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Task 2 Initial Field Investigation

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INVESTIGATION OF THE FORMER COAL GASIFICATION SITE AT COURT STREET ITHACA, NEW YORK

TASK 2 REPORT
INITIAL FIELD INVESTIGATION PROGRAM

**NEW YORK STATE
ELECTRIC & GAS CORPORATION**
BINGHAMTON, NEW YORK

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DIVISION OF SOLID AND
HAZARDOUS WASTE

E.C.JORDAN CO.

FEBRUARY 1987

INVESTIGATION OF THE FORMER COAL GASIFICATION SITE
AT COURT STREET
ITHACA, NEW YORK

TASK 2 REPORT
INITIAL FIELD INVESTIGATION PROGRAM

Prepared for

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February 1987

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1.0 INTRODUCTION

1.1 PROBLEM SUMMARY

The Court Street site is located in Tompkins County in the City of Ithaca, New York (see Figure 1). The areal setting is a lacustrine deltaic deposit nestled in the foothills of the Appalachian Plateau Uplands. The Court Street site is on the narrow plain which lies between Cayuga Inlet and the hills to the east, at an elevation of approximately 395 feet above mean sea level (MSL) and about 13 feet above the Inlet.

The site once housed a coal gasification plant, operated by the New York State Electric and Gas Corporation (NYSEG) and its predecessor companies from 1853 until 1927 (see Figure 2). By-products of the coal gasification process included coke, ash, coal tar, and spent oxide material. Coke was used to fuel the boilers. Ash and spent oxide from the purification process may have been spread on-site, especially in the early plant years (details unknown). The tar produced was stored on-site in two buried concrete storage vessels and also accumulated in the base of the relief gas holder. The storage vessels were pumped periodically by asphalt processing companies, but were not emptied when the plant closed down.

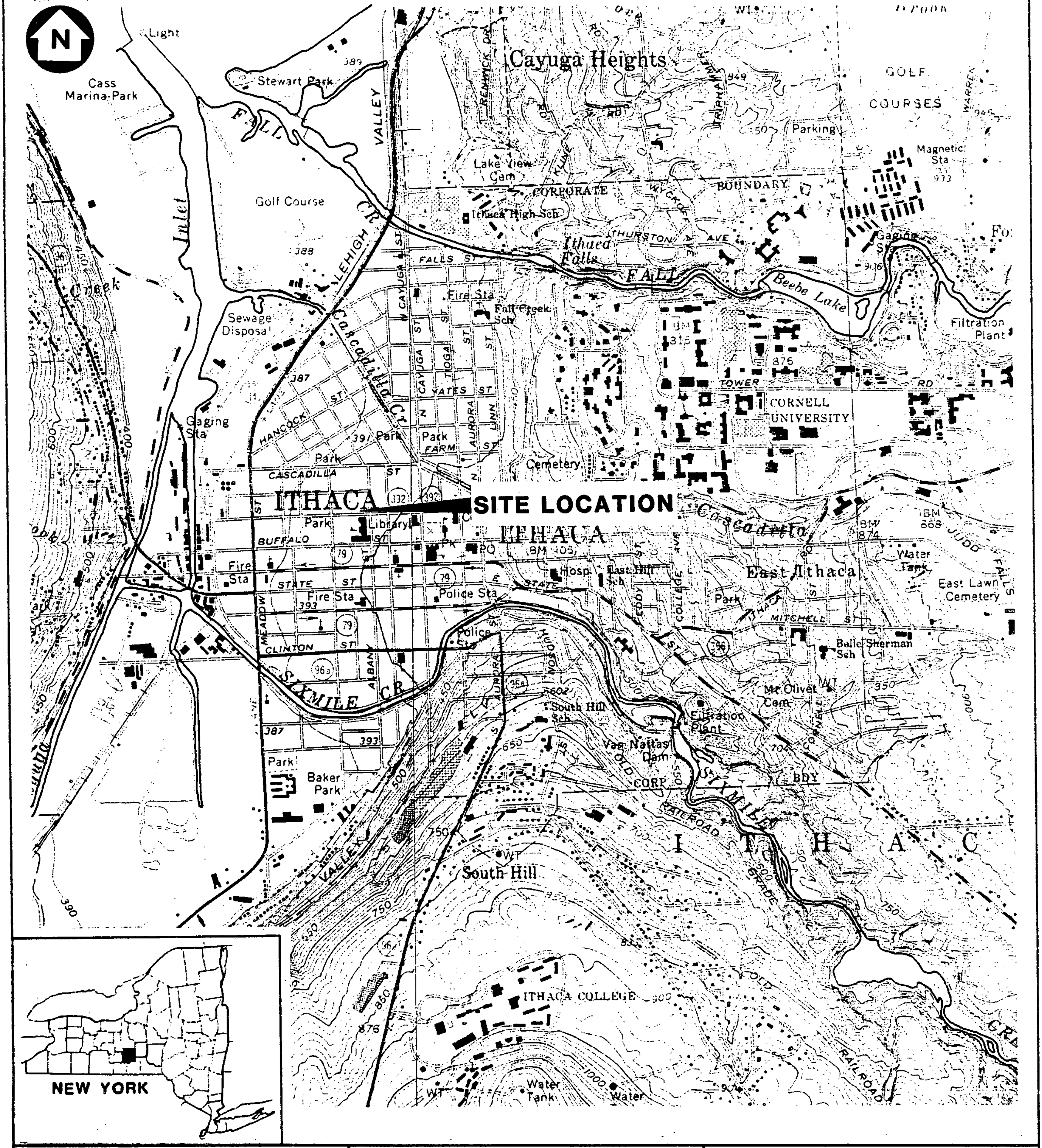
Ash and cinders are relatively free of organics but may leach traces of various heavy metals and salts. Spent oxide wastes contain high concentrations of sulfur, cyanide, and ammonia compounds, most of which are chemically bound with iron. Coal tar is a complex mixture of organic compounds composed primarily of polynuclear aromatic hydrocarbons (PAH), with smaller amounts of phenolics and light aromatic compounds (USWAG, 1984).

NYSEG acquired the gas plant site in 1929 and converted it to an operations center. The gas holders were demolished by NYSEG in the early 1930s; two new buildings were constructed on Esty Street in the late 1940s; and the purifying house and small warehouse were torn down in the late 1950s. NYSEG sold the property to the Ithaca City School District, the current owners, in 1964. A major portion of the site was paved by the city in the late 1960s for use as a playground. The buildings are presently occupied by the school district (offices, workshops, vehicle and equipment storage) and by small commercial businesses (tofu factory, small craft shops, and social service-oriented offices). Figure 3 depicts the site as it appears today.

NYSEG contracted the E.C. Jordan Co. (Jordan) to perform a site investigation at the Court Street site. The investigation is divided into five tasks, conducted using a phased approach: (1) preliminary site evaluation; (2) initial field investigation program; (3) expanded problem definition program; (4) risk assessment; and (5) conceptual design.

1.2 PURPOSE

In the preliminary site evaluation (Task 1), Jordan developed an understanding of the site's history, environmental setting, and current condition based on



BASE MAP SOURCE:
USGS QUADRANGLES
ITHACA EAST (1978)
ITHACA WEST (1978)

SCALE IN FEET

0 2000 4000

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CLIENT

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BINGHAMTON, NEW YORK

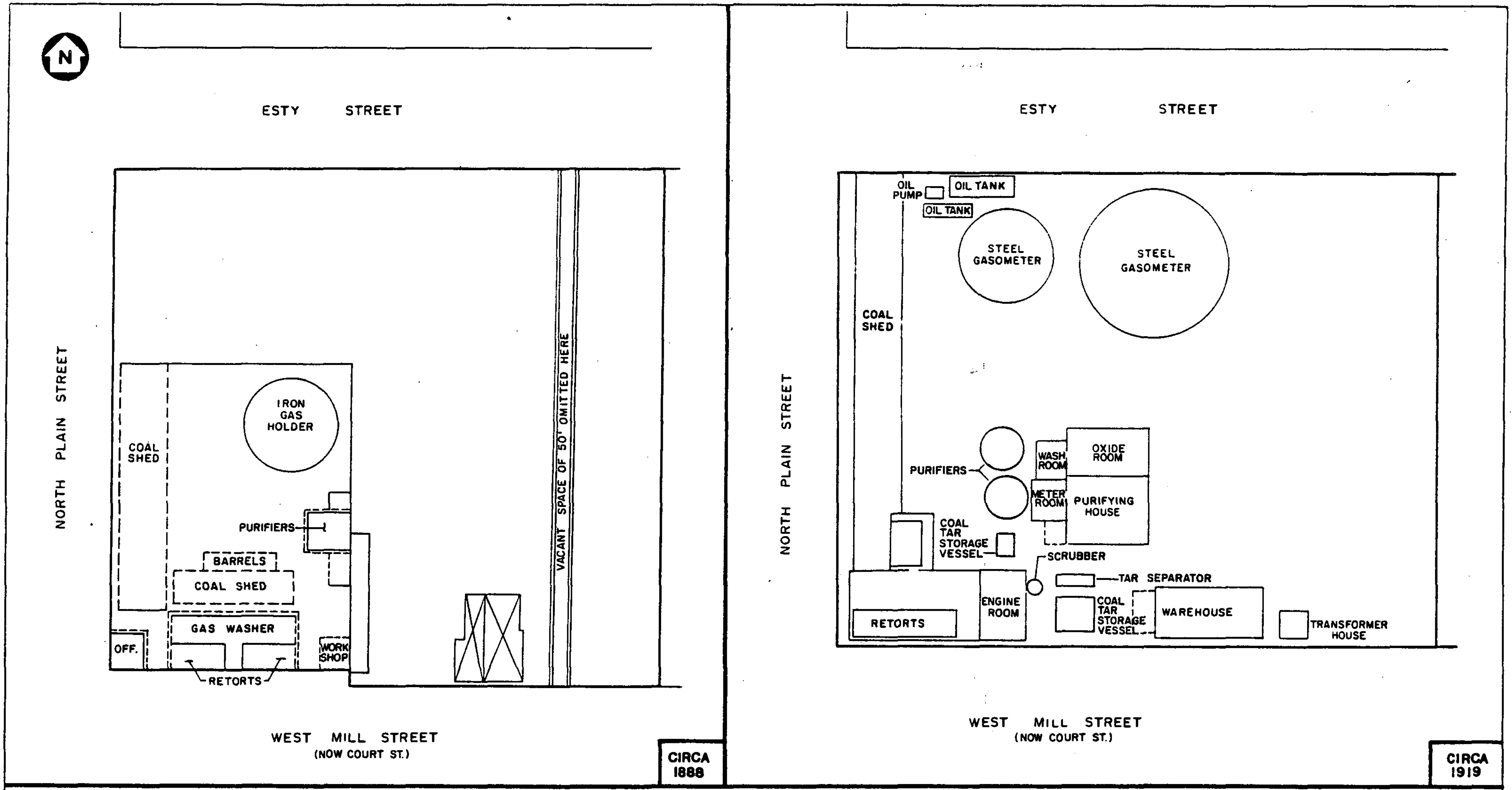
TITLE

SITE LOCATION MAP
ITHACA - COURT ST. SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

PROJECT NO. 4815-02

FIGURE 1



APPROXIMATE SCALE

0 50 100 FEET

SOURCE: SANBORN MAPS FOR THE CITY OF ITHACA, OLIN LIBRARY, CORNELL UNIVERSITY, ITHACA, NY

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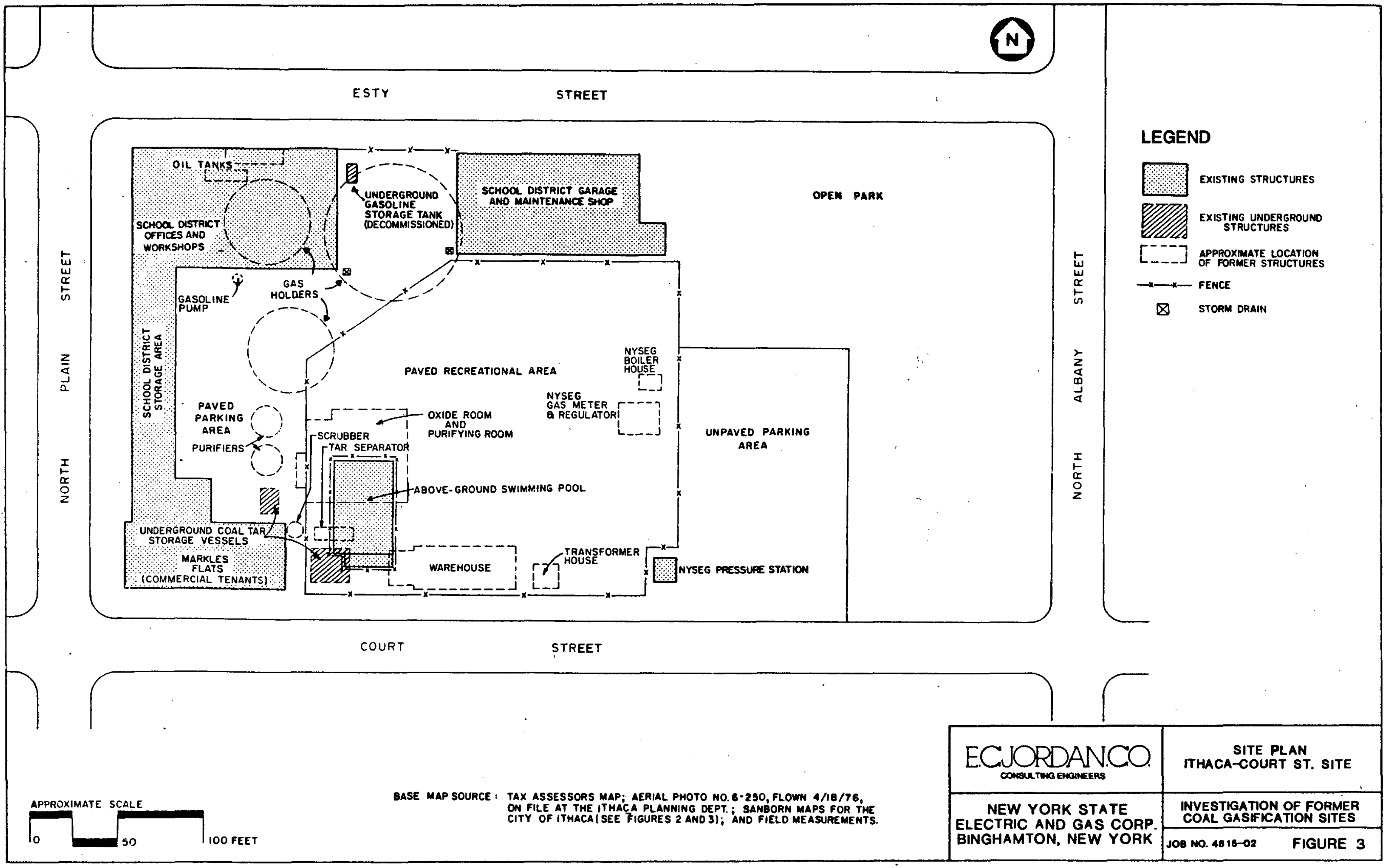
TITLE
COAL GASIFICATION PLANT
CIRCA 1888 AND 1919
ITHACA-COURT ST. SITE

CLIENT
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

PROJECT NO. 4815-02

FIGURE 2



BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76, ON FILE AT THE ITHACA PLANNING DEPT.; SANBORN MAPS FOR THE CITY OF ITHACA (SEE FIGURES 2 AND 3); AND FIELD MEASUREMENTS.

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SITE PLAN
ITHACA–COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 3

available information and direct observation. The Task 1 findings are contained in the Task 1 Report for Court Street submitted to NYSEG in April 1986 (E.C. Jordan, 1986a).

The initial field investigation program (Task 2) was designed to: (1) develop an understanding of the site hydrogeologic setting; (2) determine the identity and concentration of chemicals present in the soils, groundwater, and air; and (3) perform a preliminary assessment of the possible risks of those chemicals to human and environmental receptors. This report summarizes the findings of Task 2 and provides a recommendation for activities to be undertaken during Task 3, the expanded problem definition program. Tasks 2 and 3 will form the technical foundation for the subsequent risk assessment and conceptual design tasks.

1.3 SCOPE OF TASK 2

The scope of work required to fulfill the objectives of the Task 2 investigation is described in the Work Plan for the Court Street site submitted to NYSEG in October 1985 (E.C. Jordan, 1985). The subtasks completed are summarized below:

1. Excavated two test pits for the purpose of determining the location, size, and condition of the abandoned coal tar storage vessels and obtaining samples of the vessel contents for chemical analysis. Soil samples were also obtained for laboratory chemical analysis and logs of the test pits were prepared.

2. Excavated seven test pits for characterization of surficial soils at the site. Soil samples were collected for chemical analysis and test pit logs were prepared.

3. Drilled nine soil borings and obtained soil samples for site characterization and laboratory chemical analysis; installed six groundwater monitoring wells and two piezometers; and prepared boring logs and well installation diagrams.

4. Performed in situ permeability tests at all wells and obtained seven sets of groundwater levels from monitoring wells and piezometers.

5. Collected groundwater samples from six monitoring wells on a quarterly basis for laboratory chemical analysis (three sampling rounds completed as of August 1986).

6 Collected air samples over a three-day period at four locations for laboratory chemical analysis and monitored meteorological conditions during the sampling event.

7. Performed laboratory analysis of soil, groundwater, air, and coal tar samples.

8. Identified the relative locations and elevations of test pits, borings, monitoring wells, piezometers, and other pertinent features at the site.

9. Conducted a preliminary land use survey within 1/2 mile of the site.

10. Evaluated the results of the field investigation and analytical results and performed a preliminary assessment of the potential health and environmental risks posed by chemical constituents found at the site.

11. Identified additional data requirements to be addressed in the Task 3 expanded problem definition program.

2.0 FIELD ACTIVITIES

The field activities undertaken during Task 2 are described in this section. The accomplishments of the program and the rationale for the explorations are discussed. Field logs, well diagrams, and descriptions of the procedures used during the field activities are presented in Appendix A. Exploration and sampling procedures are further documented in the Quality Assurance Project Plan completed in April 1986 (E.C. Jordan, 1986b).

2.1 TEST PITS

Two backhoe-dug test pits were completed at the site on January 15 and 16, 1986. The locations of these test pits, TP-1 and TP-2, are shown in Figure 4. The purpose of the test pits was to determine the dimensions and condition of the two abandoned coal tar storage vessels; to determine the volume of coal tar remaining in the vessels; to evaluate soil conditions adjacent to the vessels; and to observe the foundation of the brick building nearest the vessels (known as Markles Flats).

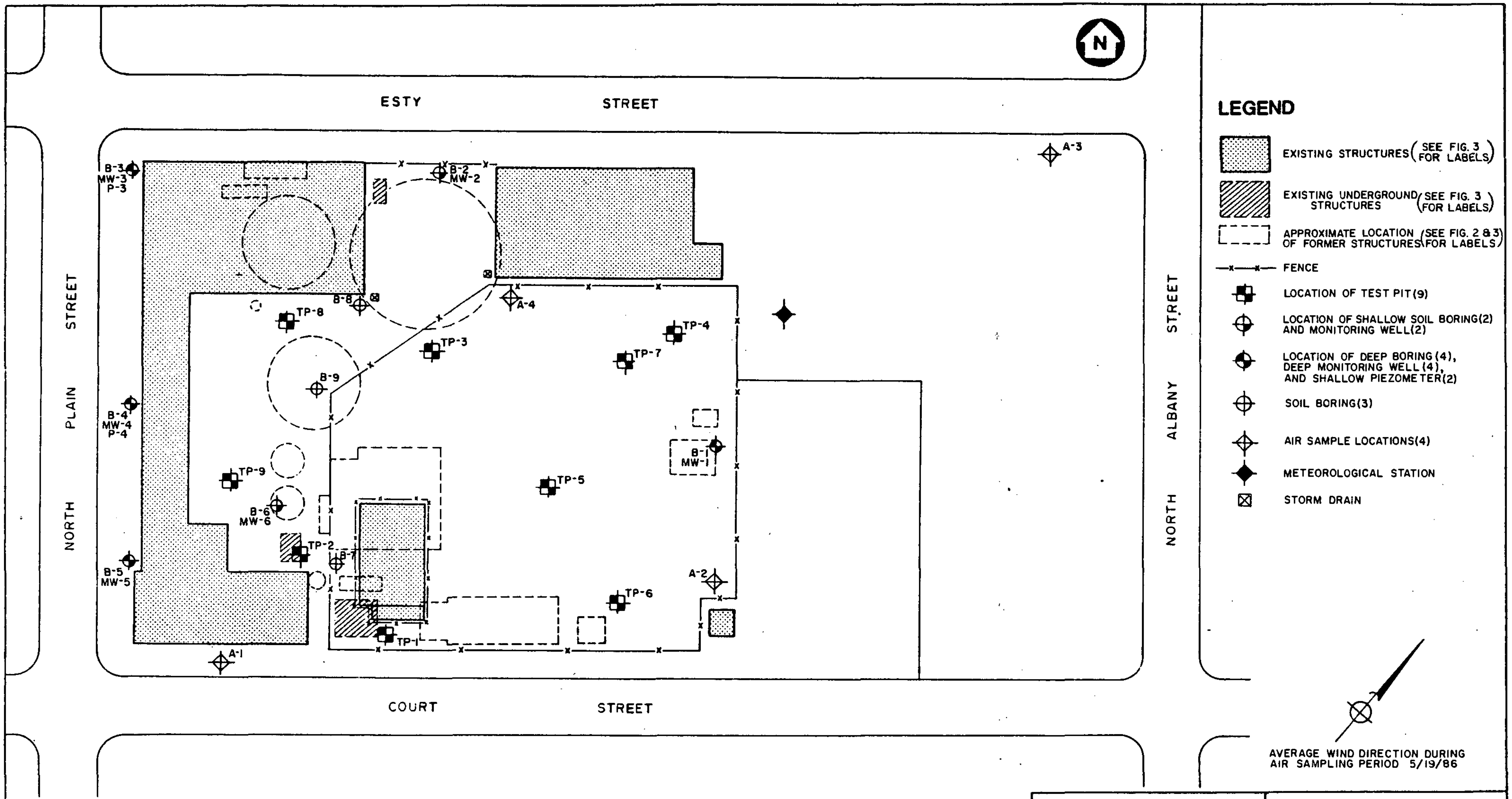
The test pits were monitored by a geologist and a geotechnical engineer and logs were prepared describing the conditions of the vessels, soils, and building foundation (Appendix A-1). TP-1 was 9 feet deep and TP-2 was 6 feet deep. Field observations noting the presence or potential presence of coal tar related wastes are summarized in Appendix A-1. Three soil samples were collected for laboratory chemical analysis by ERCO (described in Section 3.4). The analytical samples were selected from soil layers containing observable amounts of coal tar. The results of the soil analyses are discussed in Section 3.4.2.

Seven additional backhoe-dug test pits were completed at the site on May 19 and 20, 1986. These test pits, designated TP-3 through TP-9, are also shown on Figure 4. The purpose of the test pits was to investigate areas which were shown to produce anomalous responses by ground-penetrating radar (GPR) during the survey conducted during Task 1 (E.C. Jordan, 1986a).

Subsurface conditions were observed by a geologist and logs were prepared describing the soil conditions. The test pits ranged in depth from 3.6 to 8.5 feet. Field observations and logs are presented in Appendix A-1. Seven soil samples were collected, of which six were selected for laboratory chemical analysis by ERCO. The analytical samples were selected from soil layers that: (1) contained visual signs of coal gasification wastes; (2) had a coal tar odor; or (3) showed detectable levels of organic vapors as registered on a photoionization detector (PID). The results of the soil analyses are discussed in Section 3.4.2.

2.2 COAL TAR STORAGE VESSELS

The investigation of the coal tar storage vessels via test pitting on January 15 and 16, 1986 is described in Section 2.1. During the test pitting, the



APPROXIMATE SCALE

0 50 100 FEET

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

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EXPLORATION LOCATIONS
ITHACA-COURT ST. SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 4

vessels were opened and samples of the contents were obtained. The purpose of the vessel sampling activity was to characterize the physical and chemical nature of the contents and to obtain structure dimensions and fluid depths for volume calculations.

Figures 5 and 6 show a plan view and interpretive profiles of the two storage vessels which are based on data collected during both test pitting and sampling (see Appendix A-2). Vessel A contains an estimated 3,400 gallons of coal tar and 4,100 gallons of water; Vessel B holds approximately 8,500 gallons of coal tar and 9,900 gallons of water. Three samples of the vessel contents were sent to ERCO for laboratory chemical analysis. The samples were of the coal tar in each vessel and of the water in Vessel B. The analytical results are discussed in Section 3.4.1.

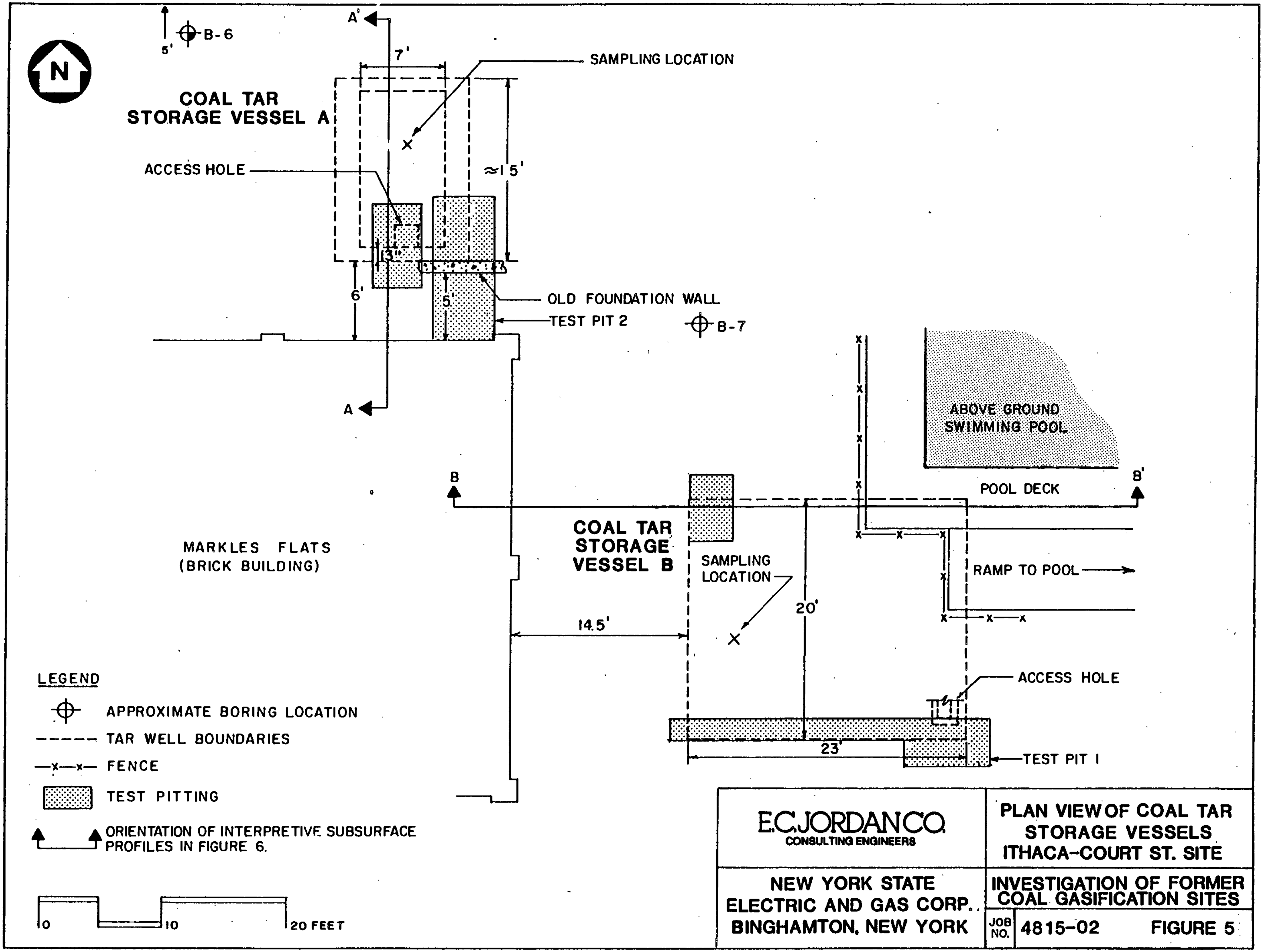
2.3 BORINGS

Nine boreholes were drilled at the site by Parratt Wolff, Inc., of East Syracuse, N.Y., between January 6 and 14, 1986. Boring locations, labelled B-1 through B-9, are depicted in Figure 4. The borings were made in order to: (1) characterize the nature and distribution of subsurface geologic materials; (2) evaluate the impacts of former coal gasification activities on subsurface soils; and (3) provide holes for installing monitoring wells. The boring locations were selected after consideration of the former coal gasification activities, the anticipated direction of groundwater flow, and the results of the geophysical survey, all of which are described in the Court St. Task 1 report (E.G. Jordan, 1986a).

The boreholes were drilled using hollow stem augers. Split spoon samples were collected at 5-foot intervals. Each sample was scanned with a PID and logged by a field geologist. Significant field observations and the boring logs are appended (Appendix A-3). The borings ranged in depth from 15 ft. to 52 ft. Reference samples were collected from representative soil layers. Eighteen analytical samples were collected; nine were selected for laboratory chemical analysis by ERCO. The analytical samples were selected from soil layers that: (1) contained signs of coal gasification wastes (based on appearance or odor); (2) showed detectable levels of organic vapors on the PID; (3) represented more permeable zones; and/or (4) were in the zone within which water table fluctuations occurred. The results of the analyses of boring samples are described in Section 3.4.2.

2.4 MONITORING WELLS AND PIEZOMETERS

Six monitoring wells and two piezometers were installed and sealed in six of the nine boreholes during the January 6 through 14, 1986 period. Figure 4 shows the locations of the wells (MW-1 through MW-6) and the piezometers (P-3 and P-4). The well and piezometer numbers correspond to the number of the boring in which they were installed. The purpose of the monitoring wells was to provide access to groundwater for obtaining water level measurements, permeability data, and water samples for laboratory analyses. The piezometers were installed to provide water level data only. The wells were located to



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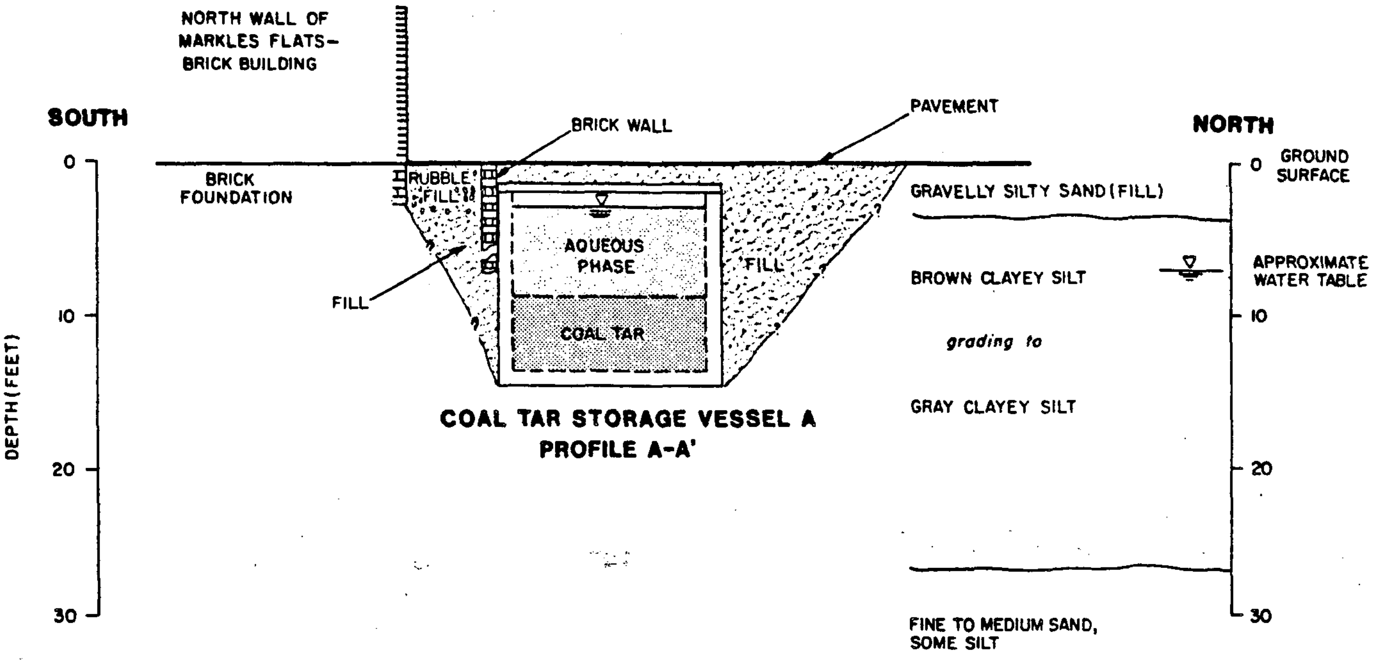
PLAN VIEW OF COAL TAR STORAGE VESSELS ITHACA-COURT ST. SITE

**NEW YORK STATE
ELECTRIC AND GAS CORP.,
BINGHAMTON, NEW YORK**

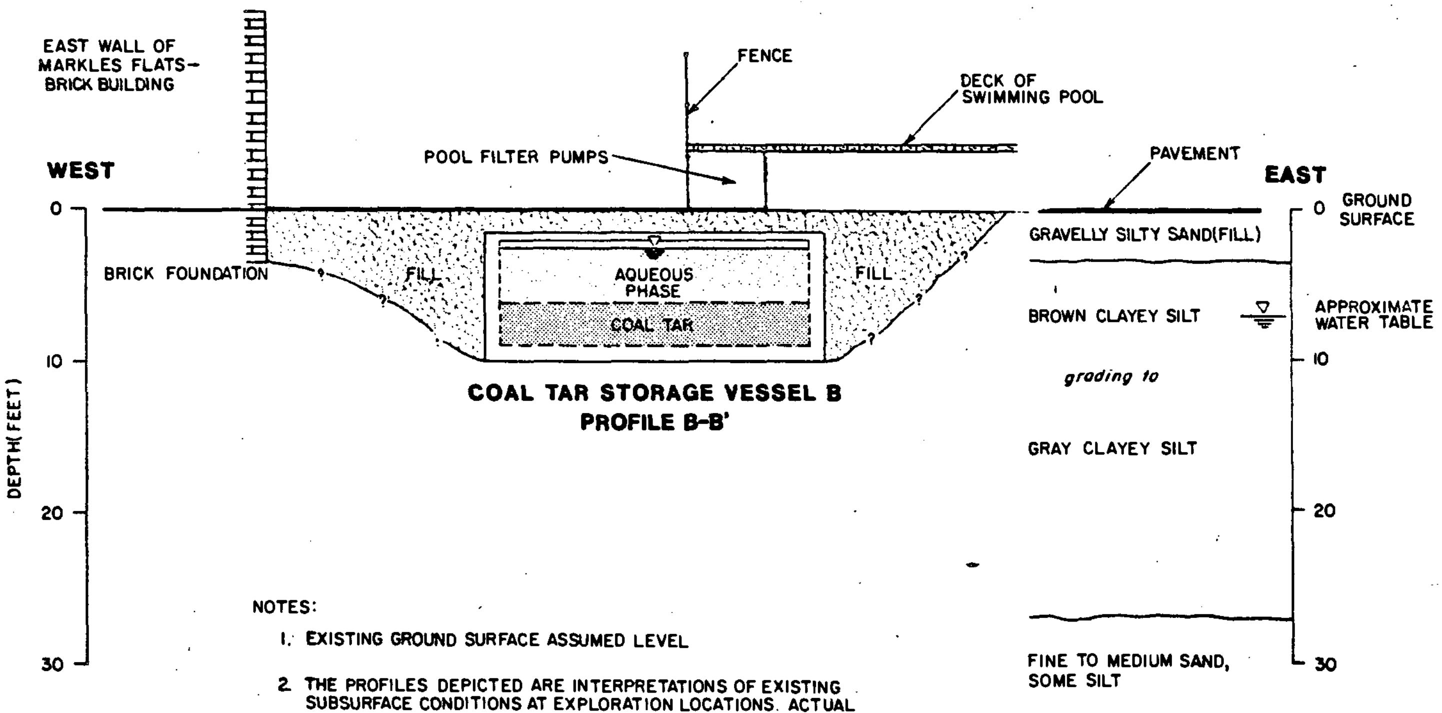
INVESTIGATION OF FORMER COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 5



COAL TAR STORAGE VESSEL A
PROFILE A-A'



COAL TAR STORAGE VESSEL B
PROFILE B-B'

NOTES:

1. EXISTING GROUND SURFACE ASSUMED LEVEL
2. THE PROFILES DEPICTED ARE INTERPRETATIONS OF EXISTING SUBSURFACE CONDITIONS AT EXPLORATION LOCATIONS. ACTUAL CONDITIONS BETWEEN EXPLORATION POINTS MAY VARY.
3. REFER TO FIGURE 5 FOR PROFILE LOCATIONS AND ORIENTATIONS.

APPROXIMATE SCALE

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INTERPRETIVE PROFILES
OF THE COAL TAR
STORAGE VESSELS
ITHACA-COURT ST. SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 6

characterize groundwater upgradient of the site (MW-1), on-site (MW-2 and MW-6), downgradient of the site (MW-3 and MW-4), and at the site perimeter (MW-5). Well screens were positioned to monitor discrete zones of potential chemical migration in the soil formation. Monitoring wells MW-2 and MW-6 and piezometers P-3 and P-4 are screened in the shallow soils and wells MW-1, MW-3, MW-4, and MW-5 are in the deeper soils.

The monitoring wells are constructed of 2-inch diameter stainless steel pipe with flush joint casing and the piezometers are made of 3/4 and 1/2 inch diameter PVC pipe. Installation diagrams are contained in Appendix A-4. Variable and constant head permeability tests were conducted on all six of the monitoring wells and one of the piezometers. Test descriptions and permeability calculations are presented in Appendix A-5. Water level measurements in wells and piezometers have been recorded on seven occasions since January 1986. These data are presented in Appendix A-6. The results of the permeability tests and groundwater level monitoring are interpreted in Section 3.2.

Three rounds of groundwater sampling have been conducted at Court St: (1) February 4, 1986; (2) April 17, 1986; and (3) August 4, 1986. During each sampling round, six groundwater samples (one from each well) and additional quality assurance samples (duplicates and blanks) were collected for laboratory chemical analysis by ERCO. Standard sampling protocols, described in Appendix A-7, were observed. Field measurements of specific conductance, temperature, and pH were made during each sampling event. The results of both the field measurements and the laboratory analyses of groundwater samples are presented in Section 3.4.3.

