figure D-2 for depth of monitor wells).

- It is generally recommended to remove three to five well volumes of water from the well to insure an accurate sample of ground-water quality but this may not be possible if the wells are low yielding. At the least, the well should be pumped or bailed to dryness before sampling. Use graduated bucket to measure volume of water removed from the well.

- The "Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities", pp 220 to 270, should be consulted for further information concerning the amount of water to evacuate from the well, types of pumps or bailers to use in sampling ground water, and procedures to follow for using pumps or bailers. Another reference source is the U.S. Geological Survey (USGS) publication, "Guidelines for Collection and Field Analysis of

Ground-Water Samples for Selected Unstable Constituents" pp 3 to 9.

(b) Clean bailer or pump with distilled water before use in other wells to prevent possible cross contamination of ground water in the monitor wells.

2.3.3 Procedures for Sample Collection and Field Analyses

(a) Allow well to recharge sufficiently to obtain samples. In some wells, this may require waiting a few minutes to a few hours.

(b) Analyses of pH, temperature, and specific conductance should be made in the field at the time of sampling because these parameters change rapidly and a laboratory analysis might not be representative of the true ground-water quality. Remove enough water from well to determine temperature of water, specific conductivity, and pH. Record values on field data sheet and discard water in a Banner so as to avoid potential contamination.

(c) Rinse sample bottle with sampled ground water <u>except</u> when bottle is fixed with a preservative.

(d) Transfer water from well sampling device to sample bottles provided by the laboratory. Care should be taken not to agitate sample in order to limit amount of added oxygen to water sample. Minimize the number of containers used in order to limit the addition of outside contaminants. Sample bottles should be prepared as specified by the 1974 and 1979 EPA "Manual of Methods for Chemical Analysis of Water and Wastes" (EPA 625/6-74-003 and EPA 600/4-79-020).

(e) If there is insufficient water in the well to supply the necessary volumes for samples specified above, the sample collector should fill up as many bottles as possible, preserve and label as required, and continue sampling daily until the remaining bottles are filled.

3.0 ANALYTICAL PROCEDURES

Analysis of water samples collected from monitor wells will be performed by an approved laboratory.

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