2.5 AIR

Air sampling was conducted by the Technology Division of the GCA Corporation (now Alliance Technologies Corporation) of Bedford, MA, at Court Street on May 19 and 20, 1986, concurrent with the second test pitting episode. The locations of the air sampling stations, A-1 through A-4, are depicted in Figure 4. The purpose of the air sampling program was to confirm the presence or absence in air of chemicals and particulates related to the site. A meteorological monitoring station, equipped to measure wind speed, wind direction, and ambient temperature was set-up at the site during the sampling event. The sampling network was established based on the prevailing wind direction during the time of sampling, which was northeast. Samples were collected at one upwind station, two on-site stations, and one downwind station.

Three types of air samplers were utilized at each location: (1) high-volume (hi-vol) air samplers with particulate filters and polyurethane foam/XAD-2 sorbent cartridges; (2) low flow portable pumps with particulate filters; and (3) a photoionization detector for total hydrocarbons. Samples were collected over a six-hour period on two consecutive days. The scheduled third day of sampling was cancelled due to heavy rains. Sampling procedures are further described in Appendix A-8. Hi-vol and portable pump samples from the first sampling round (May 19) were selected by GCA for laboratory chemical analysis by ERCO. Round 1 samples were selected because the weather on the first day was warm and dry and therefore more appropriate for sampling than the second day, which was cool and rainy. The results of the air sample laboratory analyses are presented in Section 3.4.4. The results of the hydrocarbon survey on the first day of sampling are shown in Appendix A-8. All but two of the reported values for total hydrocarbons were below 1.0 ppm. These data indicate that no significant volatile organic releases were occurring during the sampling period at the site.

2.6 SITE SURVEY

The locations of the completed subsurface explorations (test pits, borings, and monitoring wells) were surveyed by T.G. Miller Associates of Ithaca, NY, in late January, 1986. The surveyor determined exploration locations and ground elevations to the nearest 0.1 feet and uncapped riser elevations to the nearest 0.01 feet. The reference datum was 394.3 feet above MSL, taken from a USGS benchmark located at the southeast corner of Esty and North Plain Streets. The locations were mapped on a 1 inch equals 50 feet scale base map provided by Jordan.

2.7 PRELIMINARY LAND USE SURVEY

A preliminary land use survey for the area within a one-half mile radius of the site was conducted from April 30 to May 2, 1986. Existing land use maps, street maps, and aerial photographs combined with field confirmation were utilized to determine general land uses. Potentially sensitive land uses were identified with the assistance of local officials and published data. Past and present potential sources of wastes or chemicals to the soil and groundwater in the vicinity of the site were identified from aerial photos and during field checking. The potential sources were defined as locations with large storage tanks or identifiable activities which commonly use chemical substances. The land use survey is described in Section 3.3.

3.0 SITE CHARACTERIZATION

The geology and hydrogeology of the Court Street site, interpreted from data gathered in Tasks 1 and 2, are described in this section. This discussion is followed by a presentation of the results of the land use survey and the laboratory chemical analyses of the samples collected during Task 2.

3.1 GEOLOGY AND SOILS

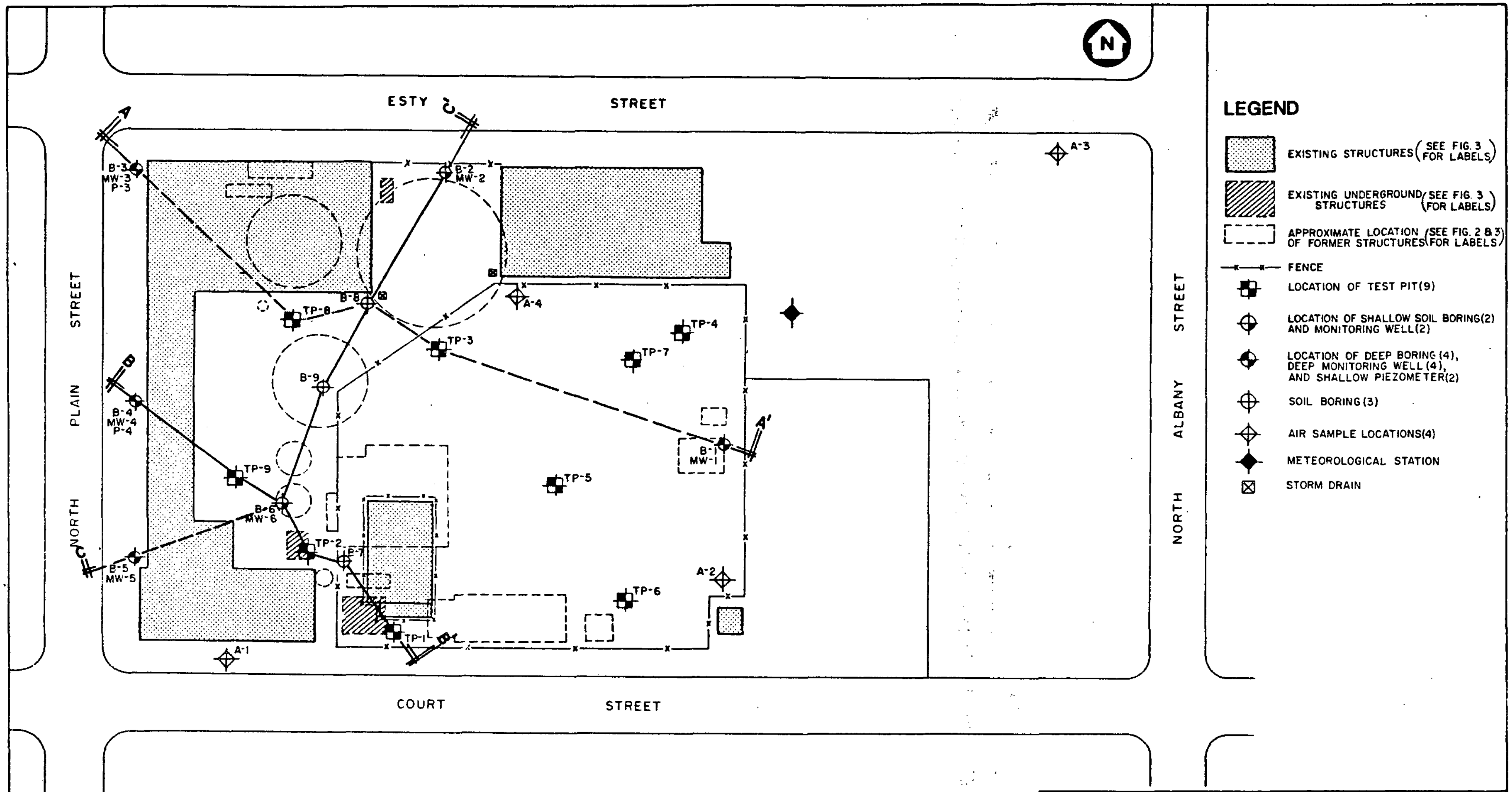
The Tompkins County area is underlain by sedimentary bedrock (i.e., shales, sandstones, and occasional thin beds of limestone) of Devonian age. The bedrock formation is mantled with glacial drift deposits of varied thickness and texture. The glacial deposits include fluvial outwash and lacustrine delta deposits which are reported to exceed 300 feet in thickness in the heart of Cayuga valley. The Court Street site rests on these deltaic deposits at the southern end of Cayuga Lake, 1¼ mile from the lake shore (USDA-SCS, 1965; Crain, 1974).

The shallow (less than 50 feet) subsurface conditions at the Court Street site were explored by means of test pit and boring explorations as described in Section 2.0. The shallow subsurface deposits represent a stratified sequence of alternating silt, sand, and gravelly sand layers. An interpretation of the stratigraphy at the site is illustrated in the interpretive geologic profiles shown in Figures 8 through 10. The profiles are constructed with a 5 to 1 vertical scale exaggeration. The locations of these profiles are shown on a plan view of the site in Figure 7.

The stratified deposits encountered in the investigation are interpreted to consist of four glacially-derived soil strata. These strata are clayey silt, sand, silt, and gravelly silty sand in vertical sequence from near surface to a depth in excess of 50 feet. In addition, fill soils overlie these strata and the entire site is capped by asphalt pavement or buildings. The textures and lateral and vertical extent of each soil stratum are described below:

- o Fill: The fill soils consist of black to brown gravelly, sandy silt with some cobbles, brick fragments, and fly ash. The fill was encountered in all of the borings and varied in depth from 3 to 15 feet. The fill is thickest in the vicinity of the former gas holders as well as at boring locations B-1 and B-4. The lateral extent of the fill off-site is unknown. Relative to other soils observed at the site, the fill has a moderately high hydraulic conductivity.

- o Clayey silt: This stratum consists of fine-grained, olive brown, clayey silt with some fine sand and traces of peat, shell fragments, and fine natural organic materials. The clayey silt was encountered in all of the borings at depths ranging from 3 to 15 feet below ground surface and varied in thickness from 7 to 23 feet. The clayey silt has a low hydraulic conductivity relative to the other soils, and therefore serves as a barrier (aquitard) to vertical groundwater flow. The topography of the clayey silt may be important in determining preferential chemical

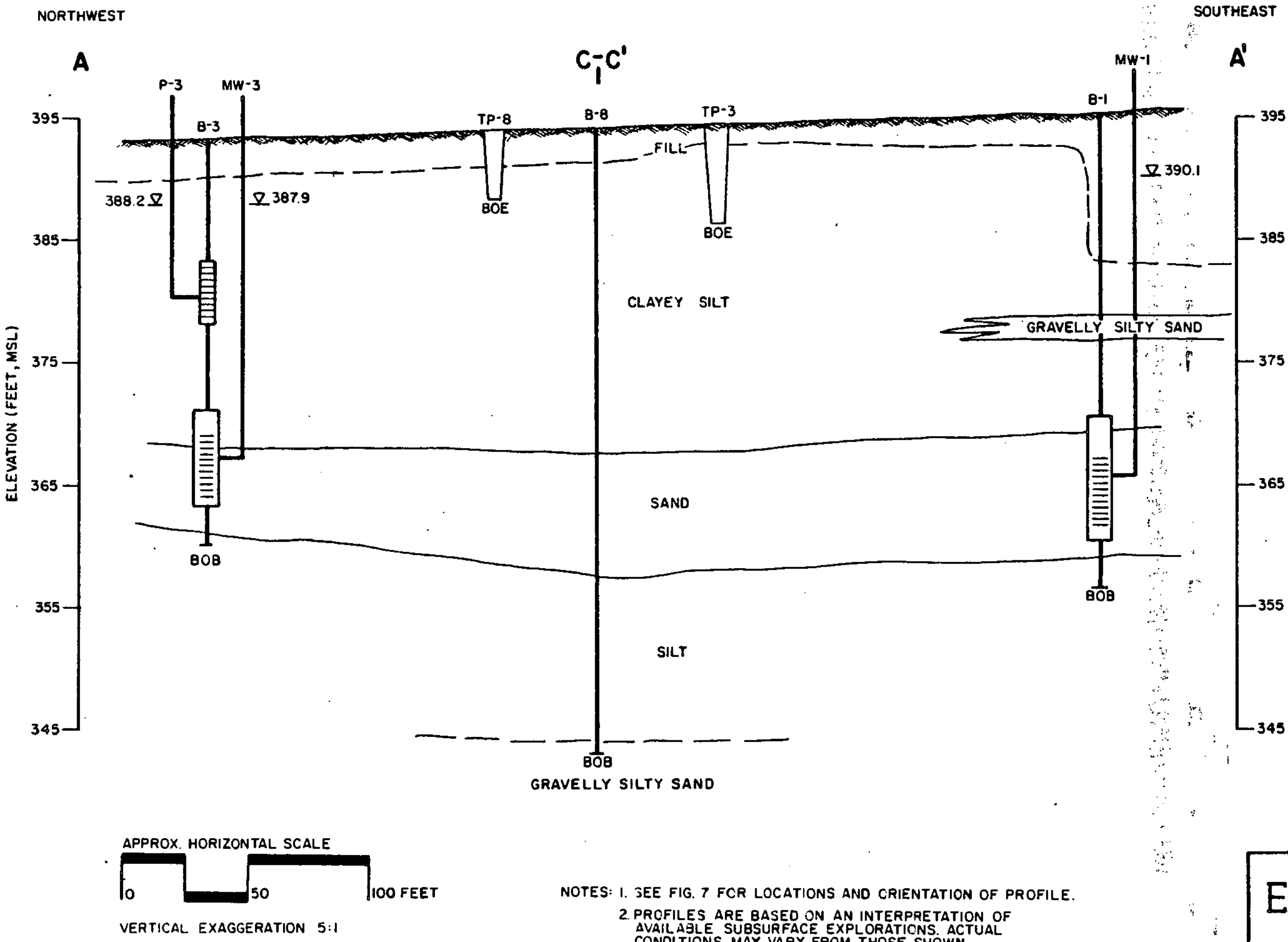


APPROXIMATE SCALE

0 50 100 FEET

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

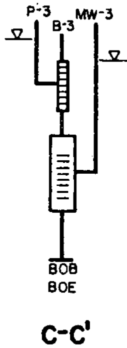
EC JORDAN CO CONSULTING ENGINEERS	GEOLOGIC PROFILE LOCATIONS ITHACA-COURT ST. SITE
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	JOB NO. 4815-02 FIGURE 7



GEOLOGIC DESCRIPTIONS

FILL:	FILL MATERIAL COMPOSED PRIMARILY OF GRAVELS, SILTS AND SANDS, WITH OCCASIONAL BRICKS, COBBLES AND ASHEN MATERIAL.
CLAYEY SILT:	PRIMARILY MIXTURES OF CLAY AND SILT WITH OCCASIONAL FINE SAND AND ORGANIC DEPOSITS.
SAND:	PRIMARILY FINE TO MEDIUM SAND WITH SOME SILTY SAND AREAS AND OCCASIONAL ORGANIC DEPOSITS.
GRAVELLY SILTY SAND:	FINE TO COARSE SAND WITH SILT AND FINE GRAVEL.
SILT:	PRIMARILY SILT WITH ABUNDANT 1-2 MM WHITE SHELLS AND ORGANIC DEPOSITS.

LEGEND



BORING, PIEZOMETER, AND MONITORING WELL LOCATION.

OBSERVED WATER LEVEL (FEET, MSL) ON MARCH 14, 1986

PIEZOMETER SCREEN

WELL SCREEN

SAND BACKFILL

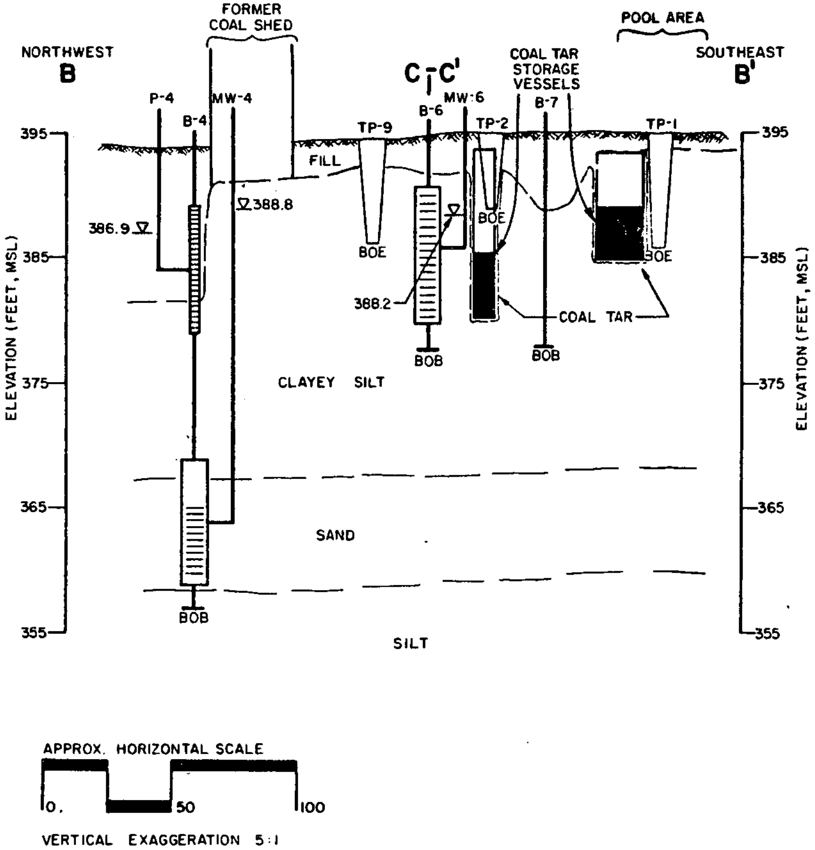
BOTTOM OF BORING

BOTTOM OF EXPLORATION

MATCHPOINT WITH GEOLOGIC PROFILE

NOTES: 1. SEE FIG. 7 FOR LOCATIONS AND ORIENTATION OF PROFILE.
2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.

E.C.JORDAN CO. CONSULTING ENGINEERS	INTERPRETIVE GEOLOGIC PROFILE A-A' ITHACA-COURT ST. SITE
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	JOB NO. 4816-02 FIGURE 8



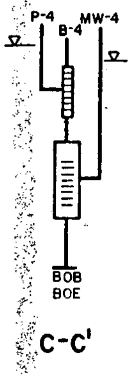
NOTES: 1. SEE FIG. 7 FOR LOCATIONS AND ORIENTATION OF PROFILE.

2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.

GEOLOGIC DESCRIPTIONS

FILL:	FILL MATERIAL COMPOSED PRIMARILY OF GRAVELS, SILTS AND SANDS, WITH OCCASIONAL BRICKS, COBBLES AND ASHEN MATERIAL.
CLAYEY SILT:	PRIMARILY MIXTURES OF CLAY AND SILT WITH OCCASIONAL FINE SAND AND ORGANIC DEPOSITS.
SAND:	PRIMARILY FINE TO MEDIUM SAND WITH SOME SILTY SAND AREAS AND OCCASIONAL ORGANIC DEPOSITS.
SILT:	PRIMARILY SILT WITH ABUNDANT 1-2 MM WHITE SHELLS AND ORGANIC DEPOSITS.

LEGEND



BORING, PIEZOMETER, AND MONITORING WELL LOCATION.

OBSERVED WATER LEVEL (FEET, MSL) ON MARCH 14, 1986

PIEZOMETER SCREEN

WELL SCREEN

SAND BACKFILL

BOTTOM OF BORING

BOTTOM OF EXPLORATION

MATCHPOINT WITH GEOLOGIC PROFILE

E.C.JORDAN CO.
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INTERPRETIVE GEOLOGIC PROFILE B-B'
ITHACA-COURT ST. SITE

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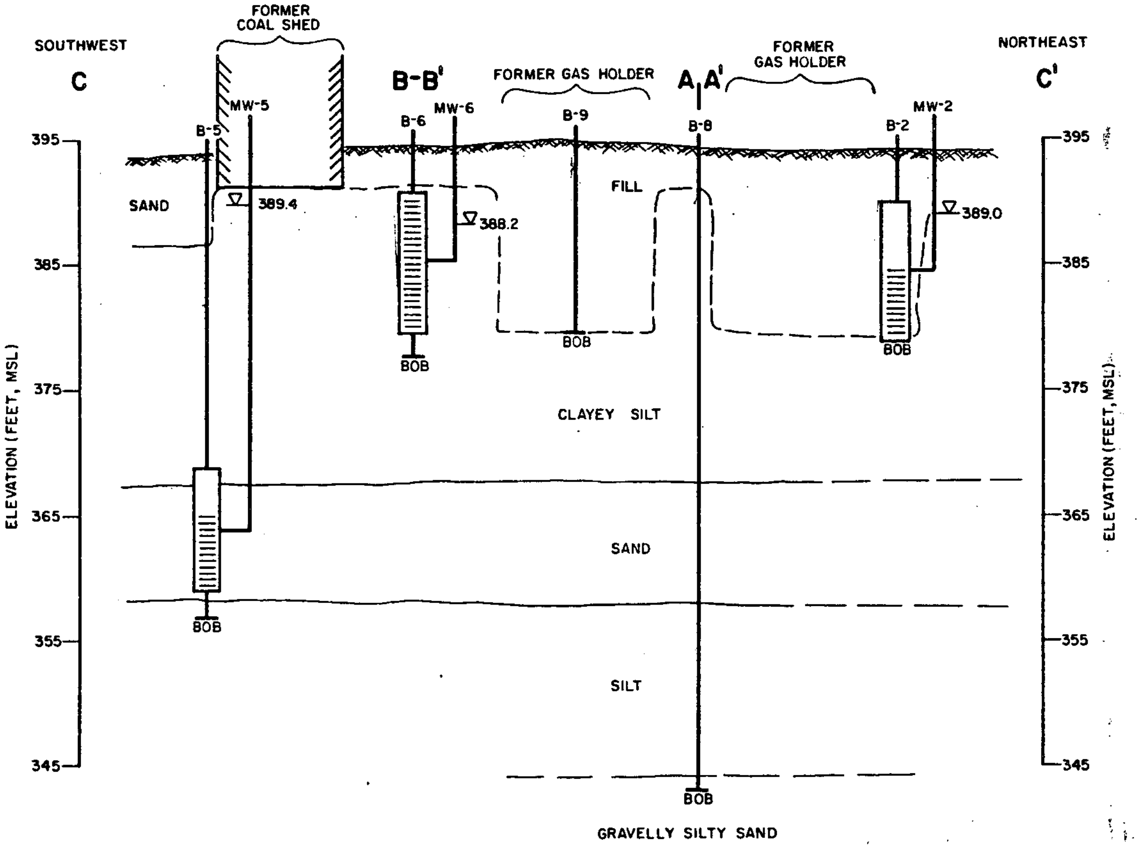
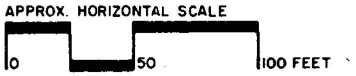
INVESTIGATION OF FORMER COAL GASIFICATION SITES

JOB NO. 4815-02 FIGURE 9





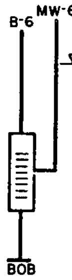
VERTICAL EXAGGERATION 5:1

NOTES: 1. SEE FIG. 7 FOR LOCATIONS AND ORIENTATION OF PROFILE.
2. PROFILES ARE BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.

GEOLOGIC DESCRIPTIONS

FILL:	FILL MATERIAL COMPOSED PRIMARILY OF GRAVELS, SILTS AND SANDS, WITH OCCASIONAL BRICKS, COBBLES AND ASHEN MATERIAL.
CLAYEY SILT:	PRIMARILY MIXTURES OF CLAY AND SILT WITH OCCASIONAL FINE SAND AND ORGANIC DEPOSITS.
SAND:	PRIMARILY FINE TO MEDIUM SAND WITH SOME SILTY SAND AREAS AND OCCASIONAL ORGANIC DEPOSITS.
SILT:	PRIMARILY SILT WITH ABUNDANT 1-2 MM WHITE SHELLS AND ORGANIC DEPOSITS.
GRAVELLY SILTY SAND:	FINE TO COARSE SAND WITH SILT AND FINE GRAVEL.

LEGEND



BORING, PIEZOMETER, AND MONITORING WELL LOCATION.

OBSERVED WATER LEVEL (FEET, MSL) ON MARCH 14, 1986

WELL SCREEN

SAND BACKFILL

BOTTOM OF BORING

B-B' MATCHPOINT WITH GEOLOGIC PROFILE

E.C.JORDAN CO. CONSULTING ENGINEERS	INTERPRETIVE GEOLOGIC PROFILE C-C' ITHACA-COURT ST. SITE
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES JOB NO. 4815-02 FIGURE 10

migration pathways since it is an aquitard. In the upper portions of the clayey silt stratum, vertical openings were observed. The openings may be related to former root growth or burrowing organisms. Although these channels appear to be laterally discontinuous and are limited to a few feet of vertical penetration, they may provide a preferential pathway for vertical groundwater movement.

- Sand: This stratum consists of grayish brown, fine to medium sand with some silt and traces of natural organic material. The sand was encountered in all of the deep borings at depths of 25 to 27 feet below ground surface and varied in thickness from 7 to 10 feet. The sand has a high hydraulic conductivity and is stratigraphically positioned between two silt strata of low permeability which act as barriers to groundwater flow.

- Silt: This stratum consists of brown silt containing occasional sand lenses, numerous white shells, and natural organic material. The silt was encountered at 35 to 40 feet below ground surface in the deep borings, and was approximately 13 feet thick. Due to the lake environment in which these soils were deposited areally, this stratum is anticipated to be laterally continuous beneath the site. This silt has a low hydraulic conductivity and therefore serves as an aquitard between the overlying sand and underlying gravelly silty sand strata.

- Gravelly Silty Sand: This stratum consists of fine to coarse sand with some silt and large (1" diameter) subrounded to subangular gravel. This stratum was penetrated in only one boring (B-8), at approximately 50 feet below ground surface. Available logs for deep explorations in the area show this stratum is approximately 20 feet thick. The gravelly silty sand is highly permeable and can yield significant quantities of groundwater. Records for existing wells located in this aquifer show yields ranging from 250 to 1,000 gallons per minute (gpm) (Crain, 1974).

The geology controls groundwater movement beneath the site. Groundwater flow occurs principally in the permeable fill, sand, and gravelly silty sand strata, which are separated by silt strata of low permeability. A detailed description of groundwater movement is presented in the following section.

3.2 HYDROGEOLOGY

The interpretation of hydrogeologic conditions at the Court Street site is based on the field permeability data and water level observations presented in Appendices A-5 and A-6.

Groundwater occurs in all soil strata on the site, creating saturated soil conditions year round. The only unsaturated soils on the site are within the upper fill soils. Based on the relative permeabilities of the soil strata investigated in this study, two groundwater flow systems and two aquitards exist above the deep gravelly sand aquifer. The two groundwater flow systems consist of: (1) a shallow, unconfined system in the permeable fill soils; and (2) an intermediate, semi-confined system in the permeable sands. The silt layers located between the fill and sand strata and below the sand stratum are interpreted to limit the hydraulic connection between these two flow systems.

The shallow and intermediate flow systems are described below in greater detail.

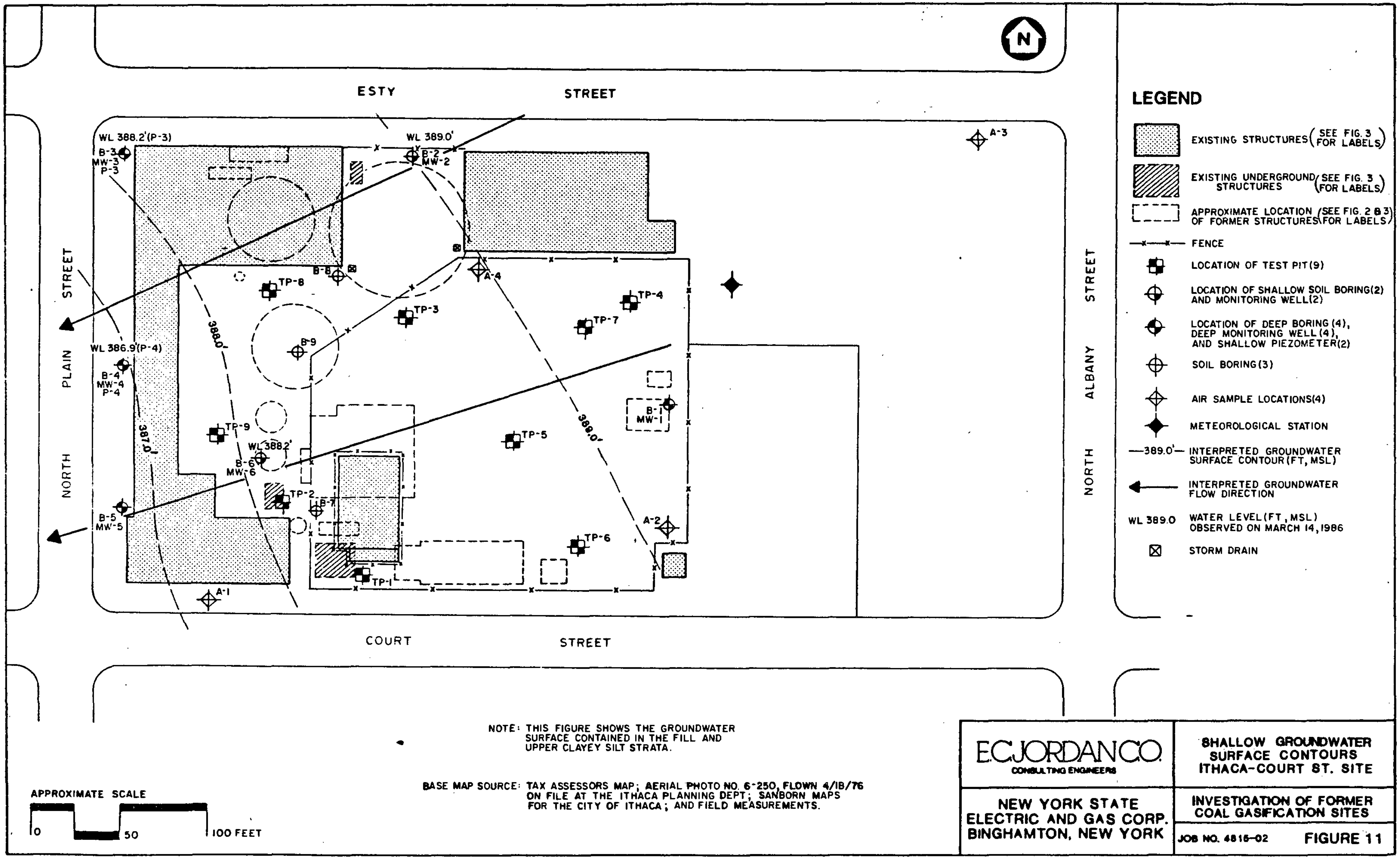
3.2.1 Shallow Groundwater System

The groundwater surface contour map for the shallow system is shown in Figure 11. The contours were interpreted using water levels observed on March 14, 1986 from wells MW-2 and MW-6 and piezometers P-3 and P-4. Water level data collected in January, April, and August result in a similar configuration of contours. The wells and piezometers monitor groundwater in the upper clayey silt and fill soils, at depths of 4 to 15 feet below the ground surface (See Figures 6 to 8).

Figure 11 shows the groundwater surface sloping from northeast to southwest across the site. The horizontal gradient of the groundwater surface is calculated to be 0.004 ft/ft. Because groundwater moves from areas of high elevation to areas of low elevation, the interpreted direction of flow in the shallow soil is to the west-southwest. Groundwater flow is horizontal through the fill soils. The interpreted flow direction is based on limited water level data in the western portion of the site. Groundwater in the north and east portions of the site is believed to follow a similar flow pattern. However, water level data at additional monitoring points are needed to support this interpretation.

The saturated thickness in the fill soils varies across the site. The thickest saturated zones occur where fill was placed in the excavations for the former gas holder foundations in the north-central portion of the site. The saturated thickness in these filled excavations is approximately 10 feet. Groundwater in the deeper fill soils is likely to be confined both vertically and laterally by the clayey silt layer. Outside of the pockets of deeper fill soils, the water table is below the fill. One exception occurs where the fill is 12.5 feet deep along the western property line (B-4) and the zone of saturation was estimated to be 5.5 feet thick. Groundwater movement occurs in the direction of increasing fill thickness likely following the surface of the clayey silt barrier. Additional monitoring wells are needed along the western site boundary to assess the potential for chemical transport in groundwater through the fill soils.

The saturated thickness and amount of movement in the fill soils is likely influenced by the asphalt paving and buildings over the entire site. The impervious cover prevents direct infiltration by precipitation. Therefore, for at least the last 30 years, precipitation has been collected as surface runoff and removed from the site. There are two storm drains located in the northern section of the site (see Figure 3). The storm drains are connected to the storm sewer system located along the north side of Court Street, which drains westward into Cayuga Inlet. While the fill soils may serve as a migration pathway, low infiltration rates over the past 30 years have likely restricted chemical mobility. Prior to paving, the rate of leaching and chemical transport in the fill soils may have been greater than they are now.



NOTE: THIS FIGURE SHOWS THE GROUNDWATER SURFACE CONTAINED IN THE FILL AND UPPER CLAYEY SILT STRATA.

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

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SHALLOW GROUNDWATER SURFACE CONTOURS ITHACA-COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

JOB NO. 4816-02

FIGURE 11

The results of permeability tests on the shallow wells and piezometers show the fill material to have a hydraulic conductivity of about 5×10^{-4} cm/sec or 1.4 ft/day, and the clayey silt to have a hydraulic conductivity of about 4×10^{-6} cm/sec or 0.01 ft/day. Groundwater velocity is a function of hydraulic conductivity, effective porosity, and the gradient. Estimating an effective porosity of 0.25 for the fill and 0.4 for the clayey silt, horizontal groundwater flow is calculated to be approximately 5 to 10 ft/yr within the fill and 0.05 to 0.15 ft/yr in the clayey silt. The horizontal gradient for both strata used in the calculation is 0.004 ft/ft.

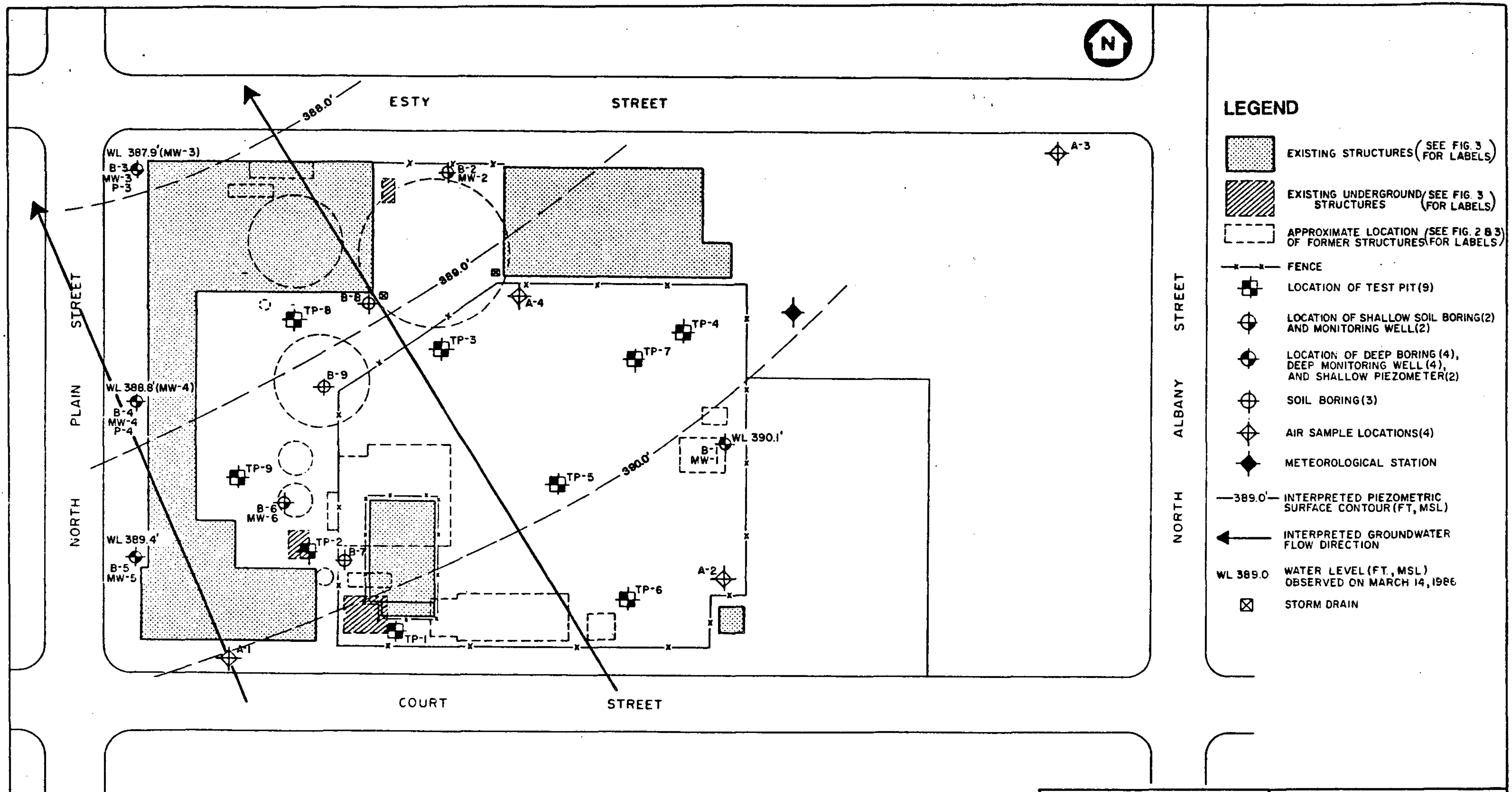
3.2.2 Intermediate Groundwater System

Figure 12 depicts the piezometric surface contours for the intermediate groundwater flow system in the sand stratum. The contours were interpreted using water levels observed on March 14, 1986 from wells MW-1, MW-3, MW-4, and MW-5. These wells monitor the sand stratum which lies between the two silt layers approximately 25 feet below the ground surface (Figures 8 to 10). The piezometric contours represent planes of equal head. Groundwater is interpreted to flow to the northwest generally perpendicular to the piezometric contours in the direction of decreasing head. The interpretation is weakest in the south-southeast portion of the site. The horizontal gradient of the piezometric surface contours is calculated to be 0.008 ft/ft.

The hydraulic conductivity of the sand stratum was determined from field tests to range between 6×10^{-4} and 1×10^{-3} cm/sec or 1.8 to 4.2 ft/day. The geometric mean hydraulic conductivity is calculated to be 1×10^{-3} cm/sec or 2.77 ft/day. Using an effective porosity of 0.3 for the sand and a gradient of 0.008 ft/ft, the corresponding horizontal groundwater flow rate within the sand is within the range of 25 to 45 ft/yr based on the geometric mean and maximum values for hydraulic conductivity.

Groundwater movement within the sand stratum is primarily horizontal. Multi-level water level data for the sand and fill strata provide an indication of the vertical seepage gradients across the clayey silt stratum. Water levels collected from MW-4 and P-4, which represent paired intermediate and shallow monitoring points, respectively, show upward seepage gradients in the range of 0.07 to 0.12 ft/ft. Using a hydraulic conductivity of 4×10^{-6} cm/sec for the silt, groundwater movement up into the clayey silt is calculated to range from 0.8 to 1.4 ft/yr. Water levels collected from MW-3 and P-3, the second pair of deep and shallow monitoring points, showed upward and downward seepage gradients. Downward seepage gradients may exist in the middle and eastern portions of the site, particularly in the area of the former gas holder foundations. Downward gradients would favor vertical movement of groundwater and site-derived chemicals where coal tar has been found in the shallow fill soils. Additional multi-level groundwater data are needed to assess the significance of chemical movement into the underlying sand stratum.

3.2.3 Groundwater Usage. The Cayuga Valley delta is comprised predominantly of laminated silt and clay deposits with moderately transmissible sand and gravel strata, as noted above. The principal sand and gravel aquifer is the Northern Cayuga Inlet Valley aquifer which is approximately 300 feet deep. Groundwater in this confined aquifer moves from the upper portions of the



APPROXIMATE SCALE
0 50 100 FEET

NOTE: THIS FIGURE SHOWS THE PIEZOMETRIC CONTOURS FOR GROUNDWATER IN THE SAND STRATUM (22 TO 36 FEET).

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT.; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

E.C. JORDAN CO.
CONSULTING ENGINEERS

GROUNDWATER
PIEZOMETRIC CONTOURS
ITHACA-COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 12

valley towards the lake, i.e., south to north. In the early 1900s, the potential for using this aquifer as a water supply source for the City of Ithaca was investigated. While Ithaca opted to use surface water as a supply source for the city, this aquifer (with potential well yields of 3 to 4 mgd) has potential for groundwater development (Crain, 1974 and 1975).

There is another significant sand and gravel deposit at a depth of between 50 and 100 feet below ground surface (see Section 3.1). This aquifer also has development potential (Crain, 1974). Jordan has identified two groundwater wells in the vicinity of the site utilizing this aquifer. These wells are located 0.25 miles northwest of the site, a position downgradient of the site with respect to regional groundwater flow. The wells are used for industrial purposes only (Andersson, 1985).

The only other well identified in the site vicinity is a shallow (5 to 6 feet deep) hand dug well. This well is 0.5 miles northwest of the site at the community gardens where it is used for watering vegetables.

Groundwater quality in Ithaca was investigated in the late 1960's as part of a comprehensive water supply study for Tompkins County (Metcalf & Eddy, 1968). Groundwater from the sand and gravel aquifers in Ithaca was tested for iron, manganese, chloride, sulfate, orthophosphate, and nitrate content. Alkalinity, hardness, total solids, dissolved solids, color, and turbidity were also measured. On the basis of these tests, the groundwater quality was judged to be good, meeting all standards then enforced by the U.S. Public Health Service for drinking water. More recent or more extensive data on groundwater quality in the Ithaca area are not currently available (Andersson, 1986).

3.3 PRELIMINARY LAND USE

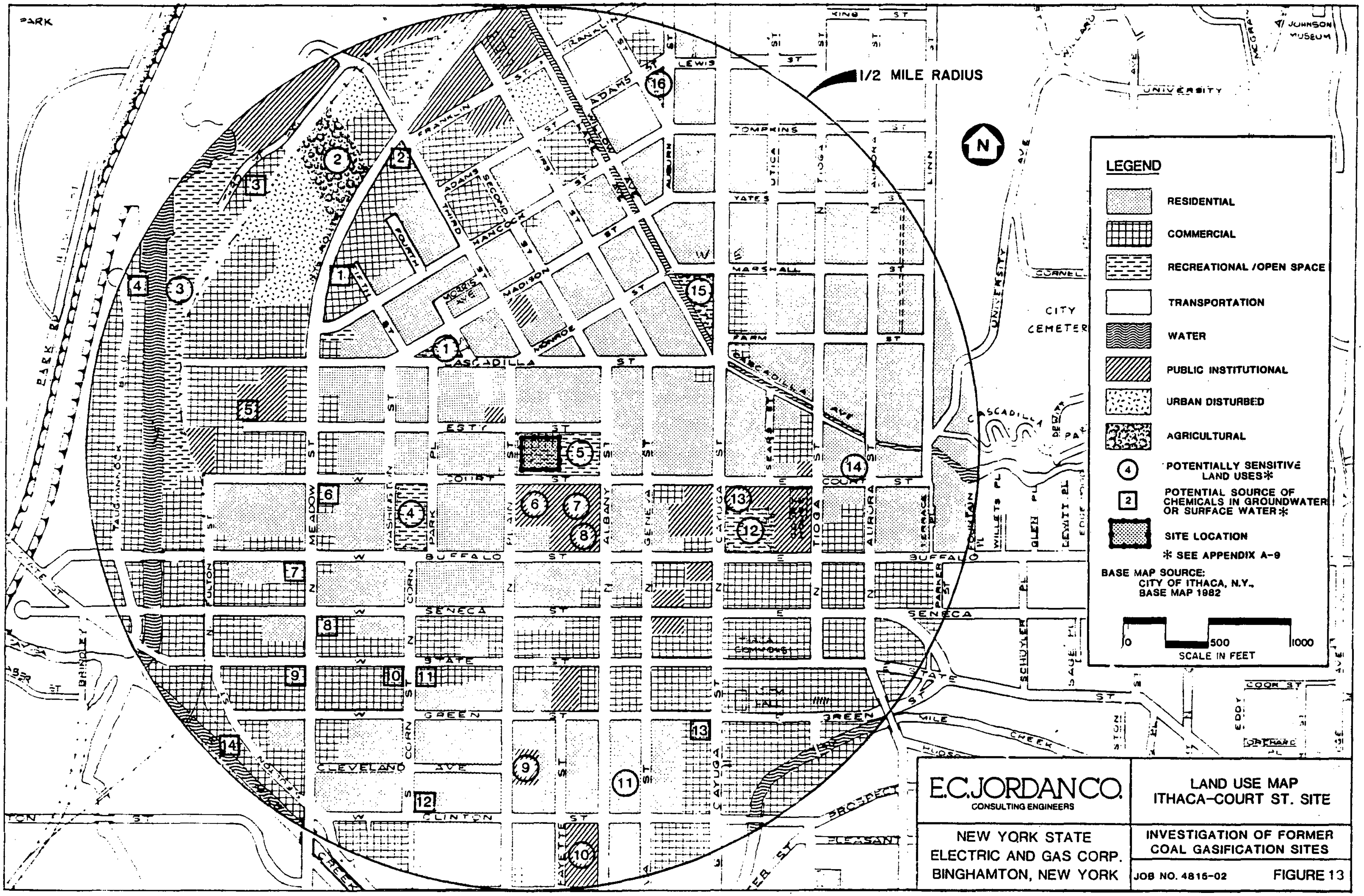
The history of land use at the Court Street site and its environs is described in detail in the Task 1 report (E.C. Jordan, 1986a). Present day land uses around the site are described here.

3.3.1 General Land Use

Figure 13 depicts land uses and cover types for the area within a one-half mile radius of the Court Street site. Land uses in the immediate vicinity of the Court Street site are predominantly residential. Housing consists mostly of single family homes on relatively small lots. Many of these homes have been converted into two or more apartments. Small commercial retail businesses and professional offices located in old homes are interspersed throughout the area.

The central business district of Ithaca is located to the southeast of the site. This area is characterized by retail, commercial, and professional office space, city and county municipal offices, and residential uses. The three major land uses are commercial, streets, and residential.

Commercial development becomes less dense to the west of the central business district (south of the site) with residential uses more common than commercial. Commercial uses in this area are concentrated along State Street.



E.C.JORDAN CO.
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LAND USE MAP
ITHACA–COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4816-02

FIGURE 13

To the southeast, west, and northwest of the site, land uses are primarily industrial and commercial with small pockets of residential uses. The industrial uses consist mostly of activities which support the construction trades such as suppliers of equipment and materials. The commercial areas along Cayuga Inlet are primarily related to recreational boating and include boat yards, docking facilities, marine equipment sales, and restaurants. Cornell University and Ithaca College both have boat houses and docking facilities along the inlet for their crew teams.

The area to the northeast of the site is dominated by residential uses and is an extension of the residential area that surrounds the site. The area is mostly single family homes interspersed with an occasional office, store, or church.

3.3.2 Potentially Sensitive Land Use

Human populations which are particularly sensitive to chemical exposure health risks include the very young, the very old, and the infirmed. Land uses which concentrate these populations are therefore of particular concern in assessing risks. Uses include day care centers, schools, recreation areas, nursing homes, hospitals, and elderly housing projects. Other sensitive land uses include agricultural land used for producing food for human consumption, waterways used for drinking water, recreation, and fishing; and wildlife habitats such as wetlands. The potentially sensitive land uses surrounding the site are located by number on Figure 13 and identified in Appendix A-9.

3.3.3 Potential Sources of Chemicals in Groundwater and Surface Water

Potential sources of chemicals in groundwater and surface water within one-half mile of the site are identified as those land uses which have (or had) either above or below ground tanks for the storage of petroleum or other products. Also included are vehicle maintenance yards and boat yards due to the probable use of solvents and other organic compounds at these locations. A scrap metal pile was also identified because of the potential for leaching of metals and organics. The potential sources of chemicals in groundwater and surface water within one-half mile of the Court St. site are located by number on Figure 13 and listed in Appendix A-9.

3.4 DISTRIBUTION OF CHEMICALS

Laboratory chemical analyses were performed by ERCO, a division of ENSECO, Inc., of Cambridge, MA, on coal tar, soil, groundwater, and air samples collected during Task 2. The analytical parameters and methods are listed in Appendix B-1.

Organic analyses of soil, groundwater, and air samples were performed using high performance liquid chromatography (HPLC) with an ultraviolet (UV) detector. Methods using HPLC were selected to provide a general characterization of the media sampled. It is specified in the HPLC methods for PAHs (Methods 610 and 8310) that suspected positives have to be confirmed using an alternate method. The coal tar samples and several replicate soil and groundwater samples were analyzed using gas chromatography (GC) and a mass spectrometer (MS) detector. The GC/MS method is more specific in identification of organic compounds as well as more accurate in quantitation. Typically, non-specific detectors such as the UV detector tend to produce results with a high bias relative to the MS.

Analytical results are presented by media below. Minimum detection limits appear in Appendix B-1.

3.4.1 Coal Tar

Three coal tar storage vessel samples were analyzed for volatile organics, semivolatile organics, metals, total organic halides, and ignitability. Two of the samples were of the coal tar in the bottom of each of the two abandoned vessels and the third was of the water on top of the coal tar in Vessel B. The results of the analyses are presented in Tables 1 and 2.

The volatile and semivolatile organic constituents of the coal tar in the Court St. vessels, as detected by GC/MS analysis, are shown in Table 1. The two coal tar samples were qualitatively comparable, but quantitatively, the sample from Vessel B contained a higher percentage of semivolatiles than the sample from Vessel A (33% and 15%, respectively). Volatile organics were found in the aqueous sample from Vessel B (benzene, toluene, styrene, and xylenes), but no semivolatiles were detected above the detection limit (1.6 mg/ℓ) except for phenol and 2,4-dimethylphenol. However, it should be noted that the detection limit was higher than the solubility of most of the PAHs in water at 25°C (see Appendix B-2). The higher detection limit was the result of sample dilution controlled by the phenols present.

Analytical results for inorganic compounds and other parameters are shown in Table 2. The coal tar samples contained selected metals leached by the extraction procedure (EP) at concentrations below the EPA limit for these metals. The results of the total organic halides (TOX) test, expressed as mg/kg of chlorine, are 830 and 870 for the tar samples from vessels A and B respectively. The presence of organic halides would not be expected in pure coal tar samples, and chlorinated organic compounds were not detected by GC/MS analysis of the samples. Inorganic chlorides, if present in sufficient quantities, can interfere with the TOX test, giving a false positive result (APHA, 1985). Possible sources of inorganic chlorides in the area of the coal tar storage vessels are road salt and swimming pool disinfectants. The ignitability test results for the coal tar samples show that both samples ignited at temperatures below the EPA limit of 140°F.

3.4.2 Soil

Nine test pit samples and ten boring samples were analyzed for volatile organics, semivolatile organics, selected metals, and cyanide. Sample depths ranged from 2 to 9 feet for the test pits and 2 to 37 feet for the borings. The analytical results are shown in Tables 3 and 4 and are expressed in terms of mg/kg.

TABLE 1

ORGANIC COMPOUNDS IN COAL TAR STORAGE VESSELS
ITHACA-COURT STREET SITE

	Coal Tar Samples		Aqueous Sample
	Vessel A[1]	Vessel B[2]	Vessel B
Volatile Organics	(mg/kg)	(mg/kg)	(mg/ℓ)
Minimum Detection Limit (MDL)	(10)	(48)	(0.002)
Volatile Aromatics			
Benzene	1,900	1,800	80.0
Toluene	2,200	2,600	33.0
Ethylbenzene	120	140	ND[3]
Total Xylene	2,200	1,900	5.6
Styrene	910	1,100	4.2
Total Volatiles	7,330	7,540	122.8
Semivolatile Organics			
Minimum Detection Limit (MDL)	(1,500)	(2,800)	(1.6)
PAH			
Acenaphthene	T[4]	T	ND
Acenaphthylene	10,000	33,000	T
Anthracene	7,800	16,000	ND
Benzo(a)anthracene	4,200	5,600	ND
Benzo(a)pyrene	4,000	5,200	ND
Benzo(g,h,i)perylene	T	T	ND
Benzo(k)fluoranthene) Benzo(b)fluoranthene) coeluted	5,200	4,900	ND
Chrysene	4,300	6,300	ND
Dibenzo(a,h)anthracene	T	T	ND
Fluoranthene	12,000	16,000	ND
Fluorene	5,400	15,000	ND
Indeno(1,2,3-cd)pyrene	T	T	ND
Naphthalene	55,000	180,000	ND
Phenanthrene	24,000	40,000	ND
Pyrene	12,000	10,000	ND
Other			
Phenol	2,700	T	48.0
2,4-Dimethylphenol	ND	ND	2.6
2,4-Dichlorophenol	T	ND	ND
Total Semivolatiles	146,600	332,000	50.6

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[1] Vessel A is located adjacent to Markles Flats.
[2] Vessel B is located next to the swimming pool.
[3] ND = Not Detected
[4] T = Detected in trace concentrations at or below the MDL.

TABLE 2
METALS, TOTAL ORGANIC HALIDES, AND IGNITABILITY RESULTS FOR COAL TAR STORAGE VESSEL SAMPLES
ITHACA-COURT STREET SITE

	Coal Tar Samples		Aqueous Sample
	Vessel A[1]	Vessel B[2]	Vessel B
EP Toxicity Metals[3]	(mg/ℓ)	(mg/ℓ)	(mg/ℓ)
Ag	ND	ND	0.0033
As	0.39[4]	2.1[4]	0.014
Ba	ND	ND	0.140
Cd	ND	ND	ND
Cr	ND	ND	0.015
Hg	ND	ND	0.0002
Pb	ND	3.7[4]	0.028
Se	ND	ND	ND
Other Metals			
Cu	ND	ND	0.023
Ni	ND	ND	0.011
Ti	1.7	1.8	ND
Zn	0.31	1.4	0.065
Total Organic Halides	(mg/kg)	(mg/kg)	(mg/ℓ)
TOX, as Chlorine	830	870	0.39
Ignitability	(°F)	(°F)	
Flash Point	99	81	NA[2]

---

[1] ND = Not Detected

[2] NA = Not Analyzed

[3] Metals in coal tar samples were analyzed following extraction procedure (EP).

[4] The EP toxicity limit for As and Pb is 5 mg/ℓ.

3.4.2.1 Organics. Volatile organics were present in all test pit samples except for sample TP-3/S-1 and sample TP-7/S-1. The total concentrations for volatile organic compounds ranged from 0.068 mg/kg in sample TP-3/S-2 (GC/MS) to 3,695 mg/kg in TP-8/S-1. The latter sample, which was collected from the top of a buried metal tank located between two former gas holders, contained what appeared to be pure coal tar. A 1946 plan of the site also shows a gasoline pump at this location and gasoline constituents may also be contributing to the volatile aromatics concentration.

Semivolatile compounds were detected in all test pit samples with the exception of TP-7/S-1. The range of detected values was narrower for total semivolatiles than for total volatiles: 54.6 mg/kg (TP-3/S-2 GC/MS) to 2,012 mg/kg (TP-2/S-1 Dup).

Volatile organic compounds were present in soils from borings B-2 through B-4 and B-6 through B-9, and absent from B-1 (the upgradient boring) and B-5. Samples from borings B-3 and B-4 contained only low levels of toluene and B-2 had low concentrations of both toluene and trimethylbenzene. The remaining boring samples (B-6 to B-9) were found to contain several, and in some cases all, of the coal tar-related volatile organic compounds in concentrations ranging from 2 mg/kg (B-6/S-1) to 65 mg/kg (B-7/S-2).

Semivolatile organic compounds were detected in samples from borings B-2, B-6, B-7, and B-9. The sum of all semivolatiles detected at these locations ranged from 51.4 mg/kg at B-6 to 3,827 mg/kg at B-9.

GC/MS confirmatory analyses were performed on three of the test pit samples: TP-1/S-1, TP-2/S-1, and TP-3/S-2. As shown in Table 3, the HPLC and GC/MS analyses of these samples were comparable with regard to the total volatile concentrations detected. For semivolatiles, differences were evident in the specific compounds detected and in the concentrations of detected compounds. In general, more PAHs were detected with GC/MS but at lower concentrations than were detected with HPLC.

Duplicate test pit samples were collected at two locations. The results of the duplicate analyses of samples TP-2/S-1 and TP-3/S-1 were comparable for volatile organics but dissimilar for semivolatile compounds. Some differences may be attributable to the inherent heterogeneity of soils; however, others are related to the non-specificity of the UV detector utilized with the HPLC method.

The volatile and semivolatile compounds detected in the test pit and boring samples matched those found in the pure coal tar samples except at TP-3. Sample TP-3/S-2 contained acetone, methylene chloride, and tetrachloroethene. The source of these compounds is not known but because of their isolated occurrence and small quantities, laboratory contamination is suspected.

3.4.2.2 Other Chemicals. The concentrations of iron, lead, and zinc found in the test pit samples are similar among samples except for TP-8, which has an elevated concentration of iron (170,000 mg/kg). All concentrations of these metals are within the ranges reported by Lindsay (1979) for native soils. Ferro-ferricyanide concentrations were determined by subtracting amenable

TABLE 3
CHEMICALS FOUND IN TEST PIT SAMPLES
ITHACA-COURT STREET SITE
JANUARY AND MAY, 1986

SAMPLE IDENTIFIER	TP-1/S-1	TP-1/S-1 GC/MS(1)	TP-2/S-1	TP-2/S-1 DUP	TP-2/S-1 GC/MS	TP-3/S-1	TP-3/S-1 DUP	TP-3/S-2	TP-3/S-2 GC/MS	TP-7/S-1	TP-8/S-1	TP-9/S-2
SAMPLE DEPTH (FT)	9.0	9.0	6.0	6.0	6.0	2.0	2.0	7.0	7.0	7.0	3.0	8.0
VOLATILE ORGANICS (MG/KG)												
-VOLATILE AROMATICS-												
BENZENE	ND (2)	ND	3.400	1.600	1.300	ND	ND	ND	ND	ND	730.0	1.100
TOLUENE	ND	ND	6.900	1.500	4.100	ND	ND	ND	0.013	ND	1100.0	0.700
ETHYLBENZENE	0.140	0.190	14.000	4.300	7.800	ND	ND	0.059	0.026	ND	200.0	2.900
STYRENE	ND	ND	0.960	ND	(4)	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENE	-- (3)	0.024	--	--	15.000	--	--	--	0.029	--	--	--
m - XYLENE	ND	--	8.300	2.100	--	ND	ND	ND	--	ND	560.0	ND
o - XYLENE	0.041	--	14.000	5.700	--	ND	ND	0.010	--	ND	620.0	ND
p - XYLENE	ND	--	9.500	2.700	--	ND	ND	ND	--	ND	460.0	1.700
TRIMETHYLBENZENE	0.024	--	9.500	6.300	--	ND	ND	ND	--	ND	ND	ND
N-PROPYLBENZENE	ND	--	ND	ND	--	ND	ND	0.025	--	ND	25.0	ND
-OTHER-												
ACETONE	--	ND	--	--	ND	--	--	--	0.100	--	--	--
METHYLENE CHLORIDE	--	ND	--	--	ND	--	--	--	0.022	--	--	--
TETRACHLOROETHENE	--	ND	--	--	ND	--	--	--	0.016	--	--	--
TOTAL VOLATILE AROMATICS	0.205	0.214	66.560	24.200	28.200	ND	ND	0.094	0.068	ND	3695.0	6.400
SEMIVOLATILE ORGANICS (MG/KG)												
-PAH-												
ACENAPHTHENE	ND	110.000	90.000	300.000	99.000	ND	14.000	37.000	(4)	ND	58.000	39.000
ACENAPHTHYLENE	ND	31.000	130.000	210.000	270.000	ND	(6)	(6)	(4)	ND	(6)	(6)
ANTHRACENE	48.000	76.000	62.000	69.000	70.000	ND	13.000	17.000	(4)	ND	70.000	39.000
BENZO(b)FLUORANTHENE	ND	(4,5)	30.000 (5)	51.000	44.000 (5)	ND	ND	ND	(4,5)	ND	20.000	ND
BENZO(k)FLUORANTHENE	ND	(4,5)	(5)	38.000	(5)	ND	ND	ND	(4,5)	ND	22.000	ND
BENZO(g,h,i)PERYLENE	19.000	(4)	(4)	15.000	14.000	ND	24.000	ND	(4)	ND	20.000	ND
BENZO(a)ANTHRACENE	ND	30.000	ND	ND	42.000	ND	(7)	(7)	(4)	ND	(7)	(7)
BENZO(a)PYRENE	(4)	(4)	31.000	270.000	32.000	ND	27.000	ND	(4)	ND	36.000	19.000
CHRYSENE	88.000	26.000	93.000	86.000	29.000	ND	19.000 (7)	8.700 (7)	(4)	ND	91.000 (7)	19.000 (7)
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	6.900	ND	ND	ND	ND	ND	ND	23.000
FLUORANTHENE	300.000	67.000	240.000	340.000	100.000	48.000	30.000	15.000	(4)	ND	99.000	180.000
FLUORENE	45.000	100.000	74.000	84.000	74.000	ND	45.000	42.000	(4)	ND	53.000	12.000
INDENO(1,2,3,-cd)PYRENE	ND	(4)	(4)	25.000	15.000	ND	24.000	ND	(4)	ND	16.000	ND
NAPHTHALENE	29.000	(4)	130.000	130.000	290.000	ND	49.000 (6)	11.000 (6)	ND	ND	160.000 (6)	12.000
PHENANTHRENE	78.000	210.000	89.000	94.000	170.000	ND	48.000	28.000	13.000	ND	86.000	47.000
PYRENE	200.000	87.000	200.000	300.000	88.000	88.000	25.000	22.000	(4)	ND	84.000	57.000
-OTHER-												
2-4 DIMETNYLPHENOL	--	ND	--	--	ND	--	--	--	ND	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	ND	--	--	ND	--	--	--	ND	--	--	--
TOTAL PAH	807.000	737.000	1169.000	2012.000	1343.900	136.000	318.000	180.700	13.000	ND	815.000	447.000
OTHER CHEMICALS (MG/KG)												
-METALS-												
IRON	18800		13800	18000		11000	10000	25000		15000	170000	22000
LEAD	ND		40	35		--	--	--		--	--	--
ZINC	74		65	97		83	47	80		78	67	66
-CYANIDE-												
TOTAL CYANIDE	2.7		12	28		95	36	6.8		0.75	140	0.61
AMENABLE CYANIDE	2.7		ND	13		1.7	0.8	2.1		ND	ND	2.3
FERRO-FERRI CYANIDE	ND		12	15		93.3	35.2	4.7		0.75	140	ND
-OTHER-												
TOTAL RECOVERABLE PHENOLICS	0.28		2.5	1.3		2.7	2.6	ND		ND	8.8	ND
TOTAL ORGANIC CARBON	1900		34000	17000		59000	41000	9100		14000	380000	6300

NOTES:
(1) INDICATES SAMPLE WAS ANALYZED BY GC/MS(EPA METHODS 8240 AND 8270). ALL OTHER SAMPLES ANALYZED BY HPLC (EPA METHODS 8020 AND 8310).
(2) ND = NOT DETECTED (SEE APPENDIX B-1 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.
(5) BENZO(b)FLUORANTHENE AND BENZO(k)FLUORANTHENE, COELUTED.
(6) ACENAPHTHYLENE AND NAPHTHALENE, COELUTED.
(7) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.

TABLE 4
CHEMICALS FOUND IN SOIL BORING SAMPLES
ITHACA-COURT STREET SITE
JANUARY 1986

SAMPLE IDENTIFIER	B-1/S-2	B-2/S-1	B-3/S-2	B-4/S-2	B-5/S-1	B-6/S-1	B-7/S-2	B-8/S-1	B-9/S-1	B-9/S-2
SAMPLE DEPTH (FT)	30.0-32.0	5.0-9.0	10.0-12.0	35.0-37.0	30.0-32.0	5.0-9.0	10.0-14.0	5.0-7.0	2.0-4.0	10.0-14.0
VOLATILE ORGANICS (MG/KG)										
-VOLATILE AROMATICS-										
BENZENE	ND (1)	ND	ND	ND	ND	ND	3.600	ND	ND	7.500
TOLUENE	ND	0.083	0.014	0.072	ND	ND	3.700	0.260	0.270	9.200
ETHYLBENZENE	ND	ND	ND	ND	ND	1.000	25.000	2.600	0.530	3.500
STYRENE	ND	ND	ND	ND	ND	ND	1.200	ND	0.850	4.800
TOTAL XYLENE	-- (2)	--	--	--	--	--	--	--	--	--
m - XYLENE	ND	ND	ND	ND	ND	ND	6.300	0.260	1.200	4.200
o - XYLENE	ND	ND	ND	ND	ND	0.420	11.000	0.820	1.800	4.800
p - XYLENE	ND	ND	ND	ND	ND	ND	8.000	0.650	0.730	3.500
TRIMETHYLBENZENE	ND	0.041	ND	ND	ND	0.610	4.800	0.440	6.700	12.000
N-PROPYLBENZENE	ND	ND	ND	ND	ND	ND	1.200	ND	ND	ND
-OTHER-										
ACETONE	--	--	--	--	--	--	--	--	--	--
METHYLENE CHLORIDE	--	--	--	--	--	--	--	--	--	--
TETRACHLOROETHENE	--	--	--	--	--	--	--	--	--	--
TOTAL VOLATILE AROMATICS	ND	0.124	0.014	0.072	ND	2.030	64.800	5.030	12.080	49.500
SEMIVOLATILE ORGANICS (MG/KG)										
-PAH-										
ACENAPHTHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	160.000
ACENAPHTHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	1100.000	480.000
ANTHRACENE	ND	7.200	ND	ND	ND	2.900	ND	ND	110.000	100.000
BENZO(b)FLUORANTHENE	ND	ND	ND	ND	ND	5.300 (3)	22.000 (3)	ND	190.000 (3)	69.000
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	(3)	(3)	ND	(3)	30.000
BENZO(g,h,i)PERYLENE	ND	ND	ND	ND	ND	2.300	ND	ND	39.000	(4)
BENZO(a)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	ND	(4)	ND	ND	ND	3.200	(4)	ND	53.000	48.000
CHRYSENE	ND	12.000	ND	ND	ND	6.300	42.000	ND	170.000	150.000
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	ND	34.000	ND	ND	ND	5.800	ND	ND	430.000	460.000
FLUORENE	ND	7.600	ND	ND	ND	4.500	ND	ND	98.000	120.000
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	ND	ND	4.900	ND	ND	47.000	(4)
NAPHTHALENE	ND	ND	ND	ND	ND	ND	78.000	ND	950.000	270.000
PHENANTHRENE	ND	11.000	ND	ND	ND	6.800	150.000	ND	220.000	160.000
PYRENE	ND	31.000	ND	ND	ND	9.400	ND	ND	420.000	420.000
-OTHER-										
2-4 DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--	--
TOTAL PAH	ND	102.800	ND	ND	ND	51.400	292.000	ND	3827.000	2467.000
OTHER CHEMICALS (MG/KG)										
-METALS-										
IRON	9300	15400	32200	10600	7010	18600	21200	17400	3870	6820
LEAD	ND	26	ND	ND	25	25	ND	ND	46	58
ZINC	36	70	68	46	31	61	73	67	23	35
-CYANIDE-										
TOTAL CYANIDE	ND	1.8	0.72	ND	ND	3.3	ND	26	72	36
AMENABLE CYANIDE	ND	1.6	0.50	ND	ND	3.3	ND	26	2.2	ND
FERRO-FERRI CYANIDE	ND	0.2	0.22	ND	ND	ND	ND	ND	69.8	36
-OTHER-										
TOTAL RECOVERABLE PHENOLICS	ND	0.24	ND	ND	ND	0.69	1.3	0.84	1.3	3.4
TOTAL ORGANIC CARBON	9500	5900	3400	26000	11000	5800	9500	16000	47000	60000

NOTES:
(1) ND = NOT DETECTED (SEE APPENDIX B-1 FOR MINIMUM DETECTION LIMITS).
(2) -- = NOT ANALYZED
(3) BENZO(b)FLUORANTHENE AND BENZO(k)FLUORANTHENE, COELUTED.
(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.

cyanide from total cyanide values (APHA, 1985). The ferro-ferricyanide concentrations were higher at TP-3 and TP-8 than at the other test pit locations. Total organic carbon concentrations ranged from 1,900 mg/kg at TP-1 to 380,000 mg/kg at TP-8. Duplicate analyses results were fairly consistent for soil samples at both TP-2 and TP-3.

The boring sample results were consistent with test pit samples for all of the inorganic constituents with a few exceptions. Iron concentrations were lower at B-9 than at the other soil sampling locations. Sample B-9/S-1 contained the highest boring concentration of ferro-ferricyanide (69.8 mg/kg) but higher levels were found in TP-3 and TP-8. Total organic carbon (TOC) concentrations ranged from 3,400 mg/kg at B-3 to 60,000 mg/kg at B-9.

A comparison of the TOC results to the sum of volatile and semivolatile organic compounds for both test pit and boring samples shows TOC to consistently be the higher of the two. Because TOC measures all organic compounds, it is not a good indicator of coal-tar related organics in soil.

3.4.3 Groundwater

Groundwater samples were collected from each of the six monitoring wells at Court St. on three separate occasions (February, April, and August 1986). Monitoring well sampling procedures are described in Appendix A-7. These samples plus blanks and duplicates were analyzed for volatile organics, semivolatile organics, and selected inorganic parameters. The results of the groundwater analyses are presented in Table 5, Appendix B-1 (Detection Limits) and Appendix B-3 (Quality Assurance Samples), and are expressed in terms of mg/ℓ.

3.4.3.1 Organics. Analytical results for volatile organic compounds were fairly consistent for all three rounds of groundwater sampling. Volatiles were not detected in well MW-1 (the upgradient well) or wells MW-3, MW-4, and MW-5 (the downgradient and perimeter wells) during rounds 1 and 2. On round 3 (August 1986), a very low concentration of toluene (0.0038 mg/ℓ) was detected in MW-1, acetone was detected in the samples from MW-3 (0.23 mg/ℓ), MW-4 was again free of volatiles, and MW-5 contained low concentrations of benzene, toluene, and xylenes. Volatile compounds were found in wells MW-2 and MW-6 on all three sampling rounds. The concentration of total volatile aromatics ranged from 0.058 to 0.3 mg/ℓ at MW-2 and 2.8 to 11.4 mg/ℓ at MW-6.

Semivolatile organic concentrations showed a similar pattern. Wells MW-1, MW-3, MW-4, and MW-5 contained no detectable semivolatile compounds on any sampling round with one exception. Fluoranthene and naphthalene were found in the round 2 sample from MW-3 (0.16 mg/ℓ and 0.28 mg/ℓ, respectively). These chemicals were not detected in MW-3 on round 3 by either HPLC or GC/MS analysis. Wells MW-2 and MW-6 were found to contain semivolatile compounds on all three sampling rounds, with total PAH concentrations ranging from 4.1 to 121.7 mg/ℓ at MW-2 and 0.55 to 26.6 mg/ℓ at MW-6.

GC/MS confirmatory analyses were performed on two groundwater samples from each sampling round. As with the soil samples, the HPLC and GC/MS analyses were comparable for the volatile organic compounds. Significant differences were

TABLE 5
CHEMICALS FOUND IN GROUNDWATER SAMPLES
ITHACA-COURT STREET SITE

SHEET 1 OF 2

WELL IDENTIFIER	MW-1				MW-2						MW-3				
SAMPLE IDENTIFIER	MW-101	MW-201	MW-201 GC/MS(1)	MW-301	MW-102	MW-102 GC/MS	MW-202	MW-202 DUP	MW-302	MW-302 GC/MS	MW-103	MW-103 DUP	MW-203	MW-303	MW-303 GC/MS
DATE OF SAMPLE COLLECTION	2/4/86	4/17/86	4/17/86	8/4/86	2/4/86	2/4/86	4/17/86	4/17/86	8/4/86	8/4/86	2/4/86	2/4/86	4/17/86	8/4/86	8/4/86
VOLATILE ORGANICS (MG/L)															
-VOLATILE AROMATICS-															
BENZENE	ND (2)	ND	ND	ND	ND	ND	0.012	0.013	0.017	0.012	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	0.004	ND	ND	0.006	ND	0.033	0.023	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	0.027	0.043	0.079	0.062	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENE	-- (3)	--	ND	--	--	0.058	--	--	--	0.047	--	--	--	--	ND
m - XYLENE	ND	ND	--	ND	0.050	--	ND	ND	0.011	--	ND	ND	ND	ND	--
o - XYLENE	ND	ND	--	ND	ND	--	0.036	0.035	0.047	--	ND	ND	ND	ND	--
p - XYLENE	ND	ND	--	ND	ND	--	0.007	0.006	0.015	--	ND	ND	ND	ND	--
TRIMETHYLBENZENE	ND	ND	--	ND	0.140	--	0.095	0.089	0.100	--	ND	ND	ND	ND	--
-OTHER-															
ACETONE	--	--	0.880	--	--	2.100	--	--	--	0.410	--	--	--	--	0.230
TOTAL VOLATILE AROMATICS	ND	ND	ND	0.004	0.190	0.058	0.183	0.186	0.302	0.144	ND	ND	ND	ND	ND
SEMIVOLATILE ORGANICS (MG/L)															
-PAH-															
ACENAPHTHENE	ND	ND	ND	ND	2.100	0.370	17.000	ND	ND	2.300	ND	ND	ND	ND	ND
ACENAPHTHYLENE	ND	ND	ND	ND	1.700	0.250	7.700	ND	(5)	0.690	ND	ND	ND	ND	ND
ANTHRACENE	ND	ND	ND	ND	ND	(4)	6.000	ND	8.200	1.200	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	ND	ND	ND	ND	ND	ND	3.400	ND	ND	(4)	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	ND	3.000	ND	ND	(4)	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.200	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	ND	ND	ND	ND	ND	ND	(6)	ND	(6)	0.760	ND	ND	ND	ND	ND
BENZO(a)PYRENE	ND	ND	ND	ND	ND	ND	2.600	ND	ND	0.490	ND	ND	ND	ND	ND
CHRYSENE	ND	ND	ND	ND	ND	ND	6.400	ND	1.300	0.720	ND	ND	ND	ND	ND
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	(4)	ND	ND	ND	ND	ND
FLUORANTHENE	ND	ND	ND	ND	ND	ND	14.000	ND	14.000	0.870	ND	ND	0.160	ND	ND
FLUORENE	ND	ND	ND	ND	0.250	0.150	25.000	ND	19.000	1.200	ND	ND	ND	ND	ND
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	ND	ND	ND	1.400	ND	ND	0.160	ND	ND	ND	ND	ND
NAPHTHALENE	ND	ND	ND	ND	2.000	3.200	6.200	ND	18.000	0.360	ND	ND	0.280	ND	ND
PHENANTHRENE	ND	ND	ND	ND	ND	0.130	11.000	ND	14.000	3.300	ND	ND	ND	ND	ND
PYRENE	ND	ND	ND	ND	ND	(4)	18.000	ND	17.000	2.800	ND	ND	ND	ND	ND
-OTHER-															
2-4 DIMETHYLPHENOL	--	--	ND	--	--	ND	--	--	--	ND	--	--	--	--	ND
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	(4)	--	--	ND	--	--	--	ND	--	--	--	--	(4)
PHENOL	--	--	(4)	--	--	ND	--	--	--	ND	--	--	--	--	ND
TOTAL PAH	ND	ND	ND	ND	6.050	4.100	121.700	ND	91.500	15.050	ND	ND	0.440	ND	ND
OTHER CHEMICALS (MG/L)															
-METALS-															
IRON	0.15	0.29		0.18	1.1		1.8	1.8	1.6		0.10	ND	0.40	0.50	
LEAD	--	ND		--	--		ND	ND	--		--	--	ND	--	
ZINC	ND	ND		ND	ND		ND	ND	0.011		ND	ND	ND	ND	
-CYANIDE-															
TOTAL CYANIDE	ND	ND		ND	0.10		0.11	0.11	0.14		0.014	0.018	0.012	0.019	
AMENABLE CYANIDE	ND	ND		ND	0.014		0.032	0.016	0.060		ND	ND	ND	ND	
FERRO-FERRI CYANIDE	ND	ND		ND	0.086		0.078	0.094	0.080		0.014	0.018	0.012	0.019	
-OTHER-															
TOTAL RECOVERABLE PHENOLICS	ND	0.28		ND	ND		0.14	0.30	ND		ND	ND	0.31	ND	
TOTAL ORGANIC CARBON	3.5	ND		2.33	18		19	7.0	6.66		11	4.3	4.3	0.88	
TOTAL NEW YORK STATE REGULATED ORGANICS (8)	ND	0.280	(4)	0.004	4.540	3.908	114.323	0.486	91.802	14.304	ND	ND	0.750	ND	ND
FIELD MEASUREMENTS															
pH (9)	7.6	7.8		8.0	7.3		7.0		7.5		7.6		7.6	7.9	
CONDUCTIVITY (10)	806.0	620.0		788.0	1370.0		1445.0		1405.0		860.0		761.0	897.0	
TEMPERATURE (11)	9.5	10.9		12.8	9.3		10.5		19.6		11.9		14.0	15.5	

NOTES:

(1) INDICATES SAMPLE VALUES WERE OBTAINED BY GC/MS(EPA METHODS 624 AND 625). ALL OTHER VALUES OBTAINED BY HPLC (EPA METHODS 602 AND 610).

(2) ND = NOT DETECTED (SEE APPENDIX B-1 FOR MINIMUM DETECTION LIMITS).

(3) -- = NOT ANALYZED

(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.

(5) ACENAPHTHYLENE AND NAPHTHALENE, COELUTED.

(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.

(7) BENZO(b)FLUORANTHENE AND BENZO(k)FLUORANTHENE, COELUTED.

(8) THE N.Y. STATE CLASS GA GROUNDWATER STANDARD FOR ORGANICS INCLUDES PHENOLIC COMPOUNDS, VOLATILE ORGANICS, AND SEMIVOLATILE ORGANICS EXCEPT FOR ACETONE, STYRENE, ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE, DIBENZO(a,h)ANTHRACENE, AND BIS(2-ETHYLHEXYL)PHTHALATE.

(9) pH READINGS IN STANDARD UNITS

(10) CONDUCTIVITY READINGS IN MICROMHOS/CM

(11) TEMPERATURE IN DEGREES CELSIUS

TABLE 5 (CONT.)
CHEMICALS FOUND IN GROUNDWATER SAMPLES
ITHACA-COURT STREET SITE

SHEET 2 OF 2

WELL IDENTIFIER	MW-4			MW-5			MW-6					
SAMPLE IDENTIFIER	MW-104	MW-204	MW-304	MW-105	MW-205	MW-305	MW-106	MW-106 GC/MS	MW-206	MW-206 GC/MS	MW-306	MW-306 DUP
DATE OF SAMPLE COLLECTION	2/4/86	4/17/86	8/4/86	2/4/86	4/17/86	8/4/86	2/4/86	2/4/86	4/17/86	4/17/86	8/4/86	8/4/86
VOLATILE ORGANICS (MG/L)												
-VOLATILE AROMATICS-												
BENZENE	ND	ND	ND	ND	ND	0.190	8.500	6.500	2.000	2.100	1.600	1.600
TOLUENE	ND	ND	ND	ND	ND	0.017	0.590	0.840	(4)	(4)	0.150	0.120
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENE	--	--	--	--	--	--	--	4.100	--	1.100	--	--
m - XYLENE	ND	ND	ND	ND	ND	0.054	(4)	--	0.210	--	0.360	0.360
o - XYLENE	ND	ND	ND	ND	ND	0.054	0.850	--	0.420	--	0.370	0.390
p - XYLENE	HD	ND	ND	ND	ND	0.026	(4)	--	0.260	--	0.240	0.260
TRIMETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	--	ND	--	0.085	0.074
-OTHER-												
ACETONE	--	--	--	--	--	--	--	11.000	--	ND	--	--
TOTAL VOLATILE AROMATICS	ND	ND	ND	ND	ND	0.341	9.940	11.440	2.890	3.200	2.805	2.804
SEMIVOLATILE ORGANICS (MG/L)												
-PAH-												
ACENAPHTHENE	ND	ND	ND	ND	ND	ND	ND	0.120	0.024	0.069	ND	ND
ACENAPHTHYLENE	ND	ND	ND	ND	ND	ND	ND	(4)	0.097	(4)	(5)	(5)
ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	0.029	(4)	ND	ND
BENZO(b)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	0.024	(4,7)	ND	ND
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	0.022	(4,7)	ND	ND
BENZO(g,h,i)PERYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	(6)	(4)	ND	ND
BENZO(a)PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	0.020	(4)	ND	ND
CHRYSENE	ND	ND	ND	ND	ND	ND	ND	ND	0.048	(4)	ND	ND
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	0.032	(4)	ND	ND
FLUORENE	ND	ND	ND	ND	ND	ND	ND	(4)	0.460	(4)	4.600	1.500
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	(4)	ND	ND	ND
NAPHTHALENE	ND	ND	ND	ND	ND	ND	ND	9.400	0.400	0.310	22.000	6.400
PHENANTHRENE	ND	ND	ND	ND	ND	ND	ND	(4)	0.047	(4)	ND	ND
PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	0.055	0.034	ND	ND
-OTHER-												
2-4 DIMETHYLPHENOL	--	--	--	--	--	--	--	0.570	--	0.170	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	ND	--	0.045	--	--
PHENOL	--	--	--	--	--	--	--	(4)	--	0.046	--	--
TOTAL PAH	ND	ND	ND	ND	ND	ND	ND	9.520	1.258	0.413	26.600	7.900
OTHER CHEMICALS (MG/L)												
-METALS-												
IRON	0.23	0.72	0.93	0.28	0.64	0.52	1.8		2.2		0.62	0.44
LEAD	--	ND	--	--	ND	--	--		ND		--	--
ZINC	ND	ND	ND	ND	0.013	ND	ND		0.015		ND	ND
-CYANIDE-												
TOTAL CYANIDE	ND	ND	ND	ND	ND	ND	0.34		1.7		1.94	1.93
AMENABLE CYANIDE	ND	ND	ND	ND	ND	ND	0.13		0.23		0.13	ND
FERRO-FERRI CYANIDE	ND	ND	ND	ND	ND	ND	0.21		1.47		1.81	1.93
-OTHER-												
TOTAL RECOVERABLE PHENOLICS	ND	0.043	ND	ND	ND	ND	ND		0.65		0.13	0.15
TOTAL ORGANIC CARBON	7.3	12	5.07	9.7	4.3	2.25	6.7		18		19.0	19.8
TOTAL NEW YORK STATE REGULATED ORGANICS (8)	ND	0.043	ND	ND	ND	0.341	9.940	21.530	4.701	3.829	29.535	10.854
FIELD MEASUREMENTS												
pH (9)	7.7	7.4	7.6	7.7	7.4	7.8	7.0		6.8		7.5	
CONDUCTIVITY (10)	695.0	607.0	740.0	664.0	609.0	755.0	5250.0		10240.0		3150.0	
TEMPERATURE (11)	10.9	13.7	15.2	11.7	14.0	15.1	8.4		9.4		15.2	

NOTES:

(1) INDICATES SAMPLE VALUES WERE OBTAINED BY GC/MS(EPA METHODS 624 AND 625). ALL OTHER VALUES OBTAINED BY HPLC (EPA METHODS 602 AND 610).
(2) ND = NOT DETECTED (SEE APPENDIX B-1 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.
(5) ACENAPHTHYLENE AND NAPHTHALENE, COELUTED.
(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.
(7) BENZO(b)FLUORANTHENE AND BENZO(k)FLUORANTHENE, COELUTED.
(8) THE N.Y. STATE CLASS GA GROUNDWATER STANDARD FOR ORGANICS INCLUDES PHENOLIC COMPOUNDS, VOLATILE ORGANICS, AND SEMIVOLATILE ORGANICS EXCEPT FOR ACETONE, STYRENE, ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE, DIBENZO(a,h)ANTHRACENE, AND BIS(2-ETHYLHEXYL)PHTHALATE.
(9) pH READINGS IN STANDARD UNITS
(10) CONDUCTIVITY READINGS IN MICROMHOS/CM
(11) TEMPERATURE IN DEGREES CELSIUS

apparent in the PAH results between the analytical methods. For example, in sample MW-106 (round 1, monitoring well 6), no semivolatiles were detected with HPLC while acenaphthene and naphthalene were reported by GC/MS at a combined concentration of 9.5 mg/ℓ. More typically, the GC/MS analysis detected the same PAH compounds as the HPLC but at lower concentrations.

Duplicate samples were also collected during each sampling round. Comparability between duplicate analyses was good, with one exception. Thirteen PAH compounds were detected in sample MW-202, while none were detected in the duplicate. A comparison between the PAH concentrations in Table 5 and the solubility limits for PAH compounds in water at 20 to 25°C (see Appendix B-2) indicates many detectable concentrations are well above the solubility limits. (The sampling protocol for the semi-volatile organic analysis does not allow sample filtration.) Discrepancies in the PAH results are therefore likely related to differences in the amount of soil/sediment in the analytical samples.

Other quality control samples collected during each of the groundwater sampling events at Court Street were sampler, trip, and filtration blanks. The analytical results for these quality assurance samples are presented in Appendix B-3. No organic compounds were found in any of the sampler or trip blanks. The filtration blanks were analyzed for metals and TOC only. A TOC concentration of 0.9 mg/ℓ was reported in the round 3 filtration blank (FB-301).

The volatile and semivolatile compounds detected in the groundwater samples were also found in the tar samples from the storage vessels with the exception of acetone and bis(2-ethylhexyl)phthalate. Acetone was present in five of the six GC/MS samples at concentrations of from 0.23 mg/ℓ to 11.0 mg/ℓ. The highest concentration of acetone, 11.0 mg/ℓ, was detected at MW-6 during the February sampling event but was not detected at this well two months later. Bis(2-ethylhexyl)phthalate was detected in sample MW-206 (0.045 mg/ℓ) and at trace levels in samples MW-201 and MW-303. Both acetone and bis(2-ethylhexyl)phthalate are common laboratory contaminants and are often reported in environmental sampling results.

3.4.3.2 Other Chemicals. Groundwater samples were analyzed for iron, zinc, total cyanide, amenable cyanide, total phenols, and total organic carbon on all three sampling rounds. Lead was added to the list of inorganic analytes during round 2. The results of these analyses are presented in Table 5.

As shown in Table 5, iron concentrations ranged from 0.1 mg/ℓ (MW-103) to 2.2 mg/ℓ (MW-206). Iron was not detected in MW-103 DUP. Zinc was present in three well samples: 0.01 mg/ℓ (MW-205), 0.02 mg/ℓ (MW-206), and 0.011 mg/ℓ (MW-302). No lead was found in the round 2 samples.

As with the soils data, ferro-ferricyanide concentrations were computed by subtracting amenable cyanide from total cyanide (APHA, 1985). Ferro-ferricyanide was detected in wells MW-2, MW-3, and MW-6 on all three rounds. Detected concentrations averaged 0.085 mg/l at MW-2, 0.016 mg/l at MW-3, and 1.35 mg/l at MW-6.

The results of the analyses for total recoverable phenolics and total organic carbon were fairly consistent among samples and from round to round. Phenolics were either absent or present in small concentrations (<0.7 mg/ℓ) in all samples. The lowest reported value for total organic carbon was 0.88 mg/ℓ in sample MW-303 and the highest was 19.8 mg/ℓ in sample MW-306 DUP. As with soils, the TOC concentrations were higher than the sum of the volatile and semivolatile organic compounds in the groundwater samples with the following exception. TOC concentrations were lower in the three samples with the highest concentrations of PAHs. Because the TOC samples are filtered before analysis and the PAH samples are not, this is evidence that the PAH results include suspended as well as dissolved compounds. This observation is supported by the PAH solubility data presented in Appendix B-2.

The results of duplicate analyses were comparable on each round. The round 2 sampler blank contained low levels of iron (0.21 mg/ℓ) and phenolics (0.035 mg/ℓ). Sampler blanks from the other two rounds were free of the analytes. The round 1 filtration blank contained only a low level of zinc (0.011 mg/ℓ) (see Appendix B-3).

3.4.4 Air

Six air samples, including a duplicate and a trip blank, were analyzed by ERCO for PAH and iron. Iron was included in the analytical program because of its indicator value for the potential release of iron cyanide compounds typically associated with coal gasification wastes. Air sampling procedures are described in Appendix A-8. The analytical results are shown in Table 6 in units of µg/m^3.

3.4.4.1 PAH Compounds. Review of the PAH results in Table 6 indicates the presence of 9 of the 16 PAH compounds listed. There is, however, no appreciable difference in values reported for the upwind, onsite, or downwind sampling stations. These results indicate that the PAH detections are most likely a result of background concentrations.

Comparison of the duplicate samples collected at Station A-3 shows some differences in the compounds detected and the quantities of specific compounds. However, where a compound was detected in one sample but not the other, the reported concentrations were close to the minimum detection limit. The trip blank for PAH monitoring contained naphthalene in the same order of magnitude as the other samples and trace concentrations of six other PAH compounds. Because the blank was prepared and handled identically to the air samples, the source of the chemicals detected in those samples is not known.

3.4.4.2 Iron. Iron was also detected in low concentrations at upwind, onsite, and downwind sampling locations (Table 6). A slightly higher iron concentration was reported at station A-2 (onsite) than at the others. This elevated onsite concentration points to a slight release of particulate matter containing this element during test pitting at the site. The presence of iron in the trip blank suggests that the low background iron content of the membrane filter may be responsible for the majority of iron reported in the air samples. The iron results for the duplicate samples collected at station A-3 exhibited only an 18 percent difference which indicates an acceptable method precision.

TABLE 6
RESULTS OF AMBIENT AIR MONITORING
ITHACA-COURT STREET SITE

Station Location	Upwind	Onsite	Onsite	Downwind	Downwind	Trip Blank
Sample Identifier	A-101	A-102	A-104	A-103	A-103 DUP	FB-101
High-Volume Samplers						
Volume sampled (m^3)	101.9	107.0	101.9	108.5	101.9	--
PAHs ($\mu g/m^3$)[1]						
Acenaphthene	0.58	ND[2]	ND	0.24	ND	T[3]
Acenaphthylene	0.70	ND	ND	ND	ND	ND
Anthracene	T	0.43	ND	T	ND	T
Benzo(a)anthracene	--[4]	ND	ND	--[4]	--[4]	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND
Chrysene	T	ND	ND	0.22	0.53	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	0.42	ND	T	0.32	T
Fluorene	1.67	1.12	ND	1.01	1.18	T
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND
Naphthalene	0.53	0.26	0.65	0.44	0.98	48.0[5]
Phenanthrene	T	0.34	1.08	T	0.39	T
Pyrene	0.42	ND	ND	ND	ND	T
Total PAHs	3.90	2.57	1.73	1.91	3.40	0.48[6]
Low Flow Pumps						
Volume Sampled (liters)	1,092.2	1,035.0	956.7	1,029.7	1,072.7	
Iron ($\mu g/m^3$)[7]	2.66	3.38	2.3	2.14	2.52	2.7[5]

---

[1] Minimum detection limit (MDL) is 0.20 $\mu g/m^3$, based on a nominal sample volume of 100 m^3.

[2] ND = Not detected

[3] T = Detected in trace concentrations at or below the MDL.

[4] Coelution with Chrysene.

[5] Value in μg.

[6] Estimated based on 100 m^3 sample volume.

[7] Minimum detection limit is 0.63 $\mu g/m^3$, based on a nominal sample volume of 800 liters (0.8m^3).

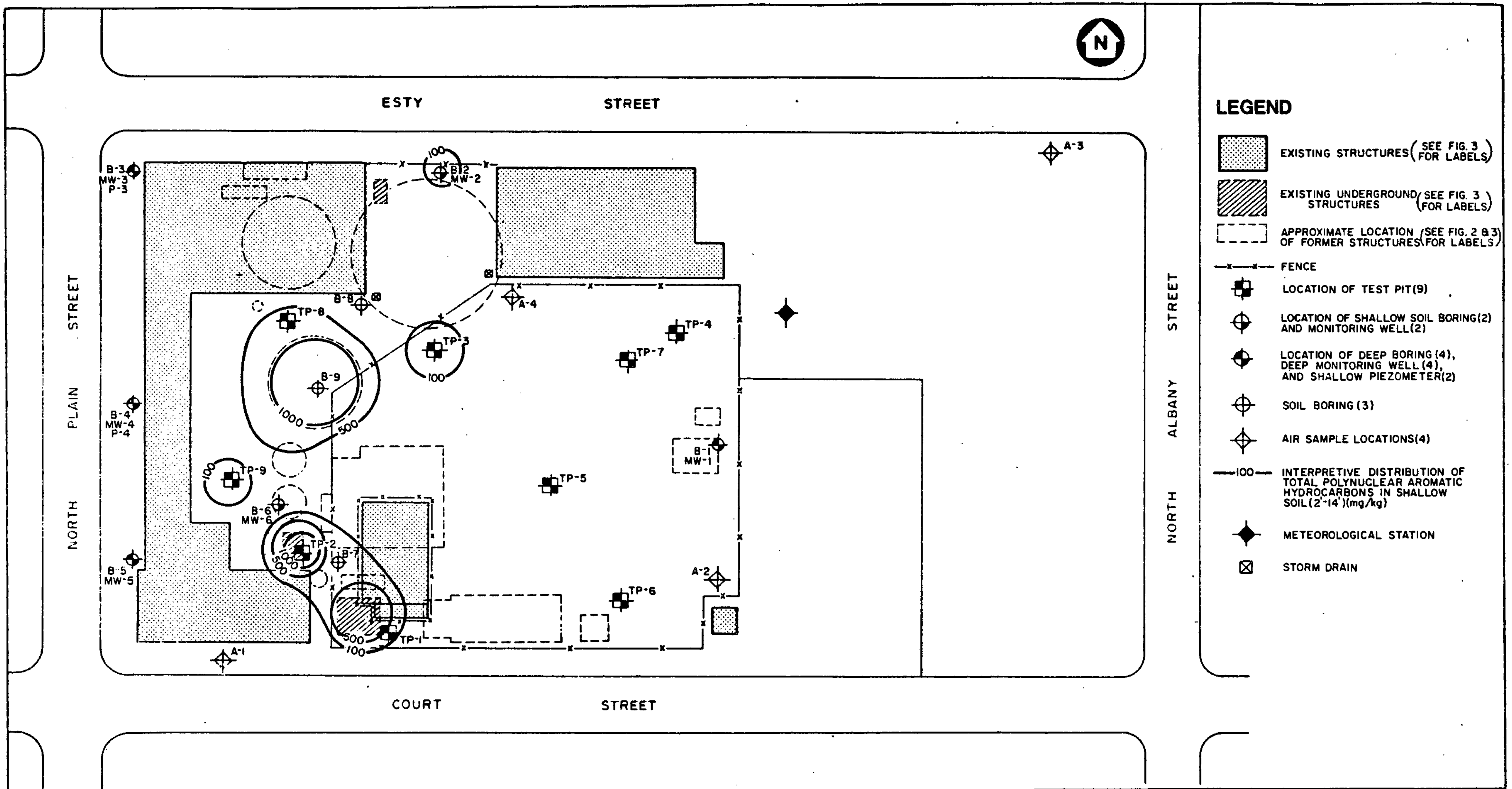
3.4.5 Summary

Analyses of soil samples from the Court Street site have confirmed the presence of coal tar related organic compounds in the soils near the former coal gasification structures (see Figure 14). These organic compounds were absent or present in low concentrations in soil samples collected along the eastern or western boundaries of the site, away from what was the active plant area. Almost all of the organic chemicals found are typical constituents of coal tar. The exceptions are acetone, methylene chloride, and tetrachloroethene which were detected at one location at concentrations which could be indicative of laboratory contamination.

Coal tar related volatile and semivolatile organic compounds were consistently present in samples from monitoring wells MW-2 and MW-6, which are adjacent to former coal gasification structures. These wells are monitoring the shallow groundwater system present in the upper clayey silt and fill at depths of 4 to 15 feet. Organic compounds were detected either irregularly and at low concentrations or not at all at the four remaining wells. These four wells are in upgradient and downgradient positions with respect to the site and groundwater flow in the sand stratum which they monitor (25 to 35 feet deep). Wells MW-2, MW-3, and MW-6 contained detectable quantities of ferro-ferricyanide, which was absent from the other wells. The chemicals detected in the groundwater are constituents of coal tar with two exceptions: acetone and bis(2-ethylhexyl)-phthalate. Both of these compounds are suspected of being sampling or analysis contaminants.

The results of the air sampling program show that PAHs and iron were present in air samples collected during test pitting at the site. However, the concentrations of chemicals at the upwind station were comparable to concentrations detected onsite and downwind, which indicates background rather than site contributions.

The results of the GC/MS confirmatory analyses for soil and groundwater samples showed that more PAHs may be present in the sampled media at lower concentrations than indicated by the HPLC data.



APPROXIMATE SCALE

0 50 100 FEET

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

E.C.JORDAN CO.
CONSULTING ENGINEERS

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

DISTRIBUTION OF TOTAL
PAH'S IN SHALLOW
SOIL(2' TO 14')
ITHACA-COURT ST. SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4816-02

FIGURE 14

4.0 SITE ASSESSMENT

The environmental conditions at the Court Street site are summarized in Table 7. Chemicals related to the former use of the site for coal gasification are present in the shallow soil and groundwater at the site. Section 4 addresses the significance of this finding. The toxicological properties of detected chemicals are summarized in Table 8. A description of the behavior of these chemicals in the soil and groundwater environment as it relates to the potential for offsite migration is presented in Section 4.1. The analytical results are compared to potentially applicable state criteria, where available, in Section 4.2. Potential risks and potentially applicable remedial alternatives are identified in Sections 4.3 and 4.4.

4.1 TRANSPORT AND FATE

Chemical transport mechanisms are summarized in Table 7. The primary pathway for chemical transport at Court Street is shallow groundwater migration. However, one offsetting factor is limited recharge and flushing of chemicals because of the asphalt cap and building cover. There is a potential for offsite movement of aromatic compounds, the lighter PAH compounds, and phenolics via this route. The rate and direction of shallow groundwater flow is dependent on the existence of preferential flow paths, such as utility trenches, fill pockets, root channels, and vertical openings at the top of the clayey silt stratum. The horizontal groundwater flow rate in the fill is estimated to be approximately 8 ft/yr compared to only 0.1 ft/yr in the clayey silt. Additional data regarding these types of features at the site are needed.

Groundwater flow in the clayey silt layer is slow in both the horizontal and vertical planes because of its low permeability and low vertical seepage gradient. These factors and the anticipated high cation exchange capacity of this fine-grained layer will act to retard the migration of chemicals. The chemical data collected from the deep downgradient wells indicate that site-related chemicals are being held in the silt layer above the more permeable sand stratum. These data need to be confirmed with GC/MS analysis, especially at MW-5.

The pavement at the Court Street site greatly reduces the potential for direct contact with chemicals and for transport via volatilization. Should excavations occur in the soils near the former gas plant structures, a contact hazard could exist and odors and measurable releases of volatile organics could possibly occur.

4.2 COMPARISON OF ANALYTICAL RESULTS TO REGULATORY CRITERIA

Analytical results are compared to potentially applicable state criteria, where available, in this section. The comparison of analytical results to regulatory criteria is presented by media.

TABLE 7

SUMMARY OF ENVIRONMENTAL CONDITIONS
ITHACA-COURT STREET SITE

Technical Factors	Coal Tar in Storage Vessels and Onsite Soils	Groundwater	Air
Chemicals Present	The following chemicals have been detected in the coal tar in the storage vessels and in the soils near former coal gasification structures: - benzene - toluene - ethylbenzene - styrene - xylenes - naphthalene and 15 other polynuclear aromatic hydrocarbons (PAH) - heavy metals - phenolic compounds Cyanide compounds derived from purification wastes have also been found in shallow soil onsite. The coal tar in the vessels appears to contain significant amounts of inorganic chloride and is ignitable.	The following chemicals have been detected in the shallow (4 to 15 feet) groundwater at the site: - benzene - toluene - ethylbenzene - xylenes - naphthalene and 14 other PAH compounds - cyanide compounds - iron Some organic chemicals were detected infrequently and in low concentrations in the deeper (25 to 35 ft.) groundwater (benzene, toluene, xylenes, fluoranthene, and napthalene).	The following PAHs were detected in on-site and/or downwind air samples collected during test pit excavations: acenaphthene, anthracene, chrysene, fluoranthene, fluorene, naphthalene, and phenanthrene. All of these chemicals except fluoranthene were also detected at the upwind station. Iron was detected at all four sampling locations.
Chemical Transport Mechanism	Seepage of free liquid wastes and leaching of soluble chemicals to groundwater are the most likely transport mechanisms. Volatilization of chemicals is unlikely unless the coal tar storage vessels or soil is disturbed. Soil erosion is not a likely chemical transport mechanism because most of the site is paved.	The groundwater surface is within 7 feet of the ground surface, in fill and clayey silt outwash soils. Shallow groundwater movement appears to be to the west/southwest with flow towards Cayuga Inlet. The direction of shallow flow is highly influenced by the distribution of the highly permeable fill material. There is a deeper, semi-confined groundwater system in a sand stratum at approximately 25 to 35 ft. Groundwater movement in this system is to the northwest. Flow in a second sand and gravel aquifer at between 50 and 100 feet below ground surface is believed to be from south to north.	Volatilization and particulate migration via wind scour are not presently of concern because most of the site is paved. Volatilization would be the primary transport route if materials were exposed. Winds in the area are generally from the northwest but were from the southwest during the May 1986 air sampling event.

TABLE 7 (Cont.)

SUMMARY OF ENVIRONMENTAL CONDITIONS
ITHACA-COURT STREET SITE

Technical Factors	Onsite Soils	Groundwater	Air
Expected Persistence of Chemicals in the Environment	The volatile fraction of the coal tar is expected to vaporize slowly into the air. Soluble components of coal tar are expected to leach into the groundwater. All components except iron cyanide compounds are biodegradable.	The coal tar-related chemicals detected in the groundwater are expected to biodegrade, migrate and disperse in the groundwater and adsorb to aquifer materials.	If chemical constituents were released to the air, they would be rapidly dispersed and susceptible to photo-oxidation.
Existing or Potential Receptors of Chemicals	The probability of direct contact to humans or animals is low since the site is paved and the coal tar storage vessels are buried. If excavations were made at the site, however, workers and area residents could be exposed to chemicals in the soil. Chemicals leaching may be transported off-site but there are no drinking water supply wells in the vicinity of the site (see groundwater).	In the absence of water supply wells in the area, exposure to chemicals in the shallow groundwater may occur in building and utility excavations in the site vicinity. The only direct groundwater usage is at a shallow agricultural well (6 ft. deep) ½-mile northwest of the site. Because shallow groundwater appears to flow to the southwest from the site, this well would not be expected to be affected by chemicals at the site.	Humans and animals in the vicinity of the site would be potential receptors of releases of chemicals to the air during site activites which result in prolonged exposure of coal tar wastes. Some potentially sensitive land uses in the site vicinity are: - onsite businesses - parks - day care centers - elementary schools - nursing homes - garden plots - boat yards

TABLE 8

TOXICOLOGICAL PROPERTIES OF COMPOUNDS IDENTIFIED IN VARIOUS MEDIA
ITHACA-COURT STREET SITE

Compound Class	Media Identified In	Specific Compounds	Toxicological Properties[1]
Volatile Organic Compounds	Groundwater Subsurface soil	Toluene, benzene, xylenes, ethylbenzene, trimethylbenzene	These aromatic compounds are absorbed readily through the respiratory and gastrointestinal (GI) tracts and can also be absorbed through the skin. Benzene has the potential to cause cancer. Depending on the dose received, the other compounds can exert toxic effects on the liver and kidneys; they can also act as central nervous system (CNS) depressants and respiratory irritants.
Semivolatile Compounds			
o PAHs	Groundwater Subsurface soil Air	Fluoranthene, naphthalene, acenaphthene, acenaphthylene, anthracene, benzo(a)pyrene, chrysene, fluorene, phenanthrene, benzofluoranthenes, indeno(1,2,3-cd)pyrene	PAHs are a diverse group of compounds of varying toxicity. They are highly lipid-soluble and are absorbed through the GI and respiratory tracts, and to a lesser degree, through the skin. Many PAHs have been shown to be potentially carcinogenic. Other PAHs are thought to be noncarcinogenic; these include fluorene, anthracene, pyrene, naphthalene, acenaphthene, phenanthrene, and fluoranthene. The acute toxicity and chronic toxicity of low level exposure are not well understood.
o Phthalate esters	Groundwater	Bis(2-ethylhexyl)phthalate (DEHP)	DEHP is considered a probable human carcinogen. It has low acute toxicity. Very high doses are potentially teratogenic and embryotoxic.
o Phenolic compounds	Groundwater	Phenol, 2,4-dimethylphenol	Depending on the dose, these compounds can produce liver and kidney toxicity and CNS effects. They can act as respiratory and skin irritants.
Inorganic Compounds	Groundwater Subsurface soil	Iron, lead, zinc, cyanide	Iron and zinc are essential nutrients. They can produce objectionable effects such as staining, bad taste, and GI irritation at high levels. Lead is a toxic metal that accumulates in the body. At certain levels it can produce neurotoxic effects, kidney toxicity, and effects on blood-forming tissues. Cyanide that is bioavailahle can exert toxic effects on the liver, kidneys, CNS, and cardiovascular system at high enough levels.

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[1] In assessing the risks to human health and the environment posed by these chemicals, not only toxicologicial properties but also potential receptors and probable exposure conditions must be considered. These factors will be addressed in the Task 4 risk assessment.

4.2.1 Standards and Guidelines

As part of the site assessment process, environmental and health criteria that may be applicable at the site were reviewed. The review covered regulatory standards and guidelines included in the following: (1) New York State regulations; (2) National Drinking Water Regulations; (3) EPA Ambient Water Quality Criteria; (4) EPA Health Advisories; (5) Occupational Safety and Health Administration (OSHA) standards; (6) American Conference of Governmental and Industrial Hygienists (ACGIH) guidelines; and (7) hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA). Potentially applicable criteria are shown in Table 9.

Criteria are not available for the chemicals of interest in soils. Criteria are also lacking for many of the detected chemicals in groundwater. New York State has established groundwater criteria for all of the chemicals which are regulated at the federal level plus many which are not. And, where both federal and state criteria exist for a given chemical, the New York State standard is always more stringent. For these reasons, the New York State standards and guidance values are used in this assessment. The State standards are enforceable by regulation while the guidance values are not enforceable by law.

4.2.2 Coal Tar

The coal tar samples collected from the two coal tar storage vessels at Court Street on January 15 and 16, 1986, were tested for two of the four characteristics of hazardous wastes (as defined by 40 CFR Part 261 Subpart C): EP toxicity and ignitability. While neither sample contained EP leachable metals in excess of the hazardous waste characteristic specified by EPA, both coal tar samples ignited at temperatures below the EPA characteristic limit of 140°F (see Table 2). The coal tar in the storage vessels therefore exhibits the EPA ignitability characteristic of a hazardous waste by RCRA and if removed, may be subject to RCRA regulations governing storage, transport, and disposal. New York State currently follows the federal criteria for characteristics of hazardous waste (Goldman, 1985).

4.2.3 Soil

As previously stated, the review of criteria did not uncover any regulations or guidelines pertaining to the detected chemicals in soils, at either the federal or state level. In lieu of such criteria, a qualitative assessment based on total PAHs is provided. PAHs were selected for this assessment because of their prevalence in coal tar (see Table 1) and their expected persistence in the soil environment.

PAHs are a diverse group of compounds of varying toxicity. They are highly lipid-soluble and are absorbed through the gastrointestinal and respiratory tracts. Some PAHs have been shown to have carcinogenic potential while others do not exhibit carcinogenicity. In developing ambient water quality criteria, the New York State Department of Environmental Conservation (NYSDEC) classified the following PAHs as carcinogenic: benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3-cd)pyrene

TABLE 9
POTENTIALLY APPLICABLE CRITERIA
FOR CHEMICALS FOUND IN GROUNDWATER
ITHACA-COURT STREET SITE

	NEW YORK STATE STANDARDS AND GUIDANCE FOR CLASS GA GROUNDWATER(1)		NATIONAL DRINKING WATER REGULATIONS		EPA HEALTH ADVISORIES(5)
	STANDARDS(2)	GUIDANCE VALUES(2)	MAXIMUM CONTAMINANT LEVELS(3)	MAXIMUM CONTAMINANT LEVEL GOAL(4)	LIFETIME ADULT EXPOSURE
		VOLATILE ORGANICS (MG/L)			
-VOLATILE AROMATICS-					
BENZENE	ND (6)	----	0.005 (7)	0	----
TOLUENE	----	0.05	----	2 (7)	2
ETHYLBENZENE	----	0.05	----	0.68 (7)	0.68
STYRENE	0.931	----	----	----	1.4
TOTAL XYLENE	----	0.05	----	0.44 (7)	0.44
m-XYLENE	----	----	----	----	----
o-XYLENE	----	----	----	----	----
p-XYLENE	----	----	----	----	----
TRIMETHYLBENZENE	----	0.05	----	----	----
-OTHER-					
ACETONE	----	----	----	----	----
		SEMIVOLATILE ORGANICS (MG/L)			
-PAH-					
ACENAPHTHENE	----	0.02	----	----	----
ACENAPHTHYLENE	----	----	----	----	----
ANTHRACENE	----	0.05	----	----	----
BENZO(b)FLUORANTHENE	----	0.000002	----	----	----
BENZO(k)FLUORANTHENE	----	0.000002	----	----	----
BENZO(g,h,i)PERYLENE	----	----	----	----	----
BENZO(a)ANTHRACENE	----	0.000002	----	----	----
BENZO(a)PYRENE	ND (6)	----	----	----	----
CHRYSENE	----	0.000002	----	----	----
DIBENZO(a,h)ANTHRACENE	----	----	----	----	----
FLUORANTHENE	----	0.05	----	----	----
FLUORENE	----	0.05	----	----	----
INDENO(1,2,3,-cd)PYRENE	----	0.000002	----	----	----
NAPHTHALENE	----	0.01	----	----	----
PHENANTHRENE	----	0.05	----	----	----
PYRENE	----	0.05	----	----	----
-OTHER-					
PHENOL	----	----	----	----	----
2,4-DICHLOROPHENOL	----	0.0003	----	----	----
2,4-DIMETHYLPHENOL	----	----	----	----	----
BIS(2-ETHYLHEXYL)PHTHALATE	4.2	----	----	----	----
TOTAL NYS REGULATED ORGANICS	0.1 (8)	----	----	----	----
		OTHER CHEMICALS (MG/L)			
-METALS-					
IRON	0.3	----	----	----	----
LEAD	0.025	----	0.05	0.02 (7)	----
ZINC	5	----	----	----	----
-CYANIDE-					
TOTAL CYANIDE	0.2	----	----	----	0.75
FERRO-FERRI CYANIDE	----	----	----	----	----
FREE CYANIDE	----	----	----	----	----
-OTHER-					
TOTAL PHENOLS (9)	0.001	----	----	----	----
TOTAL ORGANIC CARBON	----	----	----	----	----

NOTES:
(1) CLASS GA DENOTES FRESH GROUNDWATER WHICH IS A SOURCE OF POTABLE WATER SUPPLY.
(2) SEE NYS DIVISION OF WATER TECHNICAL AND OPERATIONAL GUIDANCE SERIES 85-W-38, AUGUST 1985, FOR MORE INFORMATION.
(3) MCLS (MAXIMUM CONTAMINANT LEVELS) ARE ENFORCEABLE STANDARDS PROMULGATED UNDER THE NATIONAL PRIMARY DRINKING WATER ACT FOR WATER SUPPLY SYSTEMS SUBJECT TO REGULATIONS OF 40 CFR 141 AND 40 CFR 142.
(4) MCLG'S (MAXIMUM CONTAMINANT LEVEL GOALS) ARE NON-ENFORCEABLE HEALTH GOALS WHICH HAVE BEEN SET AT A LEVEL OF NO KNOWN OR ANTICIPATED ADVERSE HEALTH EFFECTS AND INCLUDE A MARGIN OF SAFETY. FOR NONCARCINOGENS, MCLG'S ARE BASED ON CHRONIC TOXICITY DATA. FOR CARCINOGENS MCLG'S ARE PROPOSED AT THE ZERO LEVEL.
(5) EPA HA (USEPA HEALTH ADVISORIES, FORMERLY SNARL'S) ARE NON-ENFORCEABLE CRITERIA ESTABLISHED BY THE OFFICE OF DRINKING WATER. THEY ARE SET AT LEVELS WHERE ADVERSE HEALTH EFFECTS ARE NOT EXPECTED. CARCINOGENIC RISKS ARE NOT TAKEN INTO CONSIDERATION.
(6) ND = NOT DETECTABLE BY USEPA METHODS 602 OR 624 (BENZENE) OR METHODS 610 OR 625 (BENZO(a)PYRENE).
(7) PROPOSED
(8) INCLUDES ALL OF THE ORGANIC CHEMICALS LISTED EXCEPT ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE, DIBENZO(a,h)ANTHRACENE, AND STYRENE.
(9) AS MEASURED BY APHA METHOD 510.B WHICH IS EQUIVALENT TO EPA METHOD 420.1 (SEE APHA, 1985; USEPA, 1983).

(NYSDEC, 1985b). In addition, many PAHs are skin and eye irritants (NIOSH, 1982).

In Figure 15, the concentration of total PAHs in soil samples collected at Court Street are graphically displayed. PAHs were present in almost all of the samples collected from the former active plant area in concentrations ranging from 1 to 4,000 ppm range. These samples were collected primarily from the top 10 feet of soil below the asphalt. Because the area is paved, the likelihood of prolonged exposure of humans or animals to these soils is remote. Incidental contact (e.g., during excavations) resulting in dermal or eye irritation is the most probable exposure route at the site. Additional data on the concentrations and distribution of these chemicals as well as potential exposure routes are needed to complete the detailed risk assessment planned for Task 4.

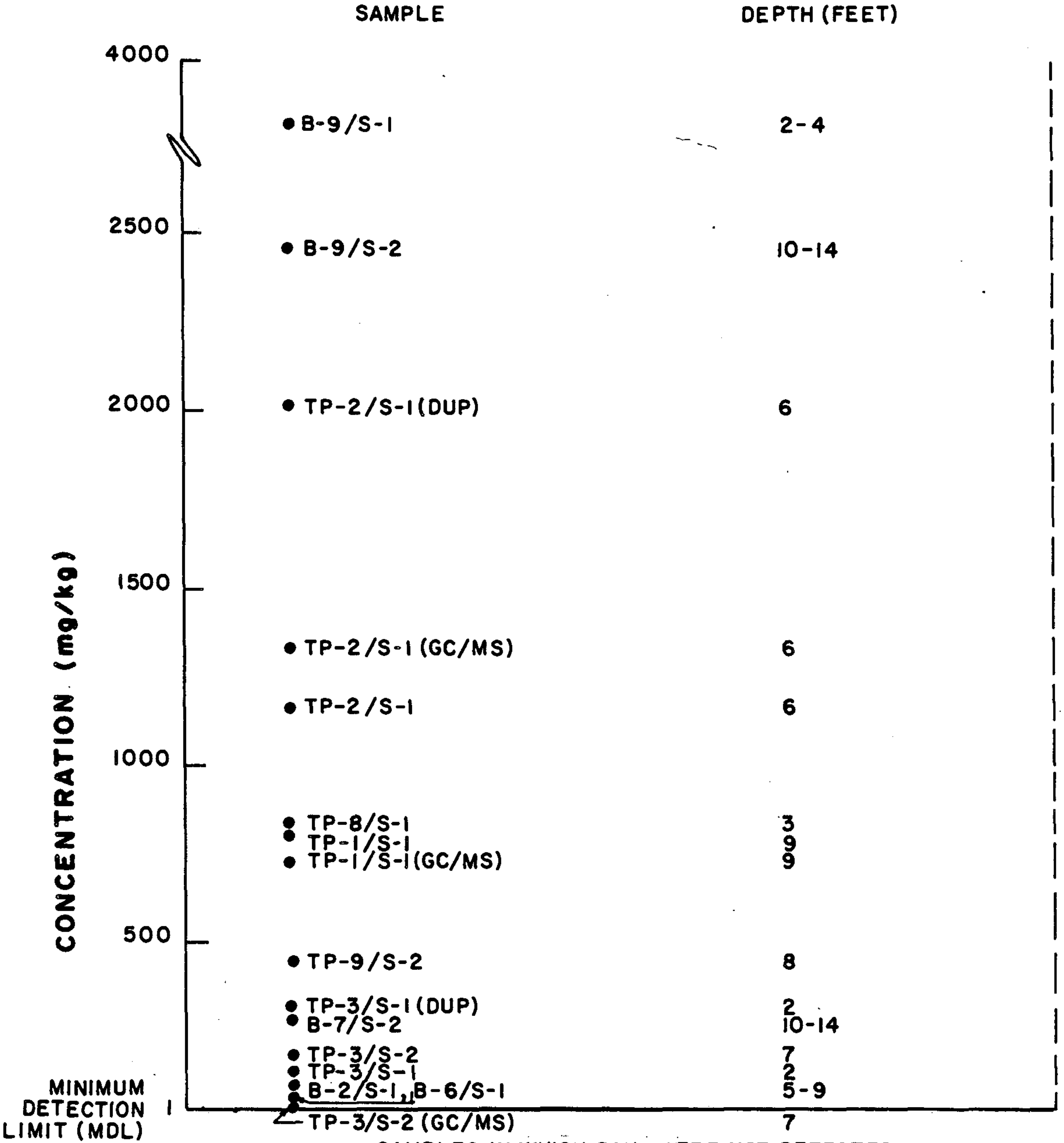
4.2.4 Groundwater

The potentially applicable federal and state criteria for groundwater that were identified in the criteria review are listed in Table 9. Most of the criteria are based on the assumption that the water being evaluated will be used as a drinking water supply. The New York State standards and guidelines are for fresh groundwater used as a source of potable water. The federal maximum contaminant levels (MCLs) are enforceable standards for water supply systems promulgated under the National Primary Drinking Water Act. Maximum contaminant level goals (MCLGs) are nonenforceable health goals designed to prevent any adverse health effects or risks and was established under the Safe Drinking Water Act (SDWA) without considering the cost or feasibility of attainment. The EPA health advisories, established by the Office of Drinking Water, are set at levels where adverse health effects are not expected. Carcinogenic risks are not taken into consideration. These advisories do take into account the length of exposure to the chemical in drinking water.

As discussed in Section 3.2, groundwater is not used as a potable water supply source in Ithaca. However, there is a high yield sand and gravel aquifer of good quality beneath the city at depths of between 50 and 100 feet which could potentially be developed as a water supply source in the future. NYSDEC has established the upstate groundwater program to protect and conserve groundwater for a best usage as a source of drinking water (NYSDEC, 1985a). While this approach and goal may be appropriate for prospective actions, it imposes severe constraints if used to define clean-up of inactive facilities where the groundwater already contains chemicals in excess of the criteria.

As shown in Table 9, standards have been promulgated by the State of New York for only six of the chemicals detected in groundwater at Court Street: benzene, benzo(a)pyrene, total organics, total cyanide, total phenols, and iron. Figures 16 and 17 graphically depict the relationship between the promulgated state standards and the groundwater analyses results. For benzene and benzo(a)pyrene, the state standard states that the chemical be not detectable by EPA Methods 602 or 624 for benzene, and EPA Methods 610 or 625 for benzo(a)pyrene (Ryan, 1987). These are the methods which were used to analyze the Court Street groundwater samples (see Appendix B-1). Because the minimum detection limit (MDL) varies with the analytical method (Methods 602

TOTAL PAHS IN SOIL



SAMPLES IN WHICH PAHs WERE NOT DETECTED

TP-7/S-1	7
B-1/S-2	30-32
B-3/S-2	10-12
B-4/S-2	35-37
B-5/S-1	30-32
B-8/S-1 ①	5-7

① THE MDL FOR THIS SAMPLE IS 5 mg/kg INSTEAD OF 1 mg/kg

E.C.JORDAN CO.
CONSULTING ENGINEERS

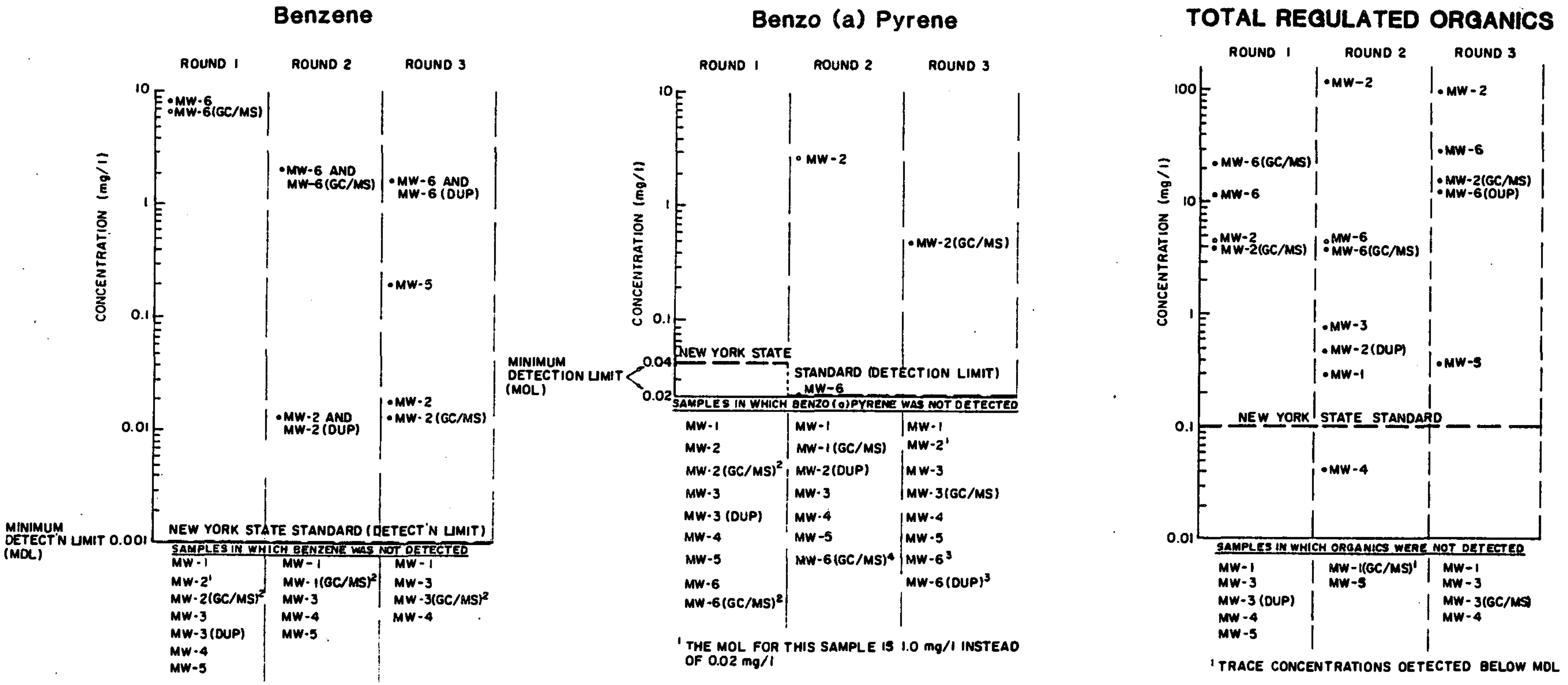
TOTAL PAHS IN SOIL
ITHACA-COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 15



Benzene:

[1] THE MDL FOR THIS SAMPLE IS 0.01 mg/l INSTEAD OF 0.001 mg/l

[2] THE MDL FOR THIS SAMPLE IS 0.002 mg/l INSTEAD OF 0.001 mg/l

Benzo (a) Pyrene:

[1] THE MDL FOR THIS SAMPLE IS 1.0 mg/l INSTEAD OF 0.02 mg/l

[2] THE MDL FOR THIS SAMPLE IS 0.1 mg/l INSTEAD OF 0.04 mg/l

[3] THE MDL FOR THIS SAMPLE IS 0.2 mg/l INSTEAD OF 0.02 mg/l

[4] TRACE CONCENTRATION DETECTED BELOW MDL

Total Regulated Organics:

[1] TRACE CONCENTRATIONS DETECTED BELOW MDL

E.C.JORDAN CO.
CONSULTING ENGINEERS

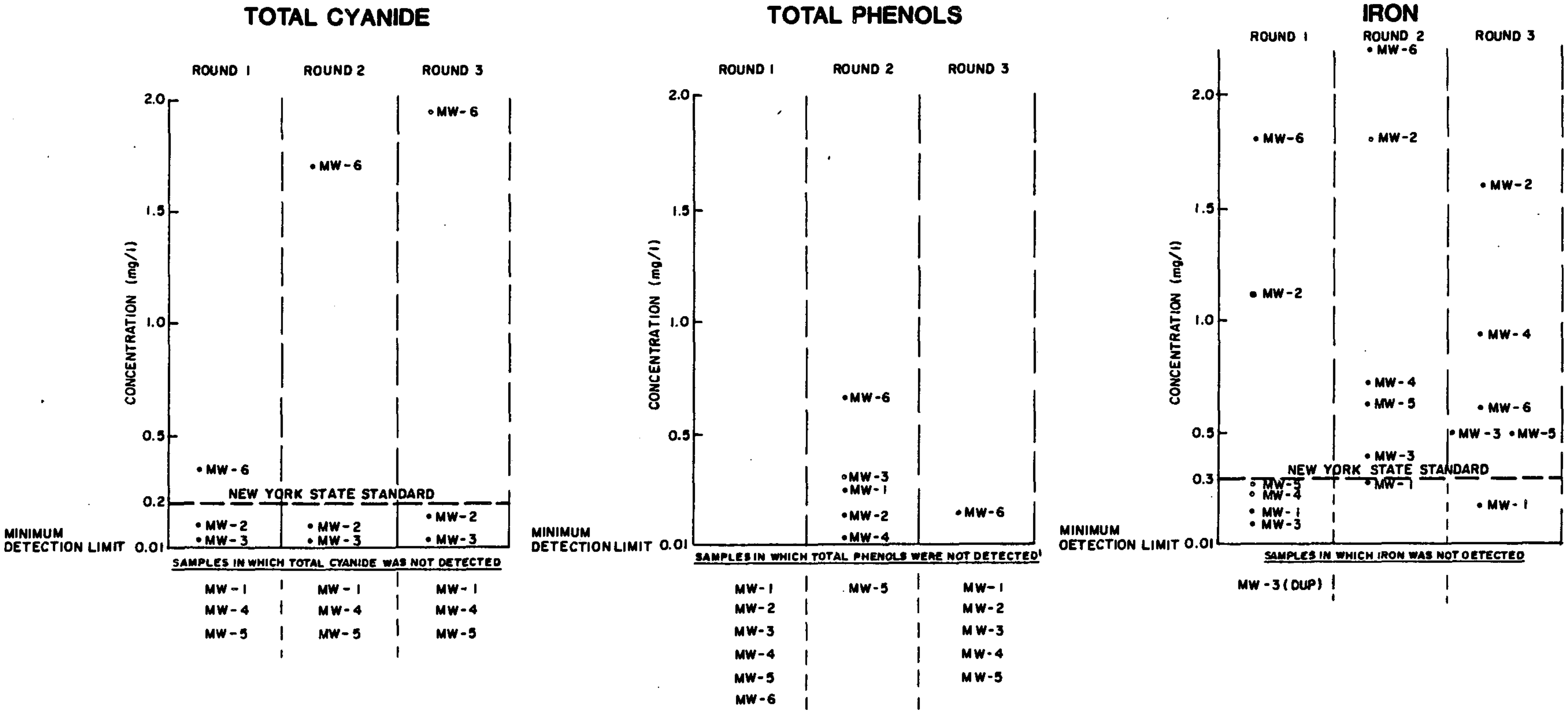
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

BENZENE, BENZO (a) PYRENE, AND TOTAL ORGANICS IN GROUNDWATER
ITHACA-COURT ST. SITE

INVESTIGATION OF FORMER COAL GASIFICATION SITES

JOB NO. 4815-02

FIGURE 16



[1] THE NEW YORK STATE STANDARD IS 0.001 mg/l

E.C.JORDAN CO.
CONSULTING ENGINEERS

CYANIDE, PHENOLICS,
AND IRON IN GROUNDWATER
ITHACA-COURT ST. SITE

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4816-02

FIGURE 17

and 610 are more sensitive than Methods 624 and 625) and with the quality of the sample (samples requiring more dilution of the sample (samples requiring more dilution have higher MDLs), the standards for benzene and benzo(a)pyrene are variable. The total phenols standard refers to phenols as measured by the American Public Health Association Method 510.B (Ryan, 1987; APHA, 1985). The analytical method used to measure phenols at Court Street was EPA method 420.1 which is identical to Method 510.B (USEPA, 1983). The detection limit reported by the analytical laboratory (ERCO) of 0.01 mg/ℓ is an order of magnitude higher than the New York State Standard of 0.001 mg/ℓ. However, the ERCO detection limit is reasonable based on the precision and accuracy capabilities of the methodology (USEPA, 1983). The data in Figure 16 are presented on a logarithmic scale and the data in Figure 17 are on a linear scale.

The figures show that the standards were exceeded more often in the shallow groundwater wells (MW-2 and MW-6) than in the intermediate sand aquifer wells (MW-1, MW-3, MW-4 and MW-5). The benzene standard was exceeded consistently at MW-6, twice at MW-2 and only once at MW-5. The standard for benzo(a)pyrene was exceeded twice at MW-2, and equaled once at MW-6. New York State also has a standard for total regulated organics of 0.10 mg/ℓ (NYSDEC, 1985b). This standard includes all of the volatile aromatics in Table 9, except styrene, and all of the PAHs except acenaphthalene, benzo(g,h,i)perylene, and dibenzo(a,h)-anthracene. In addition, total phenol and phenolic compounds are included in the total. The total regulated organics standard was exceeded during at least one sampling round at all wells except MW-4. However, there were only two wells (MW-2 and MW-6) where the standard was exceeded on more than one sampling round.

For total cyanide, only the three samples from MW-6 were in excess of the standard. The results of the total phenols analysis were inconsistent. The New York State standard was exceeded at 5 of the 6 wells (including the upgradient well) on round 2, and at MW-6 only on Round 3. Phenols were not detected in any of the other samples. The iron standard was exceeded at least twice at all wells except the upgradient well (MW-1). Iron concentrations were highest at the two shallow wells (MW-2 and MW-6) and these were the only wells where the iron standard was exceeded on all three rounds.

Samples from the shallow wells (MW-2 and MW-6) contained chemicals in excess of many of the New York State guidance values, as shown in Table 10. Only three chemicals were found in excess of these guidance values in the intermediate wells: fluoranthene and naphthalene at MW-3, and total xylene at MW-5. In each case, these chemicals were detected on only one of the three sampling rounds. The frequency of guidance value exceedances at the Court Street wells increased in the following order: MW-1 and MW-4 (zero exceedances), MW-5 (one), MW-3 (two), MW-6 (18), and MW-2 (30).

4.2.5 Air

The Court Street air samples were analyzed for PAHs and iron. The current New York State guidance, known as acceptable ambient level (AAL), for PAHs is based on the threshold limit value - time weighted average (TLV-TWA) concentration

TABLE 10
GROUNDWATER SAMPLES CONTAINING CHEMICALS IN EXCESS OF NEW YORK STATE GUIDANCE VALUES
ITHACA-COURT STREET SITE

Chemical	Guidance Value (mg/ℓ)[1]	Well Number	Round Number
Volatile Aromatics			
Toluene	0.05	MW-6	1,2,3
Ethylbenzene	0.05	MW-2	3
Total Xylene	0.05	MW-2	1,3
		MW-5	3
		MW-6	1,2,3
Trimethylbenzene	0.05	MW-2	1,2,3
		MW-6	3
PAHs			
Acenaphthene	0.02	MW-2	1,2,3
		MW-6	1,2
Anthracene	0.05	MW-2	2,3
Benzo(b)fluoranthene and Benzo(k)fluoranthene	0.000002	MW-2	2
		MW-6	2
Benzo(a)anthracene	0.000002	MW-2	3
Chrysene	0.000002	MW-2	2,3
		MW-6	2
Fluoranthene	0.05	MW-2	2,3
		MW-3	2
		MW-6	2
Fluorene	0.05	MW-2	1,2,3
		MW-6	3
Indeno(1,2,3-cd)pyrene	0.000002	MW-2	2,3
		MW-6	2
Naphthalene	0.01	MW-2	1,2,3
		MW-3	2
		MW-6	1,2,3

---

[1] New York State Division of Water, Technical and Operational Guidance Series 85-W-38, August 1985.

adopted as guidance criteria by the ACGIH (NYSDEC, 1985c). The ACGIH-TLV-TWA concentrations are 50,000 µg/m^3 for naphthalene and 200 µg/m^3 for coal tar pitch volatiles, which are the benzene extractable volatiles in particulates stopped by a glass fiber filter (ACGIH, 1986). The OSHA permissible exposure limit (a regulation) for coal tar pitch volatiles is also 200 µg/m^3 (NIOSH, 1980). Both the ACGIH and OSHA criteria are for 5-day, 8-hour work place exposure and assume no exposure during non-working hours.

The New York State AALs are equal to the ACGIH values divided by 300. This adjustment takes the effects of 24-hour exposure to the chemicals into account. The AALs are based on an assumption that all PAH compounds reported are "high toxicity air contaminants". The New York State AALs are 167 µg/m^3 for naphthalene and 0.67 µg/m^3 for coal tar pitch volatiles.

The range of naphthalene concentrations for this sampling program at Court Street was 0.26 to 0.98 µg/m^3. All of the results are well below the AAL for naphthalene. Coal tar pitch volatiles, as defined above, were not directly measured at Court Street. However, the total PAH results can be used to evaluate compliance with the AAL with the following qualifications. The high-volume air samplers used at Court Street (described in Appendix A-8) collected vapor phase as well as particulate phase PAH compounds. Thus, the criterion for coal tar pitch volatiles is applicable to only a portion of the total PAHs measured at Court Street. In addition, the PAH results for air were obtained with HPLC/UV analysis which has been shown to produce PAH results with a high bias relative to the more specific GC/MS technique (see Tables 3 and 5). This phenomenon was clearly demonstrated on an air sample collected at the First Street site, another NYSEG coal tar site in Ithaca: the total PAH concentration in that sample was 3.85 µg/m^3 by the HPLC/UV method and only 0.43 µg/m^3 by GC/MS analysis (E.C. Jordan, 1987). The GC/MS results were lower than the HPLC results by a factor of nine. With these two qualifications in mind, the total PAH concentrations can be compared to the AAL. On-site PAH concentrations are 2.5 to 3.5 times higher than the coal tar pitch volatile AAL. The downwind concentrations (obtained by averaging the duplicates) is 4 times the AAL. Because these exceedance factors are lower than the factor by which HPLC/UV can overestimate PAH results and because the coal tar pitch volatiles are a subset of the total PAHs, it is very unlikely that air quality at the site was in violation of the AAL during sampling. Even more significant is the fact that the highest PAH concentrations were detected at the upwind monitoring station. This indicates that there are offsite sources of PAHs in the area (e.g., exhaust fumes from automobile engines).

Currently, there is no acceptable ACGIH threshold limit value published for iron cyanides. The only published values available for comparison are iron oxide fumes at 5,000 µg/m^3 and cyanides at 5,000 µg/m^3. When these values are adjusted to account for full-time public exposure by dividing by 300, the resultant levels are 16.7 µg/m^3 for both. Combining the highest reported iron concentration, 3.38 µg/m^3, and the worst-case assumption that all of the material is iron cyanide, indicates that no significant release of iron cyanide is occurring.

4.3 PRELIMINARY IDENTIFICATION OF RISKS

A complete risk assessment will be conducted during Task 4. The purpose of this section is to summarize potential risks in order to determine whether or not Task 3 explorations are warranted at this site.

At present, the chemicals detected in the soils at Court Street pose little risk of human contact or ingestion. It is possible, however, that these soils may be exposed during future excavations. For example, the Greater Ithaca Activities Center (GIAC) has plans to replace the above-ground swimming pool at the site with an in-ground pool (Marean, 1986). Other possible excavations would be for utility repairs. Such excavations would present risks to workers of exposure to coal tar-related chemicals in the soil. Because of the toxicological properties of PAHs, their presence in the soil warrants further soil investigations at the site.

The chemical data obtained during Task 2 show that groundwater criteria are exceeded in shallow groundwater at the site. Several of these chemicals may be expected to be found in the shallow groundwater offsite. As with soils, there are no clearly identified receptors of chemicals detected in the shallow groundwater at Court Street. There is one shallow well, ½-mile northwest of the site, which is used for irrigating vegetables. Given the direction and rate of groundwater flow in the shallow system, however, chemicals in groundwater from the site would not be expected to impact this well. Exposures to chemicals in shallow groundwater might occur during excavations for utility repair or new construction in the site vicinity or through seepage of groundwater into basements.

Chemicals in the shallow soil and groundwater are not expected to migrate vertically to the more permeable sand and gravel aquifers because of the previously identified silt aquitards. The aquifer at a depth of 50 to 100 feet is currently a source of wash water for an industrial plant ¼-mile downgradient of the site. This aquifer and the one beneath it (at 300 feet below ground surface) have been shown to be of acceptable quality for potential use as water supply sources for the City of Ithaca (metcalf and Eddy, 1968).

The Task 2 investigations also confirmed the presence of coal tar in the storage vessels, in the original gas holder foundation, and in the soil. These waste deposits constitute a contact hazard if the soils or storage vessels are disturbed but also represent a source of chemicals that may leach to the groundwater. Furthermore, the coal tar in the storage vessels exhibits the RCRA ignitable characteristic of hazardous waste.

The air data collected during test pitting activities do not indicate a risk associated with air emissions at the present time. If, however, the coal tar in the storage vessels or in the saturated shallow soils were exposed for an extended period of time (e.g., during excavation), data necessary to assess the risks and activate precautionary measures should be collected at the time the source areas were exposed.

On the basis of this preliminary risk assessment, further soil and groundwater explorations are warranted at Court Street. The Task 3 program is needed to determine whether chemicals have moved offsite in the shallow groundwater or into the intermediate sand layer. Better definition of the distribution of coal tar and related chemicals in the soil is also needed. Additional sampling of air at the site during Task 3 is not necessary to assess risks associated with existing site conditions, but may be necessary during activities resulting in exposure of coal tar wastes.

4.4 PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES

A list of remedial alternatives which could be used to address the environmental concerns identified during Task 2 at the Court Street site is presented in Table 11. This list has been revised since the completion of Task 1 to reflect knowledge of the site gained from Task 2 investigations. The list will be further refined at the end of Task 3. The final selection of alternatives will be made after completion of the risk assessment.

TABLE 11

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
ITHACA-COURT STREET SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Soils	Containment	Capping	The site is covered with asphalt and the storage vessels have concrete covers. A thicker, more impervious cap could further reduce infiltration and, therefore, the rate of leaching of chemicals from the soils into the groundwater. Volatilization of chemicals to the air might also be further reduced.
		Slurry Wall	Generally used in conjunction with extraction and treatment of groundwater; could be used to retard the migration of chemicals by positioning in the clayey silt stratum.
	Removal	Excavation and Transport	Involves excavation and removal with subsequent transportation to another location. Potential impact on air quality during excavation and longterm liability at disposal site should be considered.
	Disposal	Landfilling	Landfill selection depends on whether wastes are hazardous or non-hazardous. If hazardous, they must be disposed of in a properly licensed RCRA landfill.
	Treatment	Incineration	Proven technology, effective in destroying organics. Onsite units require test burns prior to full scale use.
		Biodegradation	Several recent applications of this technology to coal tar and coal tar-contaminated soils have been reported in the literature. This treatment requires experimentation to determine the proper organisms and optimal operating conditions. It can be applied in situ, through land farming, or by use of a batch reactor vessel.
		Solidification	Involves mixing the waste with cement to incorporate the waste into the cement matrix. Process improves handling and is inexpensive. Does not destroy compounds but reduces toxicity by reducing availability to biota. Method is currently commercially available.
		Soil Aeration	This process removes organic contaminants from soils by partitioning. Some further treatment system may be required to treat the air, and potential impacts on air quality must be evaluated. The effect of this process on semivolatile contaminants would have to be evaluated prior to implementation.
		Vacuum Extraction	Underground wells are operated under a vacuum to volatilize and extract soil gases. Vacuum system is constructed onsite to remove and collect volatile and semivolatile compounds from the unsaturated soil zone. May require extensive carbon air treatment system to treat the off gases. Effectiveness on semivolatile compounds would have to be evaluated prior to implementation.
	Access Control	Posting Fencing Land Restrictions	Prevents contact with hazardous constituents. Will be considered in conjunction with other technologies.
	No Action		To be considered in conjunction with other technologies.

TABLE 11 (Cont.)

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
ITHACA-COURT STREET SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Groundwater	Containment	Slurry Wall	See soils.
		Capping	See soils.
	Diversion	Low Permeable Barriers	Prevent chemical migration within shallow aquifer.
		Injection Wells/Interceptor Trenches	Control groundwater flow direction. Generally used in conjunction with groundwater extraction.
	In Situ Treatment	Biodegradation	Analysis/culture of the contaminated water to determine the present activity and nutrient levels needed to stimulate hydrocarbon-utilizing bacteria.
		Aquifer Flushing	May include the use of chemical additives. Often used in conjunction with groundwater removal.
		Other Technologies	Cost-effectiveness is dependent on concentration and types of contamination. Physical or physical/chemical technologies such as oxidation, precipitation, etc. may be applicable to highly contaminated waters.
	Removal	Extraction of Groundwater via Pumping	If large volumes of water are to be extracted, onsite treatment may be appropriate. May include recharge or discharge to surface drainage. Extent of contamination and required operating period is not known. May require years of operation.
	Treatment	Carbon Adsorption	Contaminated carbon filters require appropriate disposal or regeneration. Data regarding process efficiency and applicability is available.
		Biodegradation	Onsite biological treatment may be considered if large volumes of groundwater require treatment. Extracted groundwater may also be released to publicly owned treatment works for secondary biological treatment depending on present plant capacity, waste characteristics, and feasibility.
		Steam Stripping	Steam stripping is essentially a continuous fractional distillation process using steam to remove organics from aqueous wastes. Residuals, including steam condensate recovered solvents, and "stripped" effluent must be disposed or treated.
		Incineration	Likely to destroy organic wastes in groundwater, but process cost is expected to be high.
		Ozonation/UV Photolysis	Ultraviolet light is used to enhance the reactivity of ozone and achieve oxidation o organic compounds. UV light cannot effectively destroy pollutants in opaque solutions, however. Process by-products are also a concern.
	No Action		To be considered in conjunction with other technologies.

TABLE 11 (Cont.)

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
ITHACA-COURT STREET SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Air	Control	Capping - clay liner - synthetic liner	The asphalt already controls the release of volatile chemicals. The addition of a more impervious cap may require collection and removal of contained vapors.
	Removal of Source	Excavation	Major excavation to remove source of volatilizing chemicals may result in short-term degradation of air quality when soils are exposed to the atmosphere.
	No Action		May be appropriate at this site. To be considered in conjunction with other technologies.
Contents of Coal Tar Storage Vessels	Removal	Vacuum Suction to Tank Truck Pump Via Submersible Pump	After pumpable quantities are removed, some coal tar will remain in vessels. Further cleaning methods include steam cleaning, and the use of surfactants or solvents. Must consider the effects of removal on the structural integrity of the vessels and adjacent building and on air quality.
	Coal Tar Treatment	Landfilling	See soils.
		Incineration	See soils.
	Aqueous Phase Treatment	See Groundwater Treatment	All groundwater treatment technologies would be applicable.
	In-situ Treatment	Biodegradation	See soils and groundwater. Storage vessels could possibly be used as reactor vesse

5.0 CONCLUSIONS AND RECOMMENDATIONS

In this section, the findings of the Task 2 initial field investigation program are summarized. Based on these findings, additional data needs for risk assessment and conceptual design are identified. A Task 3 program to satisfy the data requirements is then recommended.

5.1 SUMMARY OF TASK 2 FINDINGS

From the Task 2 field investigations at the Court Street site, it was learned that:

1. The shallow subsurface deposits consist of horizontally bedded delta front silts and sand.

2. There are two potentially independent groundwater flow systems in the near surface deposits: a shallow unconfined system and an intermediate semi-confined system.

3. Groundwater flow in the shallow system appears to be to the west-southwest, but additional data are needed to verify this interpretation.

4. Groundwater flow in the semi-confined sand aquifer under most of the site is to the northwest.

5. The land use surrounding the site is primarily residential and commercial. Currently there are no potential contributors to chemicals in the groundwater immediately upgradient of the site but there are a number of potentially sensitive land uses in the area.

6. The coal tar storage vessels contain a combined total of approximately 12,000 gallons of coal tar and 14,000 gallons of water. The tar exhibits the hazardous waste characteristic of ignitability.

7. PAH compounds detected in the soil and groundwater by the HPLC/UV method need to be confirmed by GC/MS analysis.

8. Chemicals related to former coal gasification activities are present in the shallow soil and groundwater near the former gas plant structures.

9. The concentrations of most organic chemicals in the shallow groundwater (4 to 15 feet) are above some of the applicable federal and/or state criteria for these chemicals.

10. Chemicals were found in one well in the intermediate (25 to 35 feet) sand aquifer on only one occasion. The quality of this aquifer should be verified with additional sampling at both existing and new monitoring wells.

11. There are no significant releases of chemicals to the air attributable to the site.

12. The potential for chemical migration offsite is highly dependent on the existence of preferential flow paths.

5.2 DATA NEEDS

The additional data needs identified during Task 2 fall into five general categories:

1. Site plan development;
2. Specific identification and quantification of chemicals;
3. Chemical distribution;
4. Chemical migration; and
5. Potential receptors.

Data requirements in each of these categories are listed in Table 12 and discussed below.

Most of the analytical data for Task 2 was generated with HPLC/UV methods. For risk assessment purposes, these data should be confirmed using a more specific detection method such as GC/MS. It is especially important to confirm positive HPLC results with GC/MS. The confirmatory analyses performed during Task 2 on Court Street samples indicate that a greater number of PAH compounds may be present at lower concentrations than shown with HPLC.

Further data on the distribution of chemicals in soil and groundwater are needed for both risk assessment and conceptual design. Soil samples from test pits in the former active plant area are necessary for determination of the extent of site-derived chemicals in the soil. Chemical data from shallow groundwater locations upgradient and downgradient of the site (new wells) as well as on-site (existing wells) are necessary to assess the distribution of chemicals detected in the shallow system. The Task 2 finding that site-derived chemicals are not present in the intermediate sand aquifer except at MW-5 needs to be confirmed in Task 3. This will require a new deep well immediately downgradient of the former gas holders as well as continued sampling of the existing wells. A deep well upgradient of MW-5 is needed to help define the source of chemicals detected there.

Additional data are needed to evaluate the potential routes for chemical migration. The impact of man-made features (e.g., building foundations, utility trenches) on shallow groundwater flow needs further study. In addition, verification of the direction of shallow and intermediate groundwater flow is needed through additional water level monitoring points. More data on vertical seepage gradients are necessary in order to assess the significance of groundwater flow through the silt aquitard.

Potential sensitive land uses within a ½-mile radius of the site were identified in Task 2. For risk assessment purposes, this radius needs to be extended to one-mile and potential as well as existing land uses need to be addressed.

TABLE 12
TASK 3 DATA REQUIREMENTS AND ACTIVITIES
ITHACA-COURT STREET SITE

General Data Requirements	Specific Data Requirement	Related Task 3 Activity
Specific Identification and Quantification of Chemicals	Confirmation of Task 2 analytical results obtained with HPLC/UV methods.	Use of GC/MS analysis on all soil and groundwater samples.
Chemical Distribution		
Soil	Further chemical data from soil near gasification structures.	Sampling and analysis of soil from test pits TP-10 to TP-15 and former distribution holder.
	Chemical data from shallow soil upgradient and downgradient of the site.	Sampling and analysis of shallow soil from borings B-1SH, B-4SH, B-5SH, B-10SH, B-11SH, and B-12SH.
	Chemical data from intermediate sand stratum downgradient of the site.	Sampling and analysis of sand stratum at boring B-11D.
Shallow groundwater	Chemical data from shallow groundwater upgradient, on-site, and downgradient of the gasification structures.	Installation of monitoring wells, MW-1SH, MW-4SH, MW-5SH MW-10SH,MW-11SH, and MW-12SH. Sampling and analysis of groundwater from all shallow wells.
Intermediate aquifer	Chemical data from sand aquifer downgradient of the site.	Installation of MW-11D. Sampling and analysis of groundwater from all deep wells.
Chemical Migration	Assessment of the impact of man-made features on shallow groundwater flow.	Study of utility and building plans; examination of building foundations with TP-10 and TP-11.
	Verification of interpretation of shallow groundwater flow direction.	Groundwater level measurements from shallow wells and piezometers.
	Further definition of vertical gradients.	Water level data from shallow and deep well clusters at four locations. Grain-size analysis performed on clayey silt.
Potential Receptors	Identification of potentially sensitive land uses, land ownership, and land use trends.	Land use survey within a one-mile radius of the site; review of tax maps, comprehensive plans, and existing zoning ordinances.

5.3 TASK 3 RECOMMENDATIONS

A scope of work for Task 3 is described in the Work Plan for the Court Street site, completed in October 1985 (E.C. Jordan, 1985). Because the specific elements of the Task 3 program could not be defined at that time, a general program representing the anticipated maximum level of effort that would be required at Court Street was presented and costed. Based on the Task 2 findings, changes to the proposed program and corresponding budget are recommended.

The Task 3 activities recommended to meet the data needs described above are listed in Table 12. They consist of: test pits, borings, and monitoring well installations; soil and groundwater sampling; laboratory chemical analysis using GC/MS methods; utility and building foundation survey; and a land use investigation. The proposed exploration locations are shown in Figure 18. Jordan plans to use Parratt-Wolff, Inc., of East Syracuse, New York to provide drilling and backhoe excavation services.

5.3.1 Utility and Building Survey

An investigation was made during Task 1 of past and present buried utilities which could be providing transport routes for chemicals from the Court Street site. The data gathered during Task 1 need to be expanded to include the depth of identified utility trenches with respect to the depth to groundwater in order to assess the significance of these features. Sources of information would include the Ithaca Water and Sewer Department, the city engineer, the Ithaca Planning Department, the Historical Society Library, and geotechnical explorations. Similarly, the impact of building foundations on shallow groundwater movement should be investigated. The key data needs would be depth of footings and foundation materials.

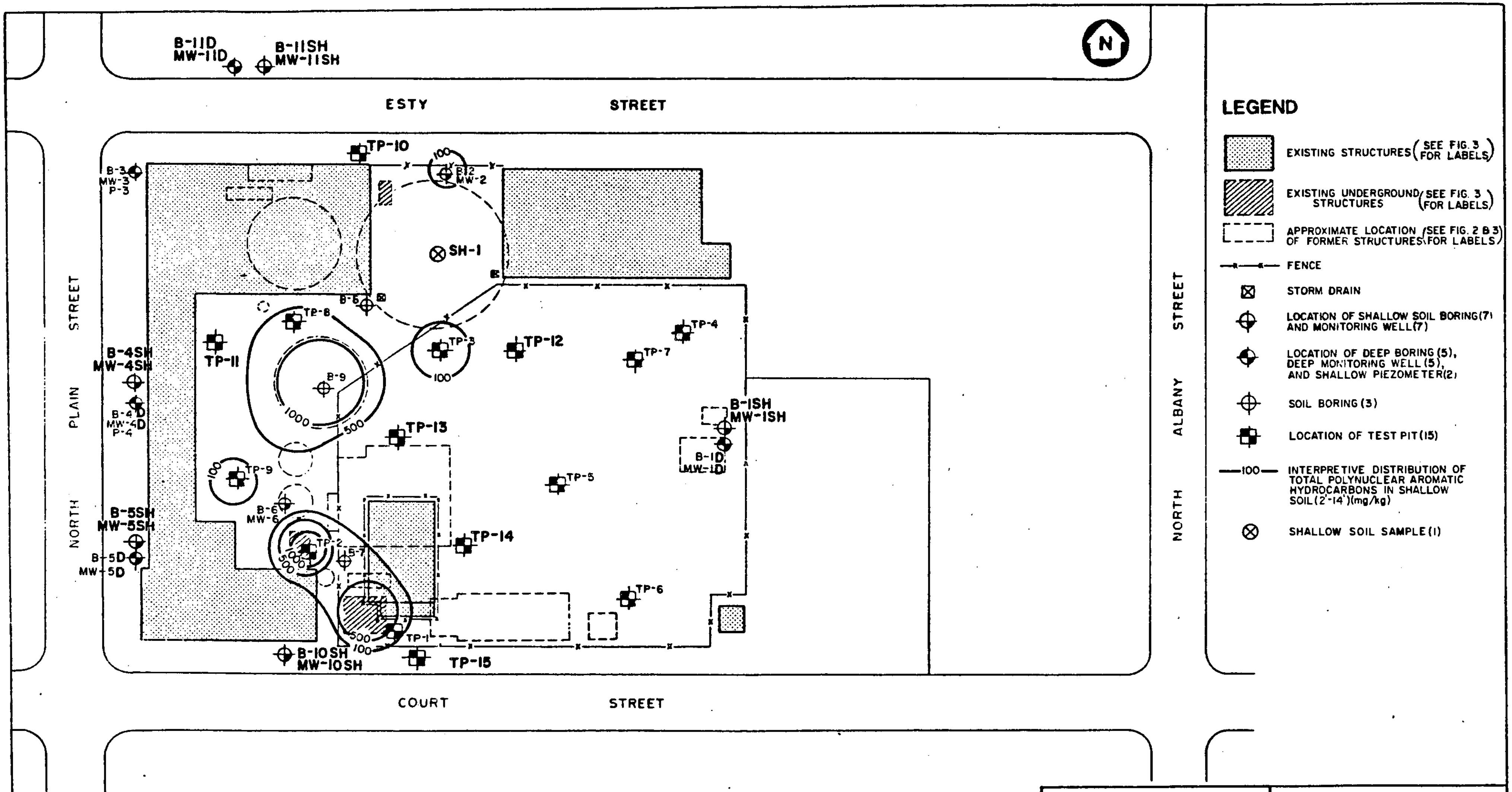
5.3.2 Test Pit Investigations

Six test pits (TP-10 through TP-15), each approximately 8 feet deep, are recommended at the locations shown in Figure 18. Test pits would be completed prior to the borings and in accordance with procedures outlined in the Work Plan. All test pits would be used to define volumes and concentrations of chemicals in soils for use in conducting the risk assessment and conceptual design tasks. Test pits TP-10 and TP-11 would also provide information on the foundations of the existing buildings.

One sample from each test pit (plus one duplicate sample) would be collected for laboratory chemical analysis. In addition, a sample of the soil above the concrete pad of the former distribution holder should be analyzed. The sample would be obtained by breaking through the asphalt and driving a split spoon to 2 feet.

5.3.3 Borings

Six shallow borings (B-1SH, B-4SH, B-5SH, B-10SH, B-11SH, and B-12SH, each approximately 20 feet deep) and one deep boring (B-11D, approximately 40 feet deep) are recommended for soil characterization and monitoring well installation. The borings would be advanced using hollow stem augers. Boring



APPROXIMATE SCALE

0 50 100 FEET

NOTE: TASK 3 TEST PITS, BORINGS, AND MONITORING WELLS ARE LABELLED IN BOLD PRINT.

BASE MAP SOURCE: TAX ASSESSORS MAP; AERIAL PHOTO NO. 6-250, FLOWN 4/18/76 ON FILE AT THE ITHACA PLANNING DEPT; SANBORN MAPS FOR THE CITY OF ITHACA; AND FIELD MEASUREMENTS.

E.C.JORDAN CO.
CONSULTING ENGINEERS

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

PROPOSED TASK 3
EXPLORATION LOCATIONS
ITHACA-COURT ST. SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4616-02

FIGURE 18

procedures described in the Work Plan would be followed. Continuous split spoon sampling, as opposed to sampling at five foot intervals, is recommended at the deep borings (B-11D) and one of the shallow borings (B-10SH). One sample from each boring (plus one duplicate sample) would be collected for laboratory chemical analysis. A sample of the clayey silt should be collected from one of the borings for grain-size analysis. Data collected from the test pit and boring explorations, and the buildings and utility survey will be used in conjunction with information collected in Tasks 1 and 2 to prepare a topographic map of the clayey silt surface.

5.3.4 Monitoring Wells

Monitoring wells should be installed in all seven of the boring locations, according to the standard procedures presented in the work plan. Monitoring well MW-1SH would be the upgradient well for shallow groundwater flow and wells MW-4SH, MW-5SH and MW-10SH would represent downgradient shallow wells. A fifth shallow well (MW-12SH) is proposed for a location to be determined after the other borings are completed. It would be located to monitor groundwater moving off-site from an area of soil contamination, if such an area is identified.

Well MW-11D would be screened in the intermediate sand aquifer for the purpose of monitoring this zone downgradient of the former gas holders. A sixth shallow well (MW-11SH) is also recommended at this location for several reasons. Shallow water level data are needed north of the site to aid in interpretation of groundwater flow direction. Chemical data from the shallow groundwater there will be important if there is a component of shallow groundwater flow in this direction. Finally, a shallow/deep well cluster would provide needed data on vertical seepage gradients. Multi-level wells are proposed for three other locations for the same reason: MW-1D/MW-1SH, MW-4D/MW-4SH, and MW-5D/MW-5SH.

Two rounds of groundwater sampling are recommended in Task 3, as originally proposed. Each round would include sampling of all the Task 2 and Task 3 wells. Two duplicates and three blanks (sampler, trip, and filtration) would be collected on each round.

5.3.5 Air Program

Based on the results of the Task 2 air sampling program, a Task 3 air quality investigation is not recommended. The investigations to date have shown that air quality is not of concern at this site under present use conditions. However, measurements will be taken with a photoionization detector during all subsurface investigations.

5.3.6 Analytical Program

Soil and water samples should be analyzed for the same set of parameters selected for the Task 2 program. However, all organic analyses should be performed using GC/MS methods as opposed to HPLC/UV methods.

5.3.7 Elevation Survey

At the completion of the field program, the locations and elevations of Task 3 test pits, borings, monitoring wells, and sample locations will be determined, relative to the previously established benchmark and reference point, by a surveyor. The site plan developed in Task 2 will be updated to include the Task 3 exploration points.

5.3.8 Land Use Assessment

One modification to the land use assessment proposed in the Work Plan is recommended. The proposed assessment included a review of building permits covering the last ten years for the area within a one-mile radius of the site in order to gain an overview of land use trends, pressures, and potential land uses. It is recommended that the building permit review be replaced by a review of available land use plans and codes and discussions with Ithaca planners.

6.0 TASK 3 SCHEDULE AND COSTS

6.1 SCHEDULE

Authorization to proceed with Task 3 investigations was received on November 30, 1986 and the Task 3 field program was started the week of December 1, 1986. The site-specific Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) were updated before starting the field program. The generic QAPP and HASP had already been submitted. A tentative schedule for all Task 3 field activities is shown in Table 13.

Jordan intends to keep NYSEG informed of findings and progress of the test pit and drilling programs at least twice per week, and immediately if any unexpected conditions are encountered. During other field activities, Jordan plans at least weekly contact with NYSEG.

6.2 COSTS

The costs of the expanded problem definition program (Task 3) were originally submitted to NYSEG in the Court Street Work Plan (E.C. Jordan Co., 1985). These costs have been modified to reflect the program recommended in Section 5.3 of this report. The new program costs are presented in Table 14.

TABLE 13

TENTATIVE SCHEDULE FOR TASK 3 FIELD ACTIVITIES ITHACA-COURT STREET SITE

Activity	Proposed Date
Exploratory Test Pits/Borings/ Monitoring Well Installations	December 1-12, 1986
Site Survey	January 1987
Groundwater Sampling	February and May 1987
Land Use Survey	April 1987

7.0 REFERENCES

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APPENDIX A

FIELD DATA

Appendix A-1

Test Pit Logs
and
Field Observations

TEST PIT OBSERVATIONS
ITHACA-COURT STREET SITE

Test Pit	Total Depth (ft)	Visual Appearance	Odor and PID Characterization	Samples Collected*
TP-1	9.0	Storage vessel dimensions measured 23 ft. (east-west) by 20 ft. (north-south) and the exposed sidewall appeared to be formed concrete. A cement access hole was observed in the southeast corner of the vessel top. Coal tar was visible in soil from 6.5 to 9.0 ft. deep.	Odors noted in coal tar coated soils. PID readings of background levels (0.4 ppm) were recorded in ambient air near the pit. No readings were obtained from the bottom of the pit.	Sample TP-1/S-1 at 9.0 ft.
TP-2	6.5	Storage vessel dimension measured 9 ft. (east-west) and sidewall material was formed concrete. An access hole covered with a metal plate was found at the southern end of the vessel. The building foundation consisted of 3.5 ft. of brick and stone masonry (no mortar) on granular fill. Soils at a depth of 6 ft. were coated with tar and a black liquid was observed seeping from beneath the building foundation at about 3.0 ft. below ground.	Strong odors noted in tar coated soils. PID readings of 5 to 50 ppm recorded in the bottom of the pit.	Sample TP-2/S-1 at 6.0 ft. Duplicate sample TP-2/S-1 Dup
TP-3	8.0	Highly stratified profile. Red, coke-like material from 0.6 to 0.7 ft and white ashy material from 1.9 to 2.0 ft. Root channels and dessication cracks in clay from 3.0 to 8.0 ft contained a black viscous liquid with lime green sheen.	Slight coal tar odor observed in white ash material. Stronger petroleum product smell noted from 3.0 to 8.0 ft. PID readings at background levels throughout profile (0.4 ppm).	Sample TP-3/S-1 at 1.9 to 2.0 ft. Duplicate sample TP-3/S-1 Dup. Sample TP-3/S-2 at 6.0 to 7.0 ft.
TP-4	7.0	No visual signs of coal tar wastes. Cobbles observed on south side of test pit from 5.0 to 7.0 feet.	No chemical odors. PID-background level.	None
TP-5	7.5	No visual signs of coal tar wastes.	No chemical odors. PID-background levels.	None
TP-6	7.6	No visual signs of coal tar wastes.	No chemical odors. PID-background level.	None

TEST PIT OBSERVATIONS
ITHACA-COURT STREET SITE
(continued)

Test Pit	Total Depth (ft)	Visual Appearance	Odor and PID Characterization	Samples Collected*
TP-7	8.5	No visual signs of coal gas production wastes. Gravel and cobbles from 6.0 to 8.5 ft; more prominent on the north side of the pit.	Slight odor detected at 4.5 to 8.5 ft. PID-2.4 ppm	Sample TP-7/S-1 at 6.0 to 7.5 ft.
TP-8	3.6	Several subsurface structures were encountered at approximately 2.0 to 3.0 ft. There was a metal storage tank on the north side which was covered by a dark grey ashy material coated with an oily substance. Moving south, a concrete wall on top of brick and then a timber form was encountered. A second wall made of mortared stone was encountred 3 ft. south of the first. A black liquid which appeared to be coal tar was seeping from the stone wall into the depression between the two walls.	Strong odors were present throughout the digging. PID readings were 10 to 15 ppm at the top of the pit and 70 to 100 ppm in the bottom of the pit.	Sample TP-8/S-1 at 2.8 to 3.1 ft. (soil from top of metal tank).
TP-9	8.5	Lead pipe (inactive) observed at 3.3 ft. Observed heavy sheen and oily product on loose gravelly, clayey, silt from 7.0 to 8.0 ft.	Odors noted from 6.0 to 8.5 ft. below ground surface. PID readings of 30 to 50 ppm were recorded.	Sample TP-9/S-1 at 7.0 to 8.0 ft. Sample TP-9/S-2 at 8.0 to 8.5 ft.

---

* All samples collected were sent to ERCO for analysis except sample TP-9/S-1.

TEST PIT RECORD

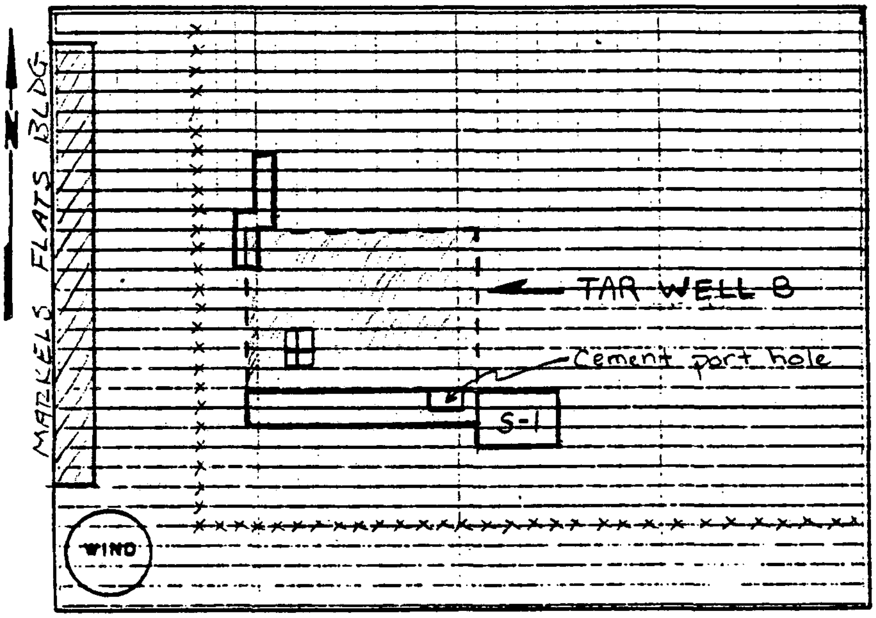
1 OF 2

SITE NYSEG COURT ST.

TEST PIT TP-1 DATE 1/16/86 TIME ST. 1400 END 1700

COORDINATES ______ GRID ELEMENT ______

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 20 FT

CREW MEMBERS

1. JOHN TETERSON
2. SCOTT WIBBY
3. CRAIG FINDLAY
4. CARPENTER #1
5. CARPENTER #2
6.

MONITOR EQUIPMENT

PI METER	[✓ Y] N
EXPLOSIVE GAS	[✓ Y] N
AVAIL. OXYGEN	Y [✓ N]
OVA	Y [✓ N]
OTHER	

PHOTOGRAPHS, ROLL ______

EXPOSURE ______

NOTES Test pit is 27' Long on the South side of tar well B. This pit followed the edge of the tar well from west to east starting at the tar well's SW corner. The well is 23' ± from corner to corner on this side. A cement port hole 2'x2' ± and raised 6" ± was found in the SE corner of the tar well set back 1' ± from the edges. The east side of the pit was dug 6'x8' ± to a depth of 9' ±. This was to provide an adequate soil profile, observe the side of the tar well and obtain analytical samples. Additional digging was done on the NW side of the tar well. The 3rd corner of the tar well was found giving the well dimensions of 20'x23' ±. Digging to depth in this area was obstructed by pipes and bricks from 2'-3' deep.

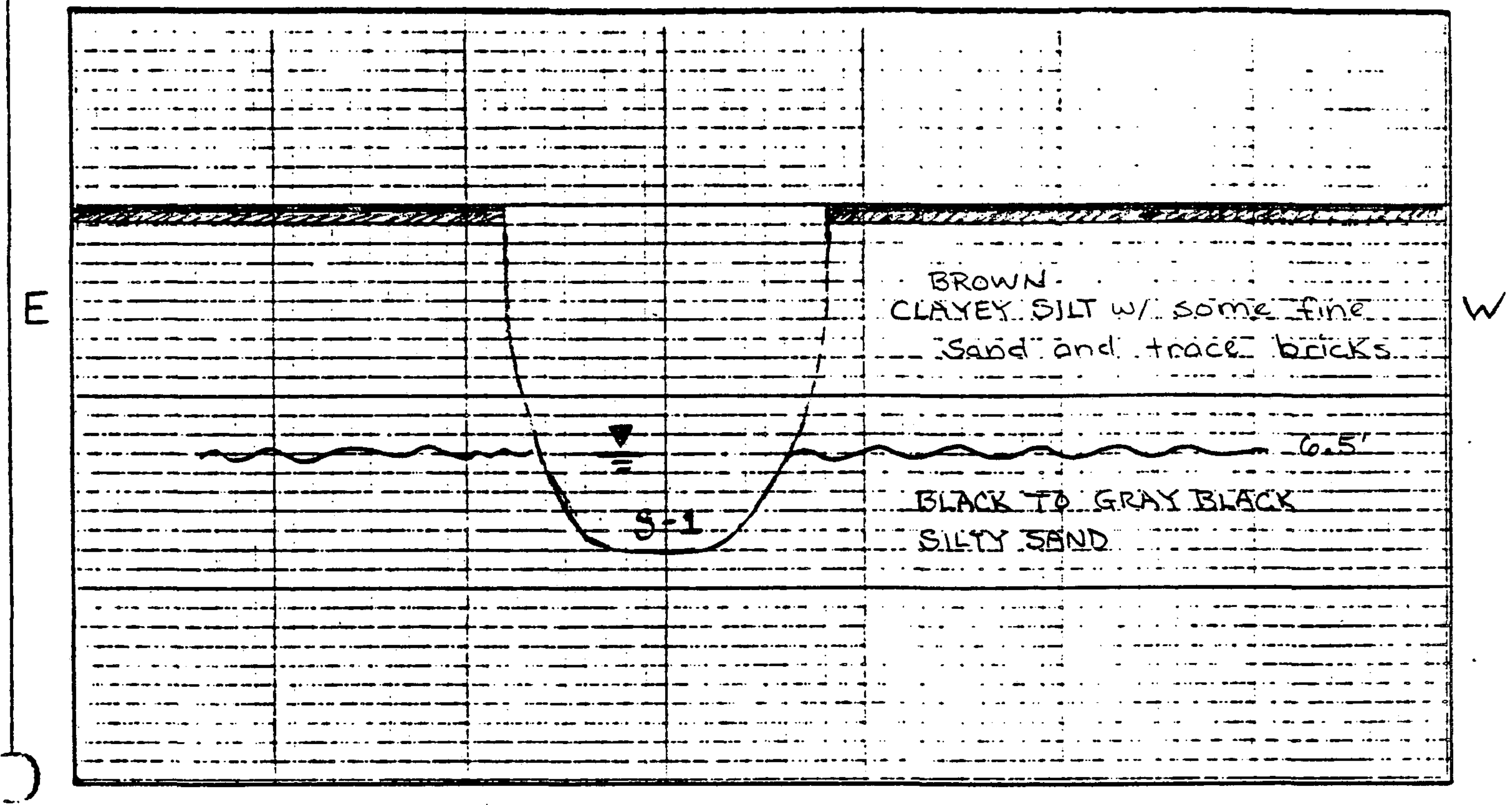
⊞ CECOS sampling location

TEST PIT RECORD
PROFILE ALONG TEST PIT- TP-1

SITE NYSEG COURT ST.

2 OF 2

DEPTH (FT) SCALE 1" = 10 FT



NOTES:

0-.4' Asphalt
.4'-6.5' Brown Clayey Silt w/ some fine sand; this formation is firm, moist & contains trace brick fragments; Slope stability is very good, no collapse
6.5'-9.' Black to Gray black Silty Sand w/ trace clay; Very wet w/ seepage @ 6.5'; Much visible coal tar and some odor. S-1 was taken from Back hoe bucket sample at 9'. Poor slope stability at 6.5'+.

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	9'		
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ____
ATTACHMENTS ____

John W Peterson
SIGNATURE

S-1 Sent to ERCO and NYSEG

TEST PIT RECORD

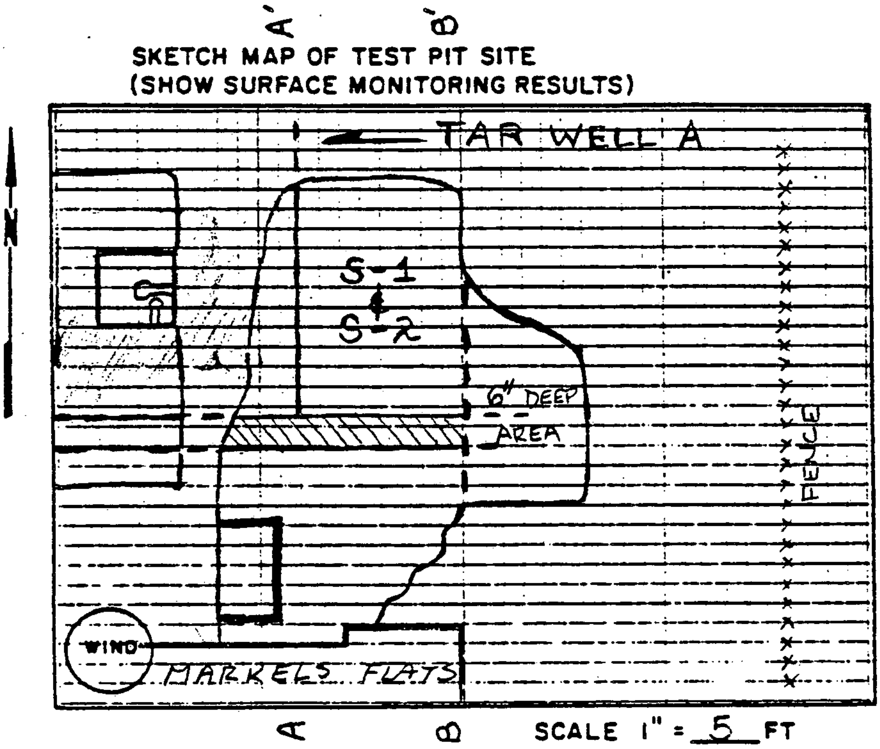
1 OF 2

SITE NYSEG COURT ST.

TEST PIT TP-2 DATE 1/16/86 TIME ST. 0900 END 1400

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 5 FT

CREW MEMBERS

1. JOHN PETERSON
2. SCOTT WIBBY
3. CRAIG FINDLAY
4. CARPENTER #1
5. CARPENTER #2
6.

MONITOR EQUIPMENT

PI METER	[✓ Y] N
EXPLOSIVE GAS	[✓ Y] N
AVAIL. OXYGEN	Y [✓ N]
OVA	Y [✓ N]
OTHER	

PHOTOGRAPHS, ROLL

EXPOSURE

NOTES Test Pit 2 was dug by the corner of the building by the area of tar well A. Digging was slow due to the proximity to the building as well as obstructions encountered. Cement square next to building 2.5'x2.5' ±. Coal tar noticed seeping between it and the building at 3' ± below ground. Potential for coal tar under the building is high. Brick and cement wall 5' ± from building which Abuts tar well A. It does not Appear to extend very deep. The north side of the Pit was dug deepest to obtain soils information and analytical samples. Additional digging to provide Some more geotechnical information revealed a steel manhole 2'x2' ±. Pipes were observed going east & South from within the manhole.

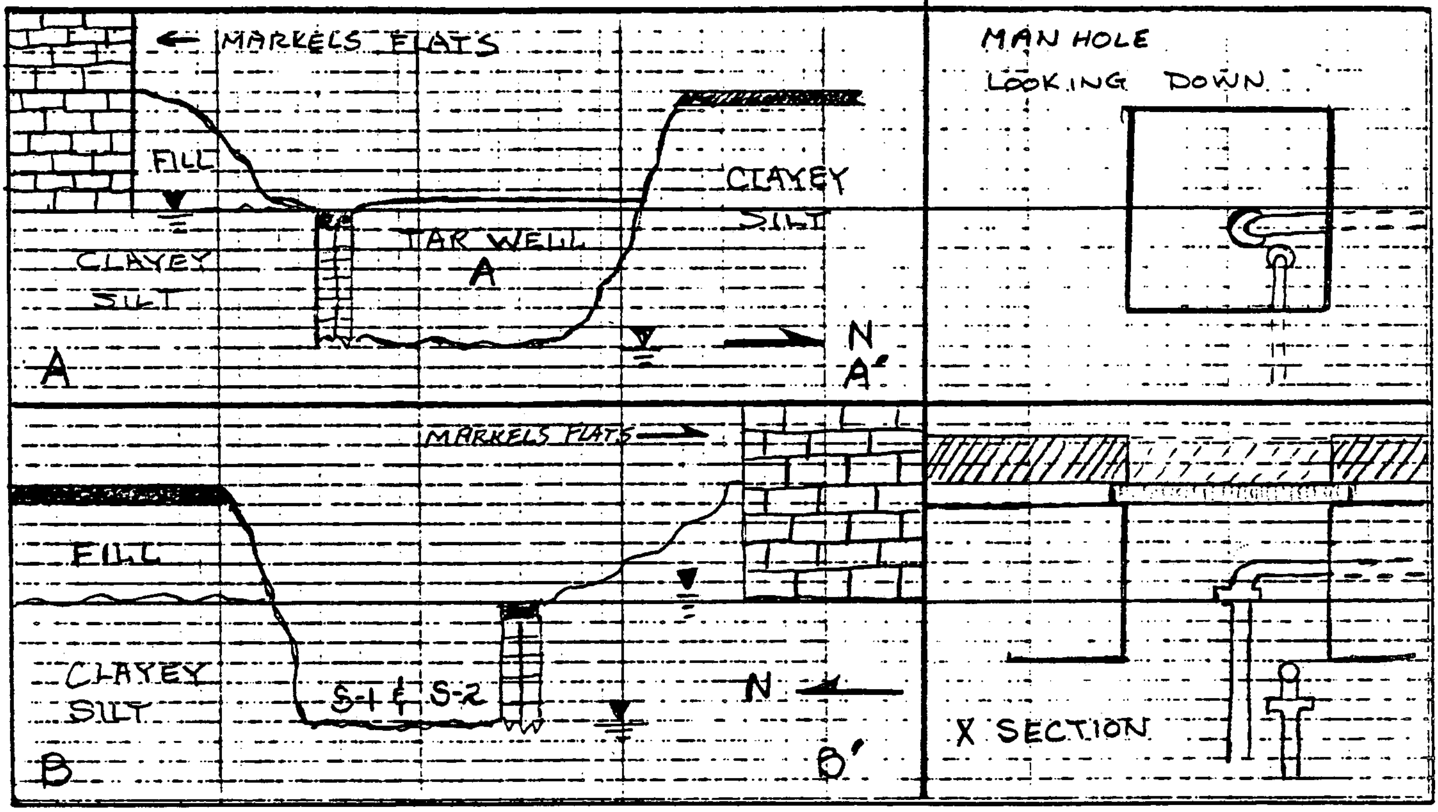
TEST PIT RECORD
PROFILE ALONG TEST PIT- TP-2

SITE NYSEG COURT ST.

2 OF 2

DEPTH (FT) SCALE 1" = 5 FT

SCALE 1" = 2' FT



NOTES:

A Brown Clayey silt on top of and around Tar Well, trace sand, moist, soft-firm.

B Fill to 3', Brown/Black Silty sandy gravel

3'+ Brown Clayey silt w/ trace sand, moist, soft-firm

S-1 & S-2 taken at 6' in visible coal tar area, seepage at 6' w/ some at 3' next to markels Flats, Some odor in pit, no ambient P.I. readings.

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	6'		
S-2	6'		
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______
ATTACHMENTS ______

John W Peterson
SIGNATURE

S-1 & S-2 sent to ERCO & NYSEG.

TEST PIT RECORD

1 OF 2

SITE NYSEG COURT ST

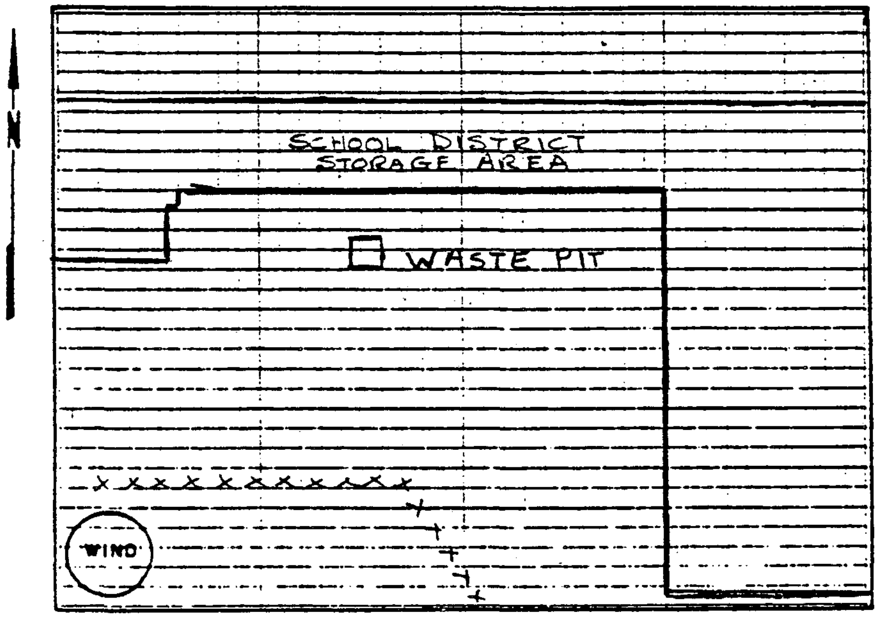
TEST PIT WASTE PIT DATE

TIME ST. 1245 END 1345

COORDINATES N/A

GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = ≈50 FT

CREW MEMBERS

1. JOHN PETERSON
2. SCOTT WIBBY
3. CARPENTER #1
4. CARPENTER #2
5.
6.

MONITOR EQUIPMENT

P I METER [✓ Y] N

EXPLOSIVE GAS [✓ Y] N

AVAIL. OXYGEN Y [✓ N]

OVA Y [✓ N]

OTHER

PHOTOGRAPHS, ROLL

EXPOSURE

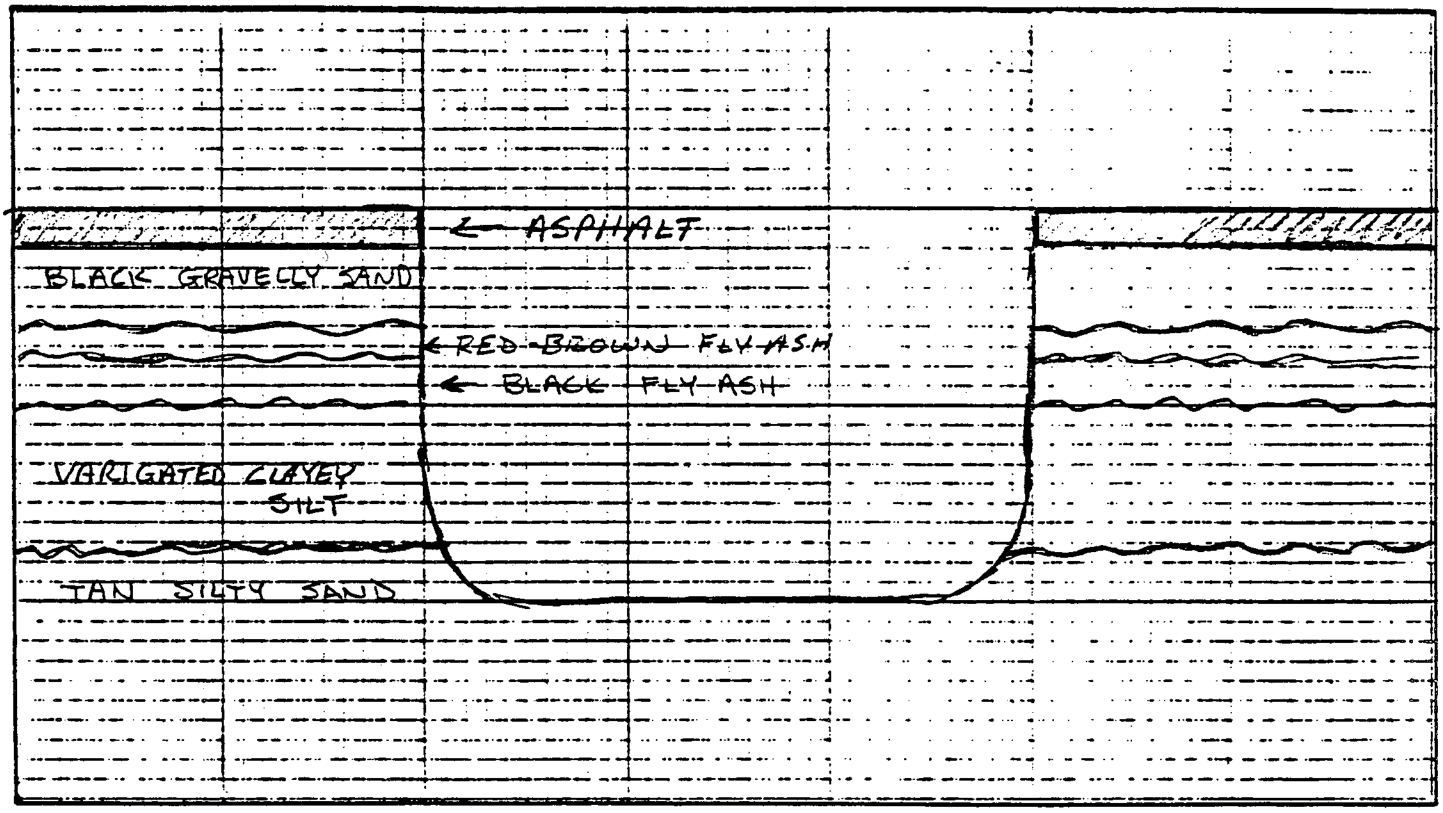
NOTES A waste pit was dug in a convenient location in the area of the school district storage area. The purpose of this pit was to provide a centralized decon. area for the drill rig, drill auger & tools & the back hoe, as well as other decon. fluids. This pit was to allow infiltration of fluids into the soils that is not possible on the asphalt covered site. The pit was dug to a depth of 4', with dimensions of 4'x6' ±.

TEST PIT RECORD
PROFILE ALONG TEST PIT- WASTE

SITE NYSEG COURT ST.

2 OF 2

DEPTH (FT) SCALE 1" = 2' FT



NOTES:

0-.4' ASPHALT

.4'-1.2' Black gravelly Sand & some cobbles, Dry, hard, tar stained, No odor

1.2-1.5 Reddish Brown, oxidized fly ash, no odor

1.5-2.0 Black tarry fly ash w/ some Sand

2.0-3.5' Variegated Clayey silt w/ some tar stains, light gray to dark gray slight odor

3.5-4.0 Grades to tan Silty sand, dry-damp

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	NO SAMPLES		
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______
ATTACHMENTS ______

John W Peterson
SIGNATURE

TEST PIT RECORD

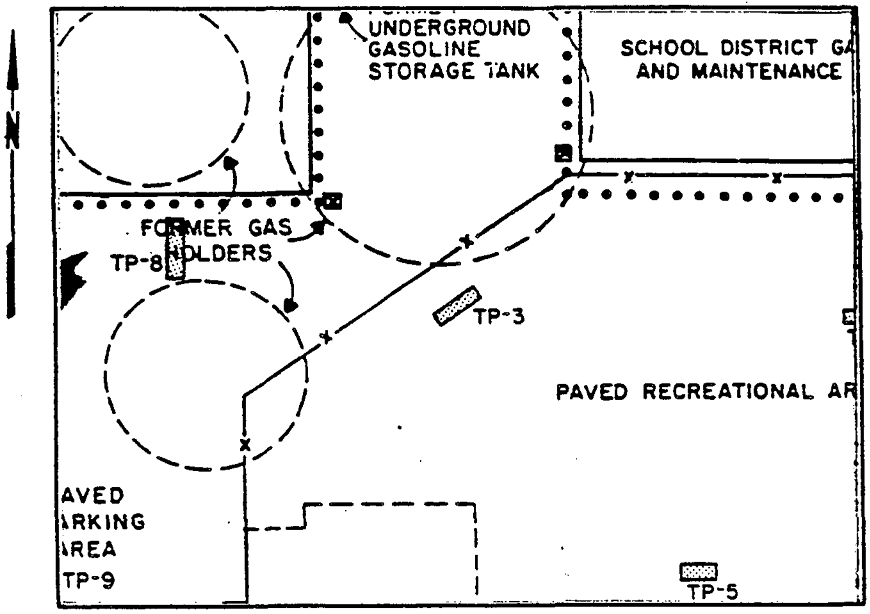
1 OF 2

SITE NYSEG, COURT ST SITE, ITHACA, N.Y.

TEST PIT TP-3 DATE 5/19/86 TIME ST. 1440 END 1550

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS

1. C. MOORE
2. J. PETERSON
3. BACK HOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT

P I METER [✓ Y] N

EXPLOSIVE GAS [✓ Y] N

AVAIL. OXYGEN [✓ Y] N

OVA Y [✓ N]

OTHER Radiation Meter

PHOTOGRAPHS, ROLL ______

EXPOSURE ______

NOTES Test pit dimension is 2.5' x 8.0' and it is 8 feet deep.

0.3'-2.0' Varied stratifed fill. Some coal tar odor noticed in the white ashen material (Fly ash ?).

2.0'-3.0' Dark gray brown to black clayey silt. Some small black flecks noticed. Slight coal tar odor.

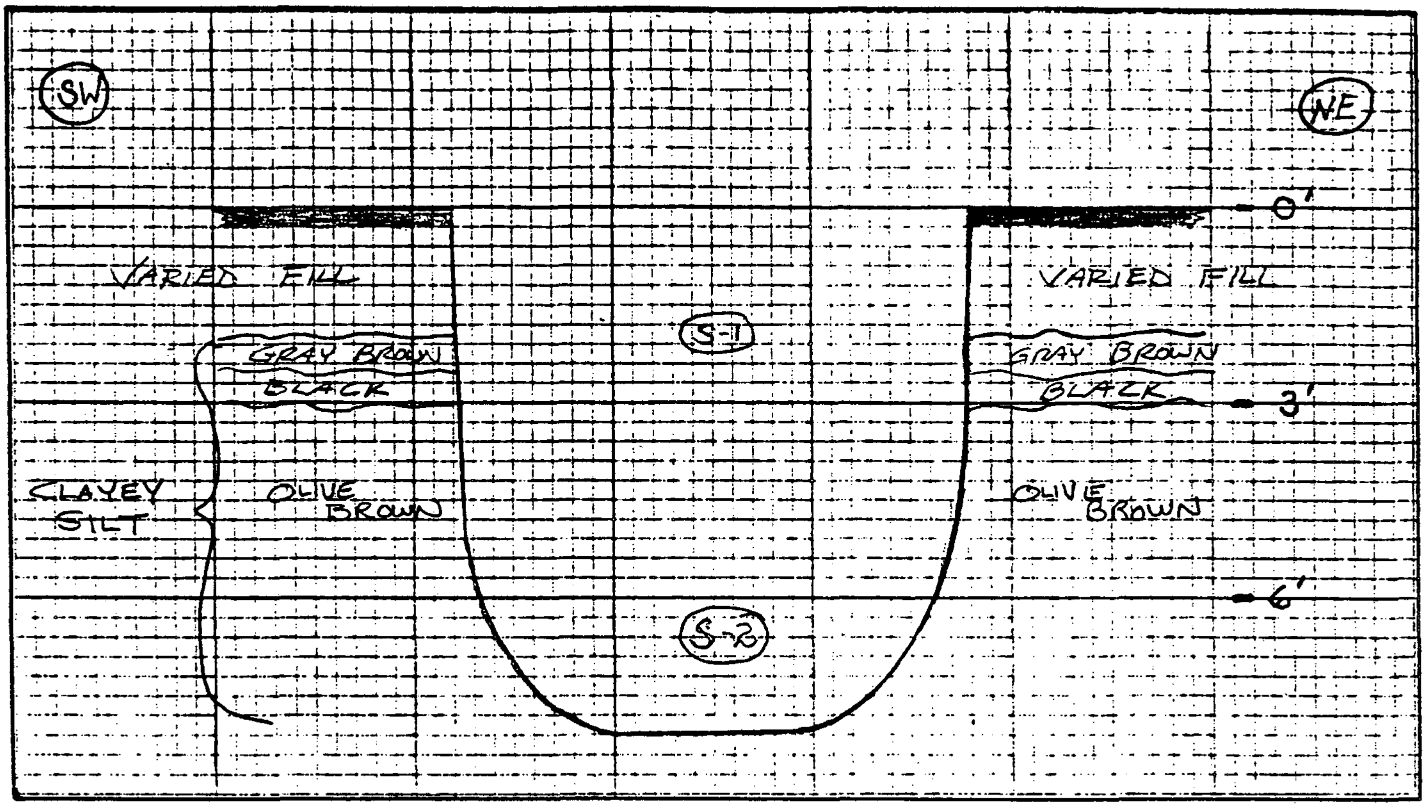
3.0'-8.0' Olive brown clayey silt. Dessication cracks and old root channels are visible. Moderate to heavy decomposition of organic material in root channels. Root channels up to 4mm. Dessication cracks and channels are iron stained. Channels and cracks are wet and contaminated with coal tar and/or petroleum products. Lime green sheen to wetness. Strong coal tar and/or petroleum product odors. Background PI readings in the ambient air.

TEST PIT RECORD
PROFILE ALONG TEST PIT- 3

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT) SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-0.6' Dark brown gravelly silt

0.6'-0.7' Red, ashen, light density

0.7'-1.1' Light brown silty sand

1.1'-1.7' Black loose gravelly sand

1.7'-1.9' Gray silty sand, moist, friable with some coarse sand

1.9'-2.0' White ashen material with slight odor

2.0'-2.5' dark gray brown clayey silt with black flecks and slight odor

2.5'-3.0' black clayey silt with slight odor.

3.0-8.0' Olive brown clayey silt, with moderate contamination.

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	1.9'-2.0'	ICEITPXX03/11	
S-2	6.0'-7.0'	ICEITPXX03/21	
S-3			
S-4			
S-5		-	
S-6			
S-7			
S-8			
DUP	1.9'-2.0'	ICEITPXX10/11	

REFERENCE: FIELD BOOK, PG. N/A
ATTACHMENTS N/A

John W Peterson
SIGNATURE

TEST PIT RECORD

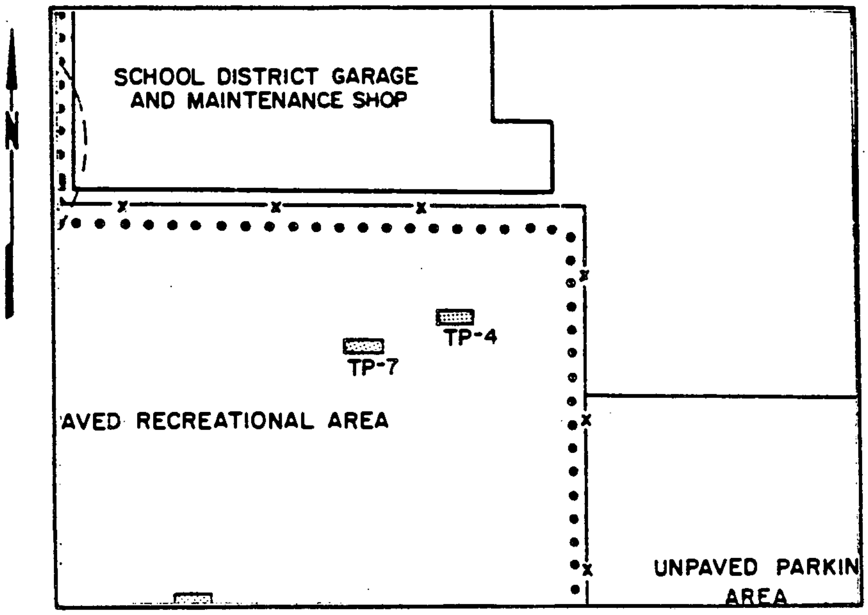
1 OF 2

SITE NYSEG, COURT ST. SITE, ITHACA, N.Y.

TEST PIT TP-4 DATE 5/19/86 TIME ST. 1020 END 1110

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS

1. C. MOOZE
2. J. PETERSON
3. BACKHOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT

P I METER [✓ Y] N
EXPLOSIVE GAS [✓ Y] N
AVAIL. OXYGEN [✓ Y] N
OVA Y [✓ N]
OTHER RADIATION METER
PHOTOGRAPHS, ROLL
EXPOSURE

NOTES Test pit dimension is 2.5'x9.0' and it is 6.7 feet deep.

0.3-1.3' Fill, dark brown gravelly sand

1.3'-6.7' Clayey silt

5.2'-6.7' gravelly silty sand with some cobbles on south side.
Orange in color at the top and brown elsewhere.
Wet in this area.

No visible signs of contamination. No samples taken.

Background PI readings in the ambient air.

ECJORDANCO

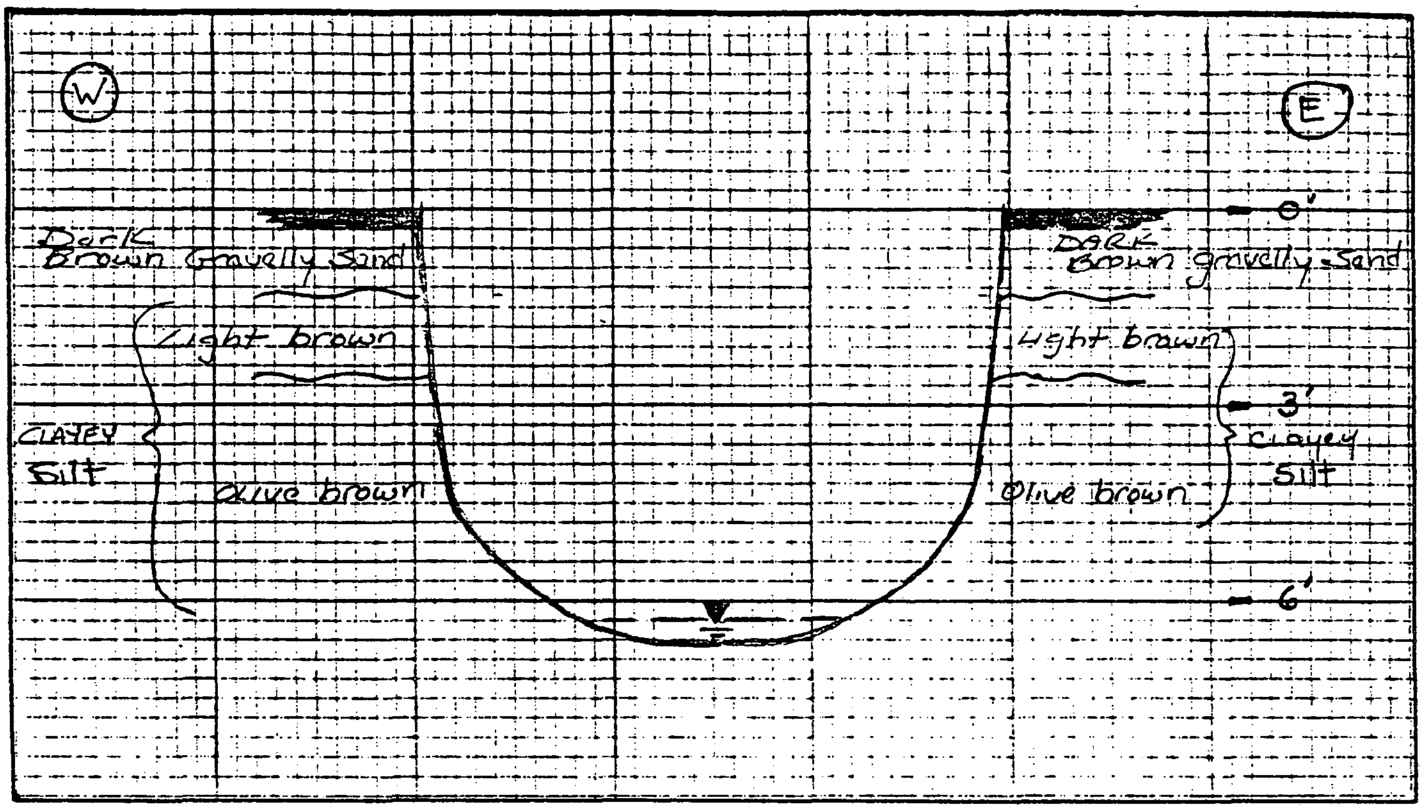
TEST PIT RECORD
PROFILE ALONG TEST PIT- 4

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT)

SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-1.3' Dark brown gravelly Sand

1.3'-6.7' Light brown clayey silt changing to olive brown clayey silt at approx 2.5'. Some fine Sand in areas.

5.2'-6.7' Brown gravelly silty Sand with cobbles on South side of test pit. Orange color at 5.2'

6.3' Static water level in test pit.

SAMPLES OBTAINED (no samples)

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ________

ATTACHMENTS ________

John W Peterson

SIGNATURE

TEST PIT RECORD

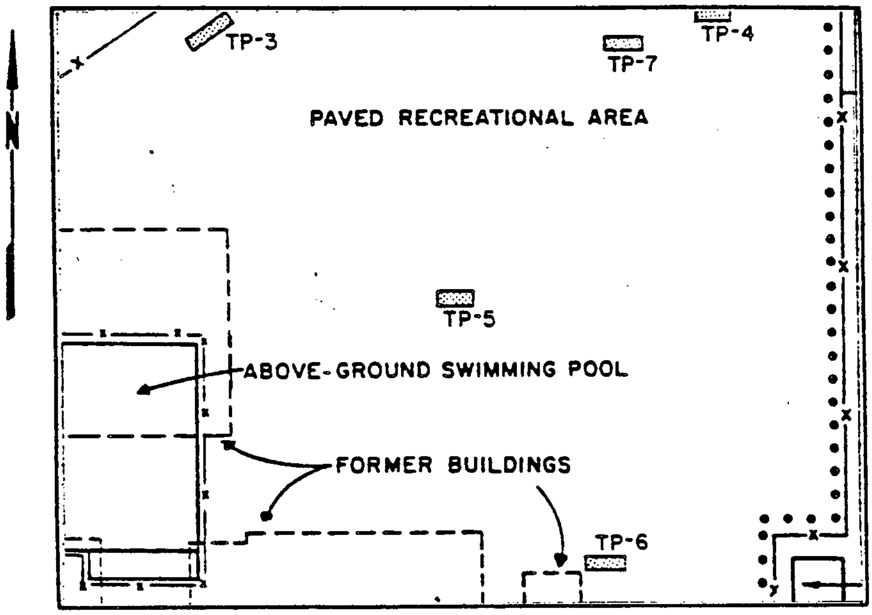
1 OF 2

SITE *NYSEG, COURT ST. SITE, ITHACA N.Y.*

TEST PIT *TP-5* DATE *5/19/86* TIME ST. *1310* END *1345*

COORDINATES *N/A* GRID ELEMENT *N/A*

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = *50* FT

CREW MEMBERS

1. *C. MOORE*
2. *J. PETERSON*
3. *BACKHOE OPERATOR*
4.
5.
6.

MONITOR EQUIPMENT

PI METER [✓ Y] N

EXPLOSIVE GAS [✓ Y] N

AVAIL. OXYGEN [✓ Y] N

OVA Y [✓ N]

OTHER *RADIATION METER*

PHOTOGRAPHS, ROLL

EXPOSURE

NOTES *Test pit dimension is 2.5' x 9.0' and it is 7.5 feet deep.*

0.3'-1.1' Fill, dark brown sand.

1.1'-1.5' Light brown clayey silt.

1.5'-2.9' Brown to dark brown silt.

2.9'-6.0' Olive brown clayey silt.

6.0'-7.5' Gray silt.

No visible coal tar contamination or noticable odors.

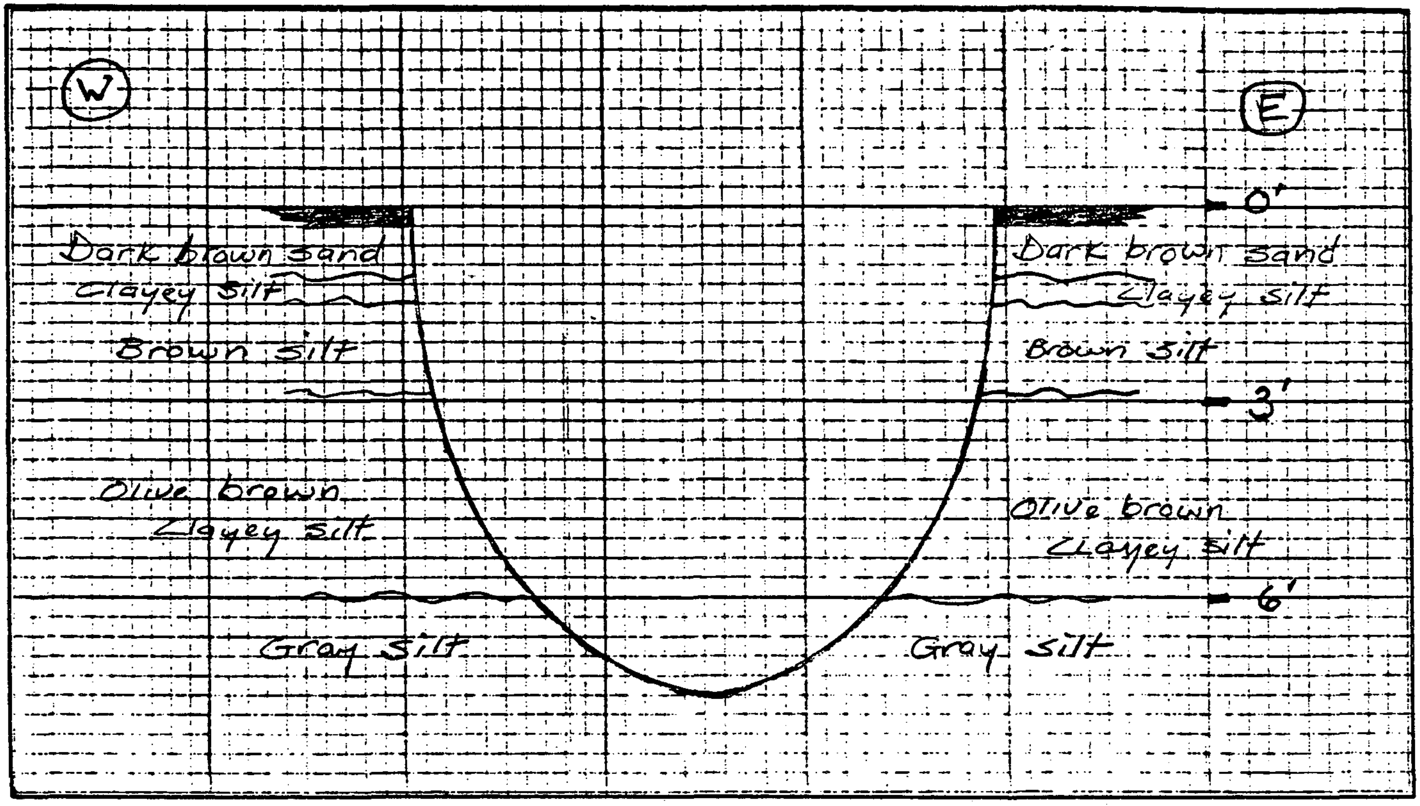
Background PI readings in the ambient air.

TEST PIT RECORD
PROFILE ALONG TEST PIT- 5

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT) SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-1.1' dark brown sand with some orange slatey rock pieces

1.1'-1.5' Varigated light brown clayey silt

1.5'-2.9' Brown to dark brown silt with some cobbles and mottled gray and orange.

2.9'-6.0' Olive brown clayey silt

6.0'-7.5' Gray silt with some fine sand and clay

SAMPLES OBTAINED (No samples)

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5		-	
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______
ATTACHMENTS ______

John W Peterson
SIGNATURE

TEST PIT RECORD

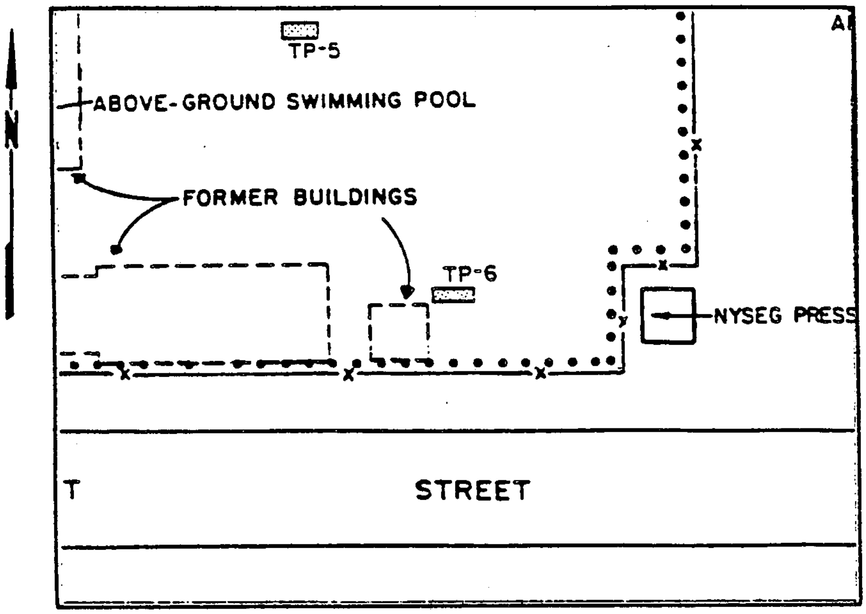
1 OF 2

SITE NYSEG, COURT ST. SITE, ITHACA N.Y.

TEST PIT TP-6 DATE 5/19/86 TIME ST. 1310 END 1345

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS

1. C. MOORE
2. J. PETERSON
3. BACHOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT

PI METER [✓ Y] N

EXPLOSIVE GAS [✓ Y] N

AVAIL. OXYGEN [✓ Y] N

OVA Y [✓ N]

OTHER RADIATION METER

PHOTOGRAPHS, ROLL

EXPOSURE

NOTES Test pit dimenson is 2.5' x 11.0' and it is 7.6 Feet deep.

0.3'-0.8' Black ash.

0.8-2.8 Brown silt

2.8-4.8 Brown clayey silt

4.8-5.3 Gravelly silty sand

5.3-7.6 Clayey silt

No visible coal tar contamination or noticable odors

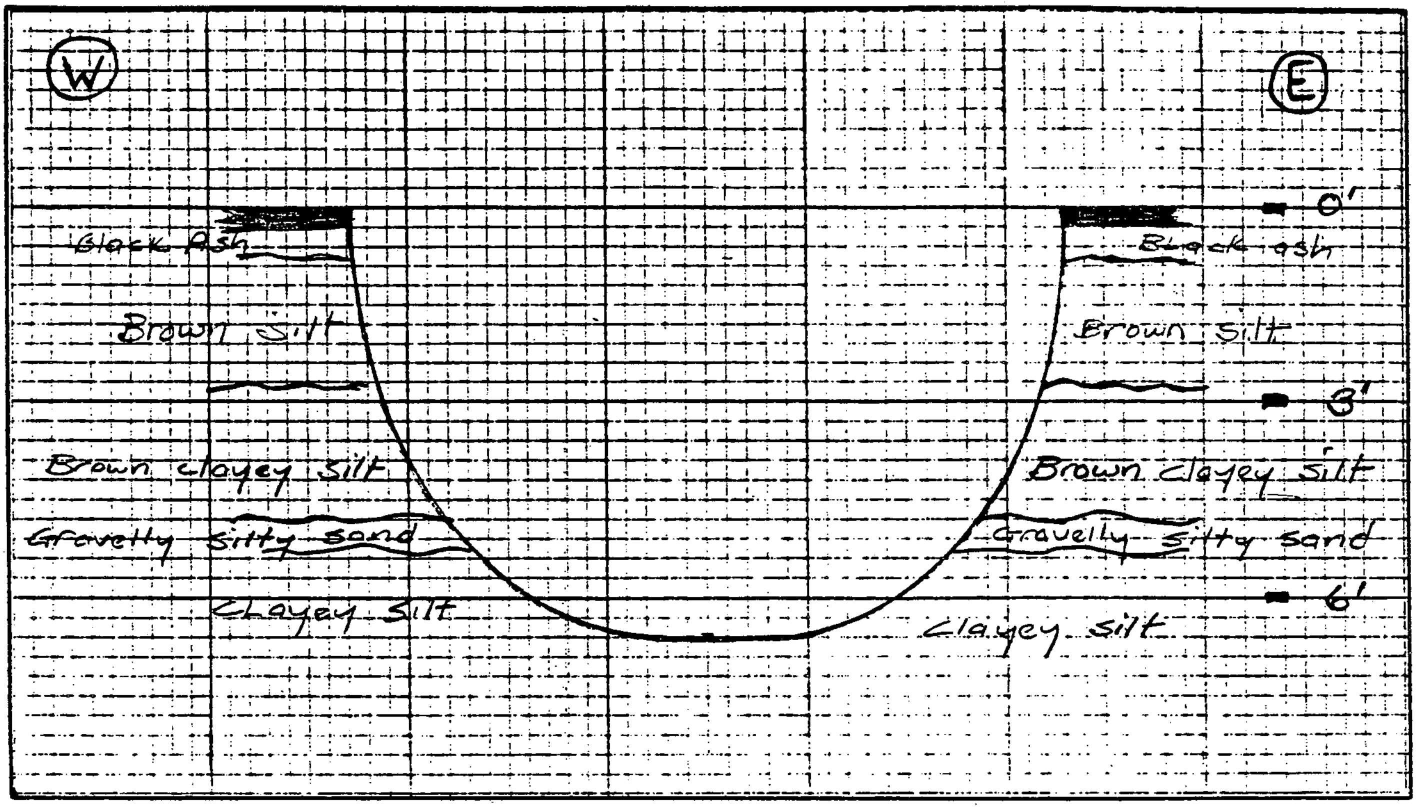
Background PI readings in the ambient air

TEST PIT RECORD
PROFILE ALONG TEST PIT- 6

SITE NYSEG , COURT STREET

2 OF 2

DEPTH (FT) SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-0.8' Brown to Black ashen material, widely graded, loose, with traces of brick

0.8'-2.8' Brown silt with some clay and fine sand, trace cobbles

2.8'-4.8' Light brown to gray brown clayey silt, mottled orange.

4.8'-5.3' gravelly silty sand

5.3'-7.6' Brownish gray clayey silt.

SAMPLES OBTAINED (no Samples)

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5		-	
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______

ATTACHMENTS ______

John W Peterson

SIGNATURE

E.C.JORDAN CO.

TEST PIT RECORD

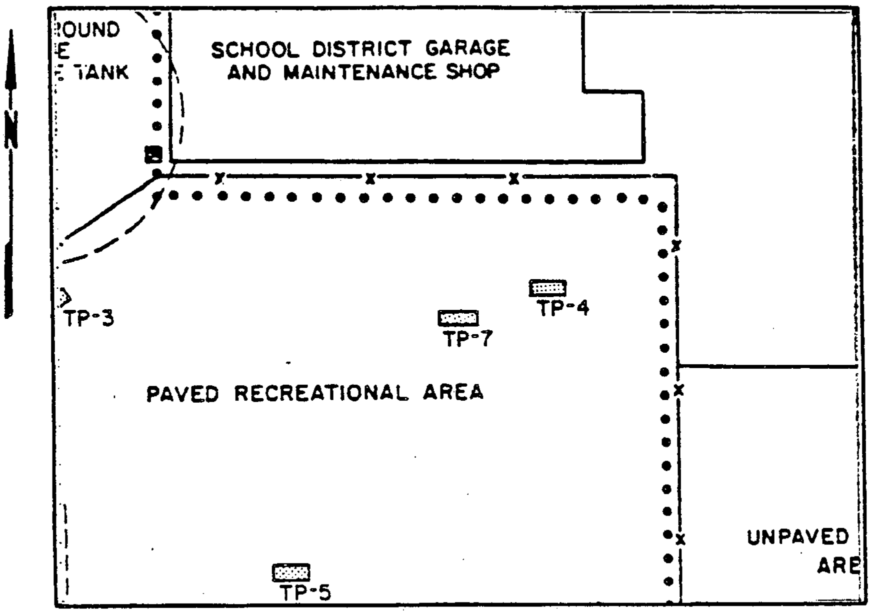
1 OF 2

SITE NYSEG, COURT ST. SITE, ITHACA N.Y.

TEST PIT TP-7 DATE 5/19/86 TIME ST. 1115 END 1210

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS

1. C. MOORE
2. J. PETERSON
3. BACK HOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT

PI METER [✓ Y] N

EXPLOSIVE GAS [✓ Y] N

AVAIL. OXYGEN [✓ Y] N

OVA Y [✓ N]

OTHER RADIATION METER

PHOTOGRAPHS, ROLL

EXPOSURE

NOTES Test pit dimension is 2.5' × 11.0' and it is 8.5 feet deep.

0.3'-3.0' Varied stratified fill

3.0'-6.0' Gray brown clayey silt, some dessication cracks and old root channels with moderate to heavy decomposed organics. Slight coal tar odor with depth.

6.0'-7.5' Gray brown silty sand some gravel and cobbles. Cobbles are more prevalent on north side of test pit. Slight coal tar odor

7.5'-8.5' Gray brown silty sand with many cobbles. Slight coal tar odor.

Background PI readings in the ambient air.

TEST PIT RECORD

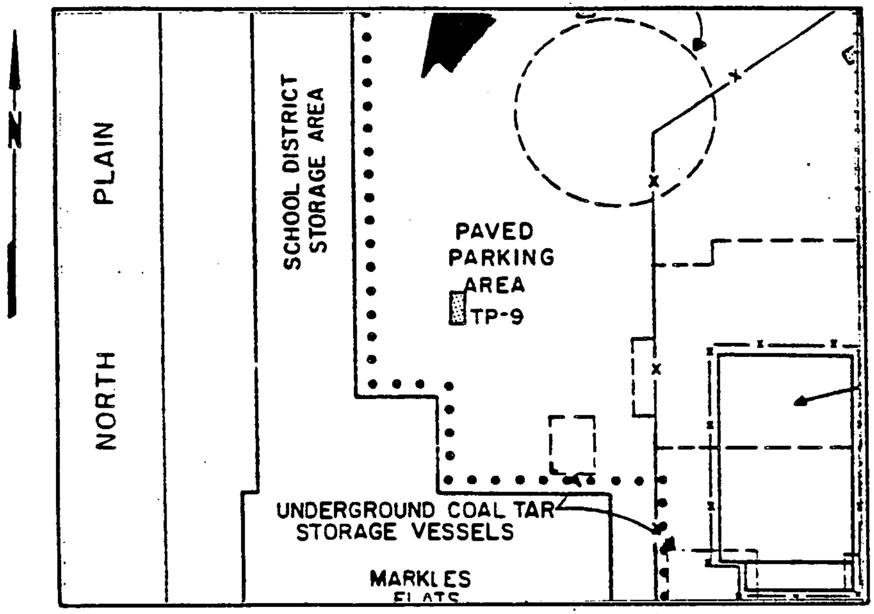
1 OF 2

SITE NYSEG, COURT ST. SITE, ITHACA N.Y.

TEST PIT TP-9 DATE 5/20/86 TIME ST. 0810 END 0930

COORDINATES ____ GRID ELEMENT ____

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS
1. C. MOORE
2. J. PETERSON
3. BACKHOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT
P I METER [✓ Y] N
EXPLOSIVE GAS [✓ Y] N
AVAIL. OXYGEN [✓ Y] N
OVA Y [✓ N]
OTHER RADIATION METER
PHOTOGRAPHS, ROLL ____
EXPOSURE ____

NOTES Test pit dimension is 2.5'x 7.5' and it is 8.5 feet deep.

0.5'-2.2' Fill, dark brown to black gravelly sand with some pockets of light brown to orange brown gravelly silty sand, stratified with some pieces of brick.

2.2'-4.2' Brownish gray clayey silt, some black flecks, old 1½" lead pipe at 3.3', some wood and cobbles at 3.0'.

4.2'-7.0' Olive green clayey silt, black flecks and streaks, some very slight odor, background P.I. readings.

7.0'-8.5' Dark gray gravelly clayey silt, loose, wet, some odor and sheen, saturated with oily brownish liquid, P.I. readings from 30-50 ppm.

Background P.I. readings in the ambient air.

TEST PIT RECORD

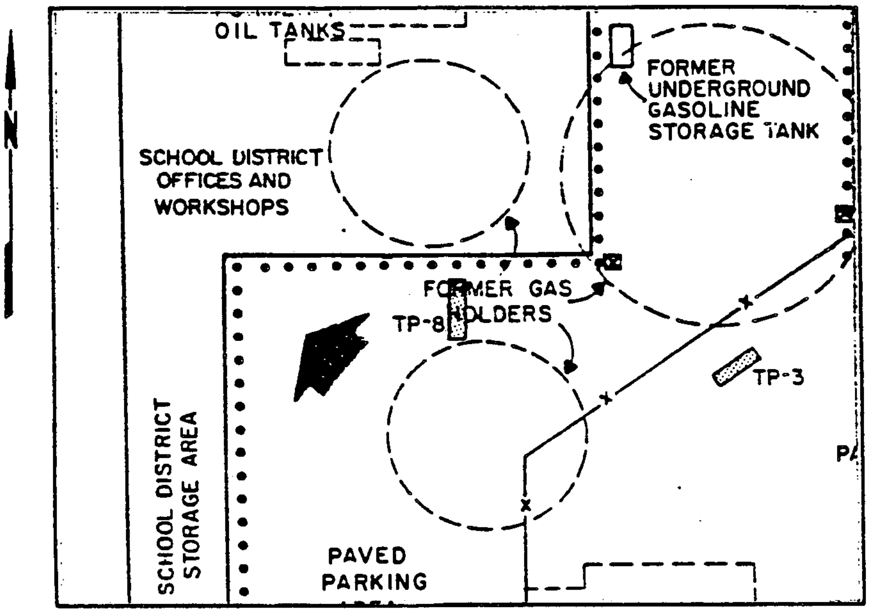
1 OF 2

SITE NYSEG, COURT ST. SITE, ITHACA N.Y.

TEST PIT TP-8 DATE 5/20/86 TIME ST. 0950 END 1205

COORDINATES N/A GRID ELEMENT N/A

SKETCH MAP OF TEST PIT SITE
(SHOW SURFACE MONITORING RESULTS)



SCALE 1" = 50 FT

CREW MEMBERS
1. C. MOORE
2. J. PETERSON
3. BACK HOE OPERATOR
4.
5.
6.

MONITOR EQUIPMENT
P I METER [✓ Y] N
EXPLOSIVE GAS [✓ Y] N
AVAIL. OXYGEN [✓ Y] N
OVA Y [✓ N]
OTHER RADIATION METER
PHOTOGRAPHS, ROLL
EXPOSURE

NOTES Test pit dimension is 2.5' x 15.75' and it is 5.6 feet deep.

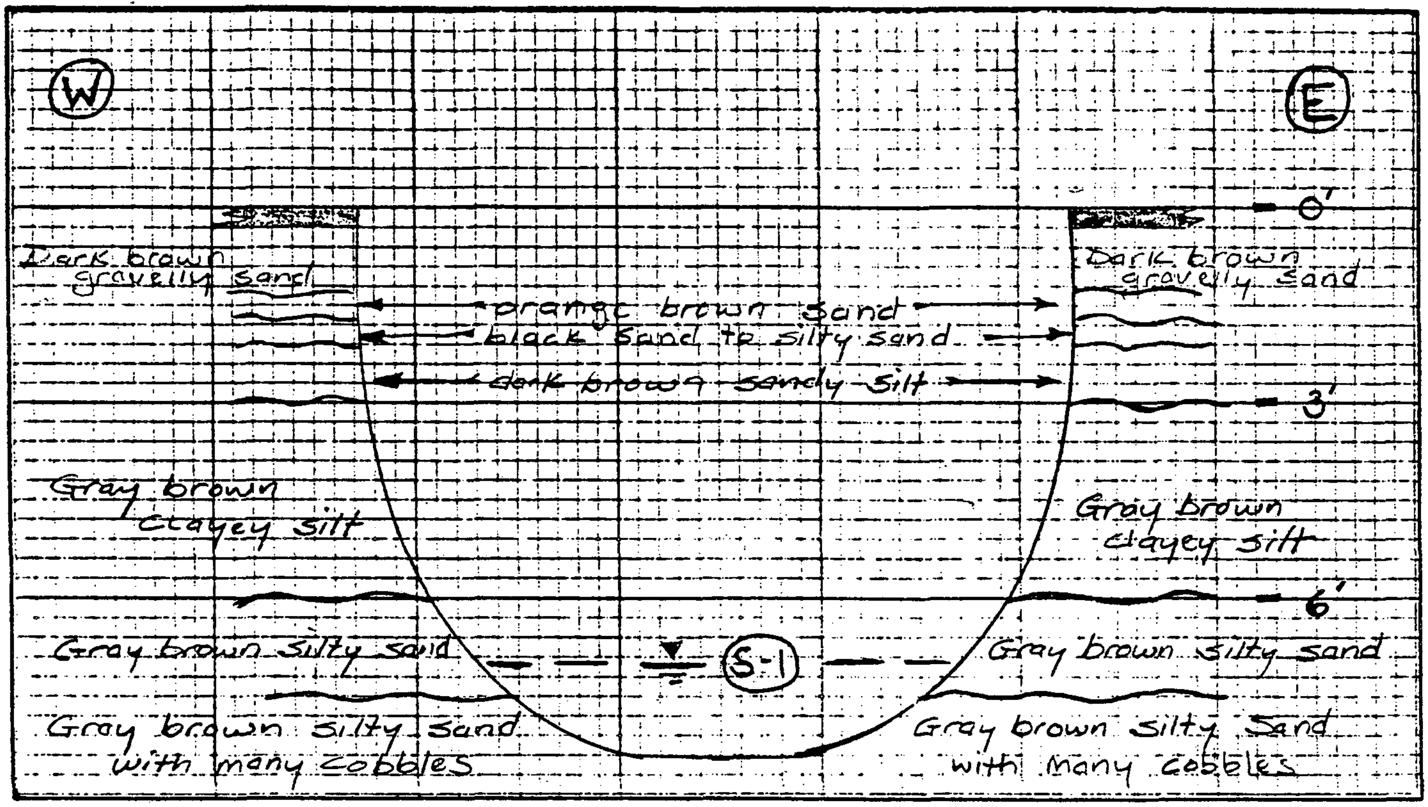
0.0'-0.4' Asphalt 0.4'-3.1,'3.2'&3.6', Varied fill ; dark brown to black gravelly silty sand to gravelly sand with some cobbles, some dark gray ashen material with coal tar odor. 2.8'-3.1' Black tarry material with sheen and coal tar odor. 70ppm P.I reading in bottom of test pit. S-1 taken in black tarry area on metal tank. Some very viscous tarry material noticed seeping from north side of mortared wall at approx. 4.5 feet. Old field stone noticed on top of motared wall, possible wall. Metal tank encountered on north side of test pit along with concrete & brick wall. P.I readings from 10-15 ppm in the top of the test pit. Back ground P.I. readings in the ambient air.

TEST PIT RECORD
PROFILE ALONG TEST PIT- 7

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT) SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-1.3' Dark brown gravelly sand with small cobbles

1.3'-1.7' Orange brown sand

1.7'-2.1' Black sand to silty sand

2.1'-3.0' Dark brown to brown friable sandy silt

3.0'-6.0' gray brown clayey silt

6.0'-7.5' gray brown silty sand with some gravel & cobbles.

7.5'-8.5' Gray brown silty sand with many cobbles

7.0' Static water level

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	6.0'-7.5'	ICEITPXX07/11	
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, P6. ________
ATTACHMENTS ________

John W Peterson
SIGNATURE

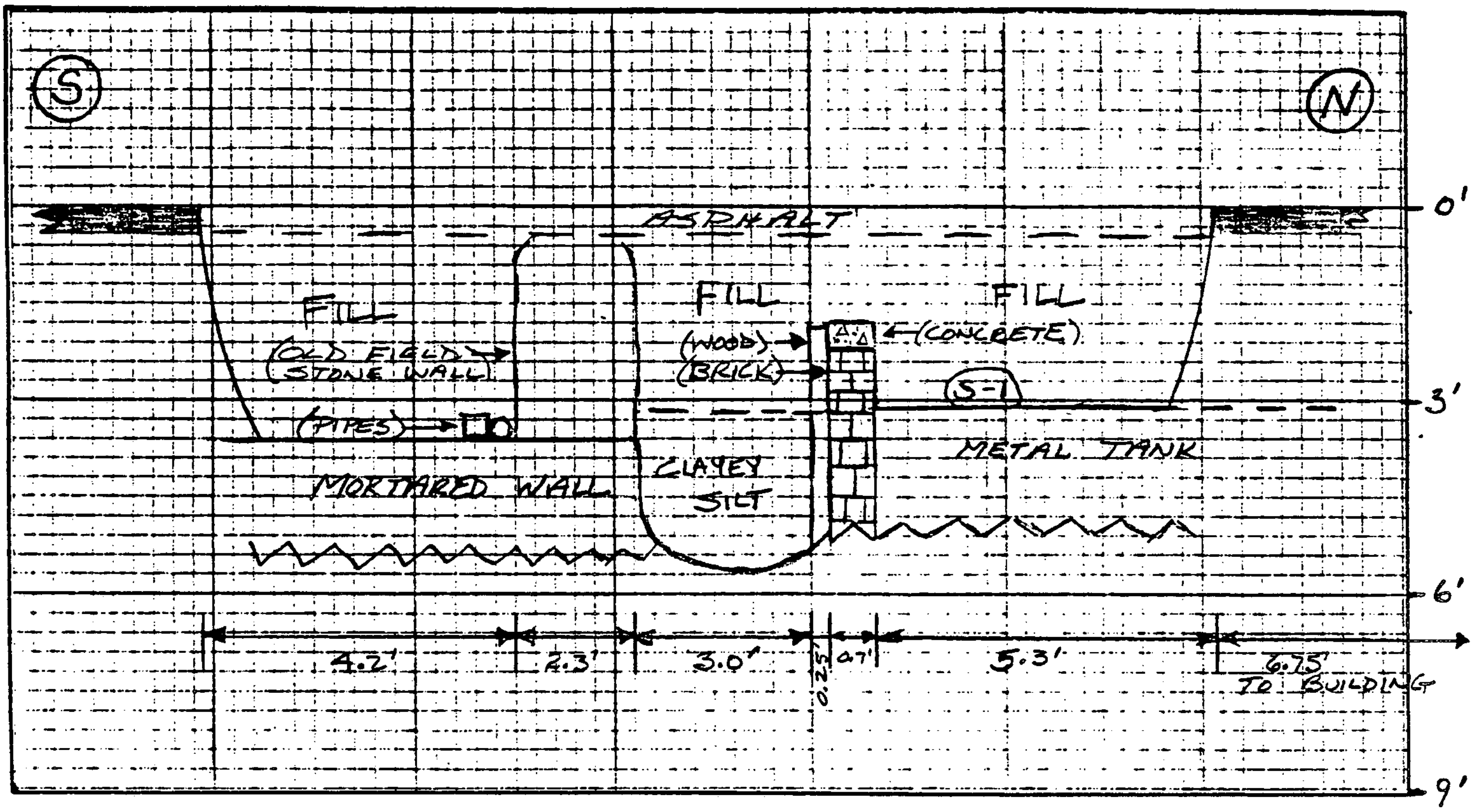
TEST PIT RECORD
PROFILE ALONG TEST PIT- 8

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT)

SCALE 1" = 3 FT



NOTES:

0.0'-0.4' ASPHALT

0.4'-3.2' FILL OVER NORTH HALF OF TEST PIT

0.4-3.6' FILL OVER OLD MORTARED WALL.

3.2'-5.6' CLAYEY SILT IN MIDDLE OF TEST PIT

5.6' TOTAL DEPTH OF TEST PIT.

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	2.8'-3.1'	ICEITPXX08/11	
S-2			
S-3			
S-4			
S-5		-	
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______

ATTACHMENTS ______

John W Peterson

SIGNATURE

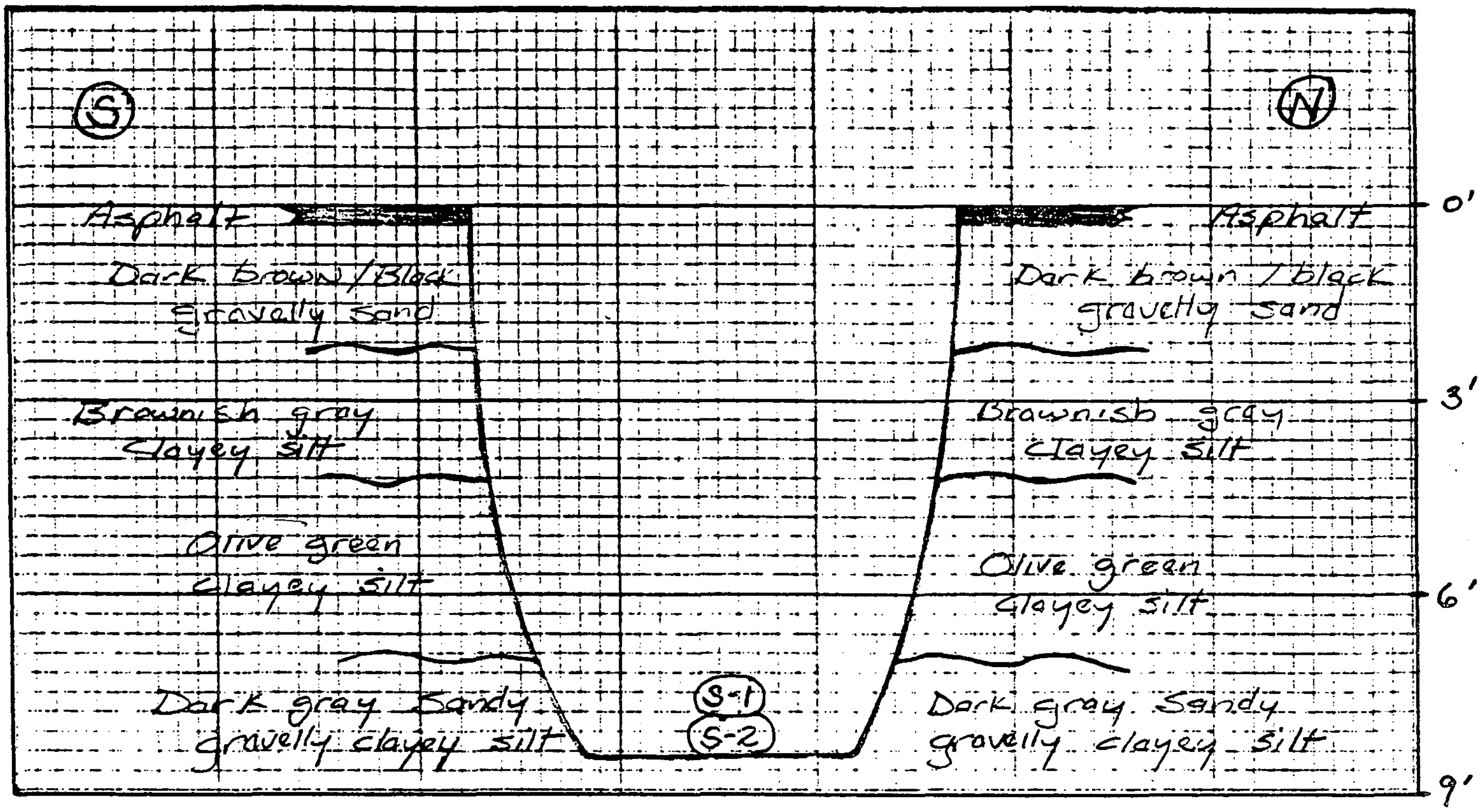
E.C.JORDAN CO.

TEST PIT RECORD
PROFILE ALONG TEST PIT- 9

SITE NYSEG, COURT STREET

2 OF 2

DEPTH (FT) SCALE 1" = 3 FT



NOTES:

0.0'-0.3' Asphalt

0.3'-2.2' Fill, dark brown to black gravelly sand

2.2'-4.2' Brownish gray clayey silt

4.2'-7.0' Olive green clayey silt

7.0'-8.5' Dark gray sandy, gravelly clayey silt.

SAMPLES OBTAINED

NO.	DEPTH (FT)	INIT. SER. NO.	HD. SP. VOA PPM
S-1	7.0'-8.0'	ICEITPXX09/11	
S-2	8.0'-8.5'	ICEITPXX09/21	
S-3			
S-4			
S-5			
S-6		-	
S-7			
S-8			

REFERENCE: FIELD BOOK, PG. ______

ATTACHMENTS ______

John W Peterson

SIGNATURE

Appendix A-2

Coal Tar Storage Vessel Dimensions

DIMENSIONS OF THE COAL TAR STORAGE VESSELS
ITHACA-COURT STREET SITE

	Vessel A	Vessel B
Outside Dimensions		
Length	15 ft. (est.)[1]	23 ft.
Width	9 ft.	20 ft.
Depth	13.5 ft. (est.)	8.5 ft. (est.)
Inside Dimensions		
Length	13 ft. (est.)	21 ft. (est.)
Width	7 ft. (est.)	18 ft. (est.)
Depth	12 ft.	7 ft.
Distance Below Ground Surface		
Top	1.5 ft.	1.5 ft.
Bottom	15 ft. (est.)	10 ft. (est.)
Distance From Building	6 ft.	14.5 ft.
Volume		
Total volume	8,200 gal. (est.)	19,800 gal. (est.)
Volume of coal tar	3,400 gal. (est.)	8,500 gal. (est.)
Volume of water	4,100 gal. (est.)	9,900 gal. (est.)

---

[1] Estimated

Appendix A-3

Boring Logs
and
Field Observations

FIELD LOG SOIL

Boring No. B-1

Project No. 4815-02	Project Name NYSEG COURT ST.		Page 2 of 3
Contractor PARRATT WOLFF	Driller AL BECK	Date started 1/7/86	completed 1/7/86
Method H.S. AUGER	Casing Size 4 3/4"	HNU 11.7/ 10.2	Protection Level D
Ground El. 395.26'	Soil Drilled 35.0'	⊻ below ground	Total Depth 39.0'
Logged by J. PETERSON	Checked by	Date	

B.G. : Background Ambient levels

Sample No.	Depth in Feet	Blows per 6 inches	Rec Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-2	15.0'-17.0'	1-2-2-1	1.6/2.0	CLAYEY SILT 15.0'-16.5' Brown w/ little fine sand, trace clay and organic material; wet; soft; non-plastic GRAVELLY SILTY SAND 16.5'-17.0' Brown, sand fine w/ some med-cs sand, fine gravel; loose; non-plastic; wet	1.2	Change @ 16.5' Clayey Silt into Gravelly silty Sand Change back to clayey silt between 17' and 20'	B.G.	B.G.
S-3	20.0'-22.0'	1-1-1-1	2.0'/2.0'	CLAYEY SILT Brown w/ Some fine sand and little organic materials i.e. fine roots/reeds & peat fibers; soft; wet; non-plastic	1.1			
S-4	25.0'-27.0'	2-3-5-11	2.0/2.0'	CLAYEY SILT 25.0'-26.0' Grayish brown w/ Some fine sand; wet; very soft. PEAT 26.0'-26.6' Brown organic material, woody fibers and reeds w/ some fine sand intermittent; wet; firm. SAND 26.6'-27.0' Grayish brown fine to med sand w/ Some silt and trace organics; wet; med dense	1.2	Change @ 26' Clayey Silt into Peat/Organics Change @ 26.6' Peat/Organics into Sand	↓	↓

DRILLING OBSERVATIONS
ITHACA-COURT STREET SITE

Boring	Total Depth (ft)	Visual Appearance	Odor and PID Characterization	Samples Collected
B-1	39	No visual signs of coal gas wastes.	No unusual odors. PID-background levels.	Sample B-1/S-1 at 12 to 14 ft. Sample B-1/S-2 at 30 to 32 ft.*
B-2	15	Oily sheen observed on soils from 5 to 12 ft.	Petroleum odors noted from 5 to to 12 ft. PID-background levels.	Sample B-2/S-1 at 5 to 9 ft.* Sample B-2/S-2 at 10 to 15 ft.
B-3	33	No visual signs of coal gas wastes.	No unusual odors. PID-background levels.	Sample B-3/S-1 at 5 to 7 ft. Sample B-3/S-2 at 10 to 12 ft.*
B-4	37	No visual signs of coal gas wastes.	No unusual odors. PID-headspace readings of 8 ppm and 4 ppm on soil from 5 to 7 ft. and 20 to 22 ft.	Sample B-4/S-1 at 15 to 17 ft. Sample B-4/S-2 at 35 to 37 ft.*
B-5	37	No visual signs of coal gas wastes.	No unusual odors. PID-background levels.	Sample B-5/S-1 at 30 to 32 ft.*
B-6	17	Black, tar material seen in soil from 5 to 12 ft.; quantity of tar decreased with depth.	Coal tar odors observed. Headspace PID reading of 15 ppm on soil from 15 to 17 ft.	Sample B-6/S-1 at 5 to 9 ft.* Sample B-6/S-2 at 10 to 12 ft.
B-7	17	Black tar observed from 6.5 to 14 ft.; tar content highest in sand lenses.	Coal tar odor throughout profile. PID-background levels.	Sample B-7/S-1 at 5 to 7 ft. Sample B-7/S-2 at 10 to 14 ft.*

DRILLING OBSERVATIONS
ITHACA-COURT STREET SITE
(continued)

Boring	Total Depth (ft)	Visual Appearance	Odor and PID Characterization	Samples Collected
B-8	52	Black ash apparent from 5 to 7 ft.	No chemical odors. Headspace PID readings of about 10 ppm on soil from 10 to 17 ft. and 25 to 27 ft.	Sample B-8/S-1 at 5 to 7 ft.* Sample B-8/S-2 at 20 to 22 ft. Sample B-8/S-3 at 35 to 37 ft.
B-9	15	Ash and tar visible from below asphalt to bottom of boring (1 to 15 ft.). Bricks encountered at 15 ft.	Tar odors throughout boring. Headspace PID reading of 5 ppm on soil from 4 to 6 ft.	Sample B-9/S-1 at 2 to 4 ft.* Sample B-9/S-2 at 10 to 14 ft.*

* Analyzed by ERCO

FIELD LOG SOIL

Boring No. B-1

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 1 of 3
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/7/86 completed 1/7/86
Method H.S. AUGERS
Casing Size 4 3/4"
HNU [✓ 11.7]/ 10.2
Protection Level D
Ground El. 395.26'
Soil Drilled 35.0'
▽ below ground
Total Depth 39.0'
Logged by J. PETERSON
Checked by
Date

B.G.: Background Ambient levels

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
	0'-.4'			ASPHALT				
	.4' +			GRAVELLY SANDY SILT (FILL) Brown w/ some cobbles 2"-3" in size and sub rounded; little clay; fines slightly plastic; moist; med. dense		Initial soils info. based on Auger derived soil and sample blow counts	B.G.	B.G.
	5.0'-7.0'	6-6-4-4	0.0/2.0	NO RECOVERY				
	7.0'-9.0'	8-8-3-2	0.2/2.0	Stone wedged into sample shoe		Poor sample recovery in top 13' of soil was due to the large amount of cobbles in the soil not allowing soil entrance into sampler		
	10.0'-12.0'	4-1-1-1	0.0/2.0	NO RECOVERY				
S-1	12.0'-14.0'	1-1-1-1	1.1/2.0	GRAVELLY SANDY SILT (FILL) Top 0.1' of sample is brown w/ little clay; fines slightly plastic; wet; loose CLAYEY SILT Brown w/ some fine sand, trace clay and organic material (small reed-like material); wet; soft; non-plastic S-1 Analytical Sample No split w/ NYSEG	S-1 ANALYTICAL	Change @ 13' Gravelly Sandy silt into clayey silt ▽ @ ~ 8.0' Initial water level during boring		

FIELD LOG SOIL

Boring No. B-1

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 3 of 3
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/7/86 completed 1/7/86
Method H.S. AUGER
Casing Size 4 3/4"
HNU [✓ 11.7]/ 10.2
Protection Level D
Ground El. 395.26'
Soil Drilled 35.0'
▽ below ground
Total Depth 39.0'
Logged by J. PETERSON
Checked by
Date

B.G. : BACK GROUND AMBIENT LEVELS

Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-5	30.0'-32.0'	3-3-5-10	2.0/2.0	SAND Brown, fine to med sand w/ some silt, trace organics and small 1-2mm white shells; wet; med. dense S-2 Analytical Sample No split w/ NYSEG	S-2 ANALYTICAL		B.G.	B.G.
S-6	35.0'-37.0'	1-2-2-2	2.0/2.0	SAND Brown, fine to med sand w/ some silt changing @ 36' into increased silts w/ some fine sand and little organic material, wet; soft; loose; fines non-plastic	1.3	change @ 36' SAND grading to Silt @ 37'		
S-7	37.0'-39.0'	3-3-3-4	2.0/2.0	SILT Brown w/ some fine sand and trace clay and little small 1-2mm white shells; wet; soft; non-plastic	1.2			
				B.O.B @ 35.0' Stopped Augers @ 35', but Sampled beyond Augers to 39.0'				

FIELD LOG SOIL

Boring No. B-2

Project No. 4815-02	Project Name NYSEG COURT ST.		Page 1 of 1
Contractor PARRATT WOLFF	Driller AL BECK	Date started 1/10/86 completed 1/10/86	
Method H.S. AUGERS	Casing Size 4 3/4"	HNU [✓ 11.7]/ 10.2	Protection Level D
Ground El. 394.06	Soil Drilled 15.0'	⊻ below ground	Total Depth 15.0'
Logged by J. PETERSON	Checked by	Date	

B.G. ; Background Ambient levels

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description		HNU jar	Comments on Advance of Boring	HNU	LEL
	0.0'-0.4'			ASPHALT					
	.4' +			SILTY SANDY GRAVEL (FILL)	Brown, w/ slightly plastic fines, moist			B.G.	B.G.
S-1	5.0'-7.0'	4-8-6-10	.5'/2.0	SILTY SANDY GRAVEL (FILL)	Dark brown w/ visible oily sheen and odor; poor recovery due to the gravelly nature of the soil so a composite sample was made w/ S-1 & S-2, sample is wet and med. dense	S-1 ANALYTICAL	P.I. Head Space on Augers is 19.5ppm @ 10' w/ slight odor near well head, no P.I. readings away from well head.	B.G.	B.G.
S-2	7.0'-9.0'	4-5-6-9	.5/2.0						
S-3	10.0'-12.0'	5-5-5-9	.3/2.0	SILTY SANDY GRAVEL (FILL)	Dark brown w/ visible oily and odor; similar poor recovery as S-1 & S-2; wet; med. dense	S-2 ANALYTICAL			
S-4	13.0'-15.0'	6-6-5-10	.7/2.0	CLAYEY SILT	14.5 silts begin to increase w/ light brown color and predominately clayey silt in the lowest portion of the sample		Change @ ~14.5'-15.0' Silty Sandy gravel (Fill) into Clayey Silt		
				S-3 & S-4 COMPOSITE			B.O.B. @ 15.0'		

E.C. JORDAN CO. Boring No. B-2 Page 1 of 1

FIELD LOG SOIL

Boring No. B-3

Project No. 4815-02	Project Name NYSEG COURT ST.		Page 1 of 2
Contractor PARRATT WOLFF	Driller AL BECK	Date started 1/9/86	completed 1/9/86
Method H.S. AUGER	Casing Size 4 3/4"	HNU [✓ 11.7] 10.2	Protection Level D
Ground El. 392.98	Soil Drilled 30.0'	⊻ below ground	Total Depth 33.0'
Logged by J. PETERSON	Checked by	Date	

B.G. : Background Ambient levels

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
	0.0' - 1.0'			Lawn & top soil		Initial soils info. based on auger derived soil	B.G.	B.G.
	1.0' - 3.0'			GRAVELLY SANDY SILT (FILL) Brown to Blackish Brown				
	3.0' +			CLAYEY SILT Brown w/ Some fine sand				
S-1	5.0' - 7.0'	1-2-1-2	1.5/2.0	CLAYEY SANDY SILT Top .5' Orange br clayey silt w/ Some fine sand, firm; moist; slightly plastic w/ trace granular material MIDDLE .5' Increased sands, fine to med ~ 50% Bottom .5' Brown clayey silt w/ Some fine sand mottled orange br. & gray w/ trace organics	S-1 ANALYTICAL SPLIT w/ NYSEG			
S-2	10.0'-12.0'	1-2-1-2	1.3/2.0	SILTY CLAY brown to gray w/ some fine Sand and trace - small 1-2 mm white shells & trace organics; firm; moist to wet	S-2 ANALYTICAL SPLIT w/ NYSEG			
S-3	15.0'-17.0'	1-1-2-2	1.2/2.0	CLAYEY SILT brown to gray w/ Some fine sand and little to trace organics and small 1-2mm white shells; moist, firm and slightly plastic	1.4			

FIELD LOG SOIL

Boring No. B-3

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 2 of 2
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/9/86 completed 1/9/86
Method H.S. AUGER
Casing Size 4 3/4"
HNU 11.7 / 10.2
Protection Level D
Ground El. 392.98
Soil Drilled 30.0'
▽ below ground
Total Depth 33.0'
Logged by J. PETERSON
Checked by
Date

B.G. : Background Ambient levels

Sample No.	Depth in Feet	Blows per 6 inches	Rec. / Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
S-4	20.0'-22.0'	1-1-2-2	.8/2.0	CLAYEY SILT Grayish w/ Some fine sand; slightly plastic; soft to firm; moist to wet; trace small 1-2mm white shells	3.0		B.G.	B.G.
S-5	25'-27'	1-4-6-7	1.8/2.0	SAND 25'-26' Grayish brown, fine to cs. sand, loose; wet, little silt 26'-27' Grayish brown, fine to med sand w/ some silt; Orange br. silty clay zone @ 26' approx 1" thick, silts increase w/ depth & grain size decreases w/ depth, sample is wet & loose	2.0	Change @ 25' Clayey Silt into Sand, when sample Spoon hit 25' the water came into boring up to 10', sand came up 5' into the bottom of the augers; Had to pull back augers slightly and re-drill the running sand		
S-6	31.0'-33'	1-1-2-3		SILTY SAND / SANDY SILT grayish br., silts increasing w/ depth & sands decreasing w/ depth, transition, small 1-2mm white shells increasing w/ depth, soft; loose; wet; fines non-plastic	1.6	Sand in Augers 1' @ 30', pulled Augers back to 29' to drop sand & drove sample from 31'-33'		
				B.O.B. Augers @ 30' Sampled to 33'				

FIELD LOG SOIL

Boring No. B-4

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 1 of 3
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/9/86 completed 1/9/86
Method H.S. AUGER
Casing Size 4 3/4"
HNU [✓ 11.7]/ 10.2
Protection Level D
Ground El. 393.85
Soil Drilled 35.0'
▽ below ground
Total Depth 37.0'
Logged by J. PETERSON
Checked by
Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
	0.0'-1.0'			LAWN & TOPSOIL		Initial soils info based on auger derived soil	B.G.	B.G.
	1.0' +			GRAVELLY SILTY SAND (FILL) Blackish brown at top to dark br. w/ depth, some cobbles, some silt & clay; moist & slightly plastic fines				
S-1	5.0'-7.0'	5-8-7-7	.7'/2.0'	Gravelly Silty Sand Brown, Sand fine to coarse w/ trace clay; slightly plastic fines; some large 1" gravel; moist, med. dense	8.6			
	10.0'-12.0'	1-1-1-1	0/2.0'	NO RECOVERY, lost sample due to loose Sands and/or gravel and cobbles prohibiting entry of soil into sampling spoon		Driller notes water in boring @ 9'		
S-2	12.0'-14.0'	1-1-1-1	1.8'/2.0'	CLAYEY SILT Dark brown w/- some fine sand and little organics, trace fine sand lenses approx. 1/16"; wet; soft; fines slightly plastic * Potential ponding of water on top of the clayey silt, top .2' of S-2 is loose silty sand and wetter than the clayey silt	2.8	Change @12.5' Gravelly silty Sand into Clayey silt		

FIELD LOG SOIL

Boring No. B-4

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 2 of 3

Contractor PARRATT WOLFF | Driller AL. BECK | Date started 1/9/86 completed 1/9/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU [✓ 11.7] / 10.2 | Protection Level D

Ground El. 393.85' | Soil Drilled 35.0' | ⊻ below ground | Total Depth 37.0'

Logged by J. PETERSON | Checked by | Date

B.G.: Backround Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
S-3	15.0'-17.0'	1-1-2-2	1.8/2.0	CLAYEY SILT Dark brown w/ some fine sand and little organics; wet; firm to soft; slightly plastic	S-1 ANALYTICAL SPLIT W/ NYSEG		B.G.	B.G.
S-4	20.0'-22.0'	1-2-2-1	2.0/2.0	CLAYEY SILT Dark brown w/ some fine sand and little organics; wet; soft; slightly plastic	4.2			
S-5	25.0'-27.0'	2-4-6-6	1.5/2.0	CLAYEY SILT 25.0'-26.3' Dark brown w/ some fine sand and trace cs. sand and little organics; wet; soft; slightly plastic ORGANIC ZONE 26.3'-26.6' Red brown to brown stiff; woody fibers & peaty SAND 26.6' + brown-to grayish, sand fine to coarse w/ some silt; loose; wet; med. dense; fines slightly plastic	1.6	Change @ 26.6' into SAND		
S-6	30.0'-32.0'	2-3-4-3	1.2/2.0	SILTY SAND brown to grayish brown, fine sand w/ some med sand and little coarse sand, loose, very wet; trace organics & 1-2mm white shells	0.6			

FIELD LOG SOIL

Boring No. B-4

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 3 of 3

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/9/86 completed 1/9/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU [✓ 11.7] / 10.2 | Protection Level D

Ground El. 393.85' | Soil Drilled 35.0' | ⊻ below ground | Total Depth 37.0'

Logged by J. PETERSON | Checked by | Date

B.G. : Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
S-7	35.0'-37.0'	1-2-2-3	2.0/2.0	SILTY SAND 35.0' - 35.3' brown to grayish brown, fine sand w/ some med sand and little coarse sand; loose; wet trace organics & small 1-2mm white shells SILT 35.3' + Brown to grayish brown, some fine sand decreasing to trace fine sand @ 36'; some clay and small 1-2 mm white shells; shells begin to have a somewhat stratified look from 36' on; Sample is soft; wet, fines are slightly plastic.	S-2 ANALYTICAL SPLIT W/ NYSEG		B.G.	B.G.
				B.O.B. @ 35.0' Sample below augers from 35'-37'				

FIELD LOG SOIL

Boring No. B-5

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 1 of 2
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/8/86 completed 1/8/86
Method H.S. AUGER
Casing Size 4 3/4"
HNU [✓ 11.7]/ 10.2
Protection Level D
Ground El. 393. 86
Soil Drilled 35.0'
▽ below ground
Total Depth 37.0'
Logged by J. PETERSON
Checked by
Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
	0.0'-1.0'			LAWN & TOPSOIL		Initial soils info based on auger derived soil	B.G.	B.G.
	1.0' +			SILTY SAND Black to brown w/ some clay, moist; slightly plastic				
S-1	5.0'-7.0'	5-4-2-5	0.5/2.0	SILTY SAND Brown, fine to coarse sand, little gravel and clay; moist, loose, fines slighty plastic, mottled orange br.	2.4			
S-2	10.0'-12.0'	1-1-1-1	1.0/2.0	CLAYEY SILT Dark brown w/ little to trace Sand and organics, wet; soft.	1.6	Change @ 7.0' -10.0' Silty Sand into Clayey silt		
S-3	15.0'-17.0'	1-1-2-2	1.6/2.0	CLAYEY SILT Grayish brown w/ little fine sand, little organic spots & brown to black woody fibers; trace med-c's. Sand and gravel; wet; soft; non-plastic	1.2			
S-4	20.0'-22.0'	1-1-2-1	1.7/2.0	CLAYEY SILT Grayish brown, Little fine sand w/ slight increase in bottom .7' of Sample, trace organics; wet. Soft; non-plastic	1.0			

FIELD LOG SOIL

Boring No. B-5

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 2 of 2
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/8/86
completed 1/8/86
Method H. S. AUGER
Casing Size 4¾"
HNU [✓ 11.7] / 10.2
Protection Level D
Ground El. 393.86
Soil Drilled 35.0'
▽ below ground
Total Depth 37.0'
Logged by J. PETERSON
Checked by
Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-5	26.0'-28.0'	3-8-9-8	2.0/2.0	CLAYEY SILT 26.0 - 26.5' Grayish brown, Some fine sand, trace organics; wet; soft; non-plastic SILTY SAND 26.5' - 28' Grayish brown, Sand fine to med., trace organics; wet; loose to med. dense; fines non plastic; Small organic zone @ 26.5', ½" of woody fibers, peaty	1.2	Dead spoon in augers Settled from 25'-26', will take S-4 from 26'-28' Change @ 26.5 clayey silt into Silty Sand		
S-6	30.0'-32.0'	2-2-5-6	2.0/2.0	SILTY SAND Grayish brown, Sand fine to med., trace organics; wet; loose; fines non-plastic	S-1 ANALYTICAL SPLIT W/NYSEG			
S-7	35.0-37.0'	2-3-2-3	2.0/2.0	SILTY SAND Grayish brown, Sand fine to med, trace organics, wet; very loose; fines non-plastic SANDY SILT 35.5'-36.0' Silts increasing Sands decreasing Some organics SILT 36.0'-37.0' grayish brown w/ little to trace fine sand and trace clay, some small 1-2m white shells; soft; non-plastic	1.2	B.o.B. @ 35.0 Augers @ 35' w/ last sample @ 35'-37'		

E.C. JORDAN CO.

Boring No. B-5

Page 2 of 2

FIELD LOG SOIL

Boring No. B-6

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 1 of 2

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/13/86 completed 1/13/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU [✓ 11.7]/ 10.2 | Protection Level D

Ground El. 394.72' | Soil Drilled 15.0' | ▽ below ground | Total Depth 17.0'

Logged by J. PETERSON | Checked by | Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
	0.0'-0.4'			ASPHALT		Initial soils info. based on auger derived soil	B.G.	B.G.
	0.4 - 3.5'			GRAVELLY SILTY SAND (FILL) Black to dark brown; moist; fines slightly plastic				
	3.5' +			CLAYEY SILT Brown w/ Some fine sand				
S-1	5.0'-7.0'	3-3-3-2	.9/2.0	CLAYEY SILT Dark brown to brown w/ Some fine sand, Some areas grade to silty sand/ sandy silt; visible black coal tar type contamination most prominent in these Sandier areas, i.e. 6.5' and 7.5'; Sample is moist to wet is sands; firm fines & loose Sands	S-1 COMPOSITE ANALYTICAL SPLIT W/ NYSEG			
S-2	7.0'-9.0'	1-1-2-2	1.5/2.0			Driller notes water into hole @ 10'		
S-3	10.0'-12.0'	1-1-1-2	2.0/2.0	CLAYEY SILT olive brown w/ Some fine silty Sand / sandy silt areas; some visible black coal tar type contamination mostly in Sandier areas, i.e. 10.0'-10.3' & 10.7'-11.2', decreasing contaminants w/ depth; sample is wet and soft to firm.	S-2 ANALYTICAL SPLIT W/ NYSEG	These soils do not appear to be natural due to lack of good structure & the random nature of the contaminants		

FIELD LOG SOIL

Boring No. B-6

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 2 of 2

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/13/86 completed 1/13/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU 11.7/ 10.2 | Protection Level D

Ground El. 394.72' | Soil Drilled 15.0' | ⊻ below ground | Total Depth 17.0'

Logged by J. PETERSON | Checked by | Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-4	15.0'-17.0'	1-1-1-1	2.0/2.0	CLAYEY SILT Gray brown to olive brown w/ little spots ~ 1/16" in size of random black contamination which is on the decrease w/ depth, Sample is wet & Soft	14.5		B.G. ↓	B.G. ↓
				B.O.B. @ 15.0' Last sample below augers from 15.0'-17.0'				

FIELD LOG SOIL

Boring No. B-7

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 1 of 1

Contractor PARRATT WOLFF | Driller AL. BECK | Date started 1/14/86 completed 1/14/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU 11.7/ 10.2 | Protection Level D

Ground El. 395.06 | Soil Drilled 15.0' | ⊻ below ground | Total Depth 17.0'

Logged by J. PETERSON | Checked by | Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
	0.0'-0.4'			ASPHALT		Initial soil info based on auger derived soil.	B.G.	B.G.
	0.4 +			SILTY SANDY GRAVEL (FILL) Black to dark brown w/ some brick pieces; Some odor of Coal tar products				
S-1	5.0'-7.0'	1-1-1-1	1.6/2.0	SILTY SANDY GRAVEL (FILL) 5.0' - 6.5' Black to dark brown w/ extensive coal tar contamination @ 6.5'; wet; loose. CLAYEY SILT 6.5' + Brown, w/ little fine sand and Some coal tar, moist to wet; firm	S-1 ANALYTICAL SPLIT w/ NYSEG	Change @ 6.5' Silty Sandy Gravel into Clayey silt		
S-2	10.0'-12.0'	1 for 12" -1 -1	1.0/2.0	CLAYEY SILT Olive br. w/ trace fine sand; Soft, moist to wet; trace spots of contamination around Sand; fine Sand Seam ~1/8" at 13.6' w/ contamination	Composite S-2 ANALYTICAL SPLIT W/ NYSEG			
S-3	12.0'-14.0'	2-2-2-2	1.6/2.0					
T-1	15.0'-17.0'	Pushed w/ Rods	0.0/2.0	NO RECOVERY Some trace fine Sand in tube, could not get proper seal. 3" Shelby tube				

FIELD LOG SOIL

Boring No. B-8

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 1 of 3

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/6/86 completed 1/6/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU [✓ 11.2]/ 10.2 | Protection Level D

Ground El. 394.36' | Soil Drilled 50.0' | ⊻ below ground | Total Depth 52.0'

Logged by J. PETERSON | Checked by | Date

B.G. Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
	0.0'-0.4'			ASPHALT		Initial Soil info. based on auger derived soil	B.G.	B.G.
	0.4'-3.0'			SILTY SANDY GRAVEL (FILL) Black to dark brown, trace clay, moist				
	3.0' +			CLAYEY SILT Brown, moist, Little sand				
S-1	5.0'-7.0'	2-2-2-2	1.2/2.0	CLAYEY SILT olive br. to dark gray, trace fine sand w/ trace fly ash (black) at top of sample; firm; moist	S-1 ANALYTICAL			
S-2	10.0'-12.0'	1-2-2-2	1.5/1.9	CLAYEY SILT olive brown w/ little fine sand, moist; firm; slightly plastic	12.4			
S-3	15.0'-17.0'	1-2-3-2	1.9/2.0	CLAYEY SILT Olive brown w/ Some fine Sand and trace organics; firm; moist; slightly plastic	7.0			
S-4	20.0'-22.0'	1-2-2-3	1.6/2.0	CLAYEY SILT Olive brown w/ Some fine Sand, fine to med Sand lense last .3' of the sample; wet; firm to soft; slightly plastic	S-2 ANALYTICAL			

FIELD LOG SOIL

Boring No. B-8

Project No. 4815-02
Project Name NYSEG COURT ST.
Page 2 of 3
Contractor PARRATT WOLFF
Driller AL BECK
Date started 1/6/86
completed 1/6/86
Method H.S. AUGER
Casing Size 4 3/4"
HNU 11.7 / 10.2
Protection Level D
Ground El. 394.36'
Soil Drilled 50.0'
∇ below ground
Total Depth 52.0'
Logged by J. PETERSON
Checked by
Date

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-5	25.0'-27.0'	2-2-7-11	1.6/2.0	CLAYEY SILT 25.0'-26.5' Brown w/ trace fine sand and some peat/woody brown organics grading to all organics/peat from 26.2'-26.5' SAND 26.5'-27.0' Gray fine to med Sand w/ some silt and trace clay; wet; med. dense	10.2	Change @ 26.5' Clayey silt into Sand	B.G.	B.G.
S-6	30.0'-32.0'	3-5-5-6	1.3/2.0	SAND Gray fine to med Sand w/ some silt, little coarse sand and gravel fraction, wet, loose to med. dense	1.6			
S-7	35.0'-37.0'	2-2-3-2	1.8/2.0	SAND Gray fine to med w/ some silt, trace coarse sand. loose; wet; Change in the end of the spoon into clayey silt w/ trace fine Sand	S-3 ANALYTICAL	Change @ 36.7' Sand into Silt		
S-8	40.0-42.0'	2-2-3-3	1.6/2.0	SILT Grayish w/ trace Clay, some small 1-2mm white Shells and some organics, woody material, roots, fibers; wet; soft; non-plastic	1.5			

FIELD LOG SOIL

Boring No. B-8

Project No. 4815-02 | Project Name NYSEG COURT ST | Page 3 of 3

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/6/86 completed 1/6/86

Method H.S AUGER | Casing Size 4 3/4" | HNU 11.7 / 10.2 | Protection Level D

Ground El. 394.36' | Soil Drilled 50.0' | ⊻ below ground | Total Depth 52.0'

Logged by J. PETERSON | Checked by | Date

B.G. : Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec/Pen.	Description	HNU jar	Comments on Advance of Boring		
							HNU	LEL
S-9	45.0'-47.0'	2-2-3-2	2.0/2.0	SILT Grayish w/ trace Clay, some small 1-2mm white shells and some organics peaty, woody fibers; wet; soft; non-plastic	2.8		B.G. ↓	B.G. ↓
S-10	50.0'-52.0'	11-19-20-5	1.0/2.0	SILTY SANDY GRAVEL Gray, Sand fine to cs. w/ large gravel pieces up to 1" in size, Sub-angular to Sub-rounded; wet; med. dense to dense	1.6	Change @ 50' Silt into Silty Sandy Gravel		
				B.O.B @ 50' Last sample below augers @ 50.0'-52.0'				

FIELD LOG SOIL

Boring No. B-9

Project No. 4815-02	Project Name NYSEG COURT ST.		Page 1 of 2
Contractor PARRATT WOLFF	Driller AL BECK	Date started 1/14/86 completed 1/14/86	
Method H.S. AUGER	Casing Size 4 3/4"	HNU 11.7/ 10.2	Protection Level D
Ground El. 394.96'	Soil Drilled 15.0'	▽ below ground	Total Depth 15.3'
Logged by J. PETERSON	Checked by	Date	

B.G.: Background Ambient Air

Sample No.	Depth in Feet	Blows per 6 inches	Rec. / Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
	0.0'-0.4'			ASPHALT		Initial soils info. based on auger derived soils Turns brown to black at Approx. 1'		
	0.4' +			SILTY SANDY GRAVEL (FILL) Varied dark brown to black; wet; loose; w/ some visible contaminants & slight odor; fly ash & coal tar				
S-1	2.0'-4.0'	1-1-1-1	2.0/2.0	SANDY SILT (FILL) white w/ some black and trace blue-green, sand fine to cs. w/ some gravel; wet; firm. Some odor w/ much visible fly ash and coal tar	S-1 ANALYTICAL SPLIT W/ NYSEG			
S-2	4.0'-6.0'	W.O.H.	0.4/2.0	GRAVELLY SILTY SAND (FILL) Black; wet; loose; w/ visible coal tar and some odor	50	Driller notes increased gravel @ 8'		
S-3	10.0'-12.0'	13-8-18-11	1.4/2.0	SILTY SANDY GRAVEL (FILL) Black w/ trace white and blue-green; wet; med dense; visible coal tar and some fly ash; some odor also	S-2 COMPOSITE ANALYTICAL SPLIT W/ NYSEG	Water in the hole @ 9.5'		
S-4	12.0-14.0	3-10-2-3	.6/2.0	looser material in S-4				

FIELD LOG SOIL

Boring No. B-9

Project No. 4815-02 | Project Name NYSEG COURT ST. | Page 2 of 2

Contractor PARRATT WOLFF | Driller AL BECK | Date started 1/14/86 completed 1/14/86

Method H.S. AUGER | Casing Size 4 3/4" | HNU [✓ 11.7]/ 10.2 | Protection Level D

Ground El. 394.96' | Soil Drilled 15.0' | ⊻ below ground | Total Depth 15.3'

Logged by J. PETERSON | Checked by | Date

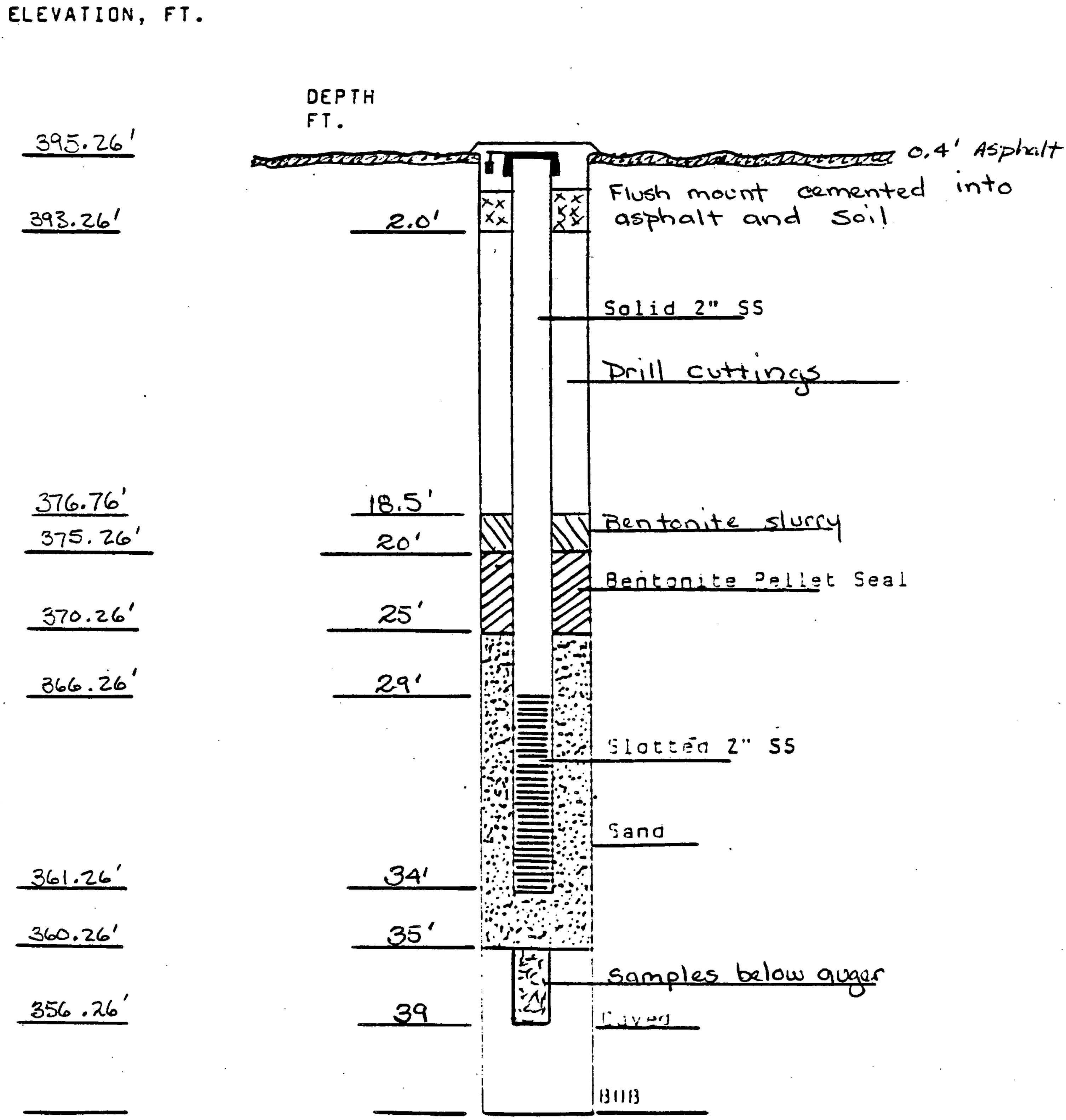
Sample No.	Depth in Feet	Blows per 6 inches	Rec / Pen.	Description	HNU jar	Comments on Advance of Boring	HNU	LEL
S-5	15.0-15.3'	50 for .3'	.3/.3	SILTY SAND (FILL) Black, sand fine to cs. w/ some gravel, very wet w/ visible coal tar type contamination, some odor and some pieces of brick in the sample	N/A	Refusal @ 15.3' Pieces of brick, possible bottom of old gas holder? did not save S-5 B.O.B @ 15'		
				INITIAL TRY AT B-9				
S-1	3.0'-5.0'	W.O.H. 12" -1 -1	.2/2.0	SILTY SANDY GRAVEL Dark brown to black, wet, very loose; visible coal tar type contamination, some odor; poor sample recovery, can only fill 2 VOA jars	S-3 COMPOSITE ANALYTICAL - 2 VOA'S	Stopped the boring upon sample refusal and moved rig ~8' to the north.		
S-2	5.0'-6.7'	1-2 & Refusal @ 6.7'	.2/1.7'					
				B.O.B. @ 5.0' Last sample below augers 5.0'-6.7'				

Appendix A-4

Well/Piezometer Installation Diagrams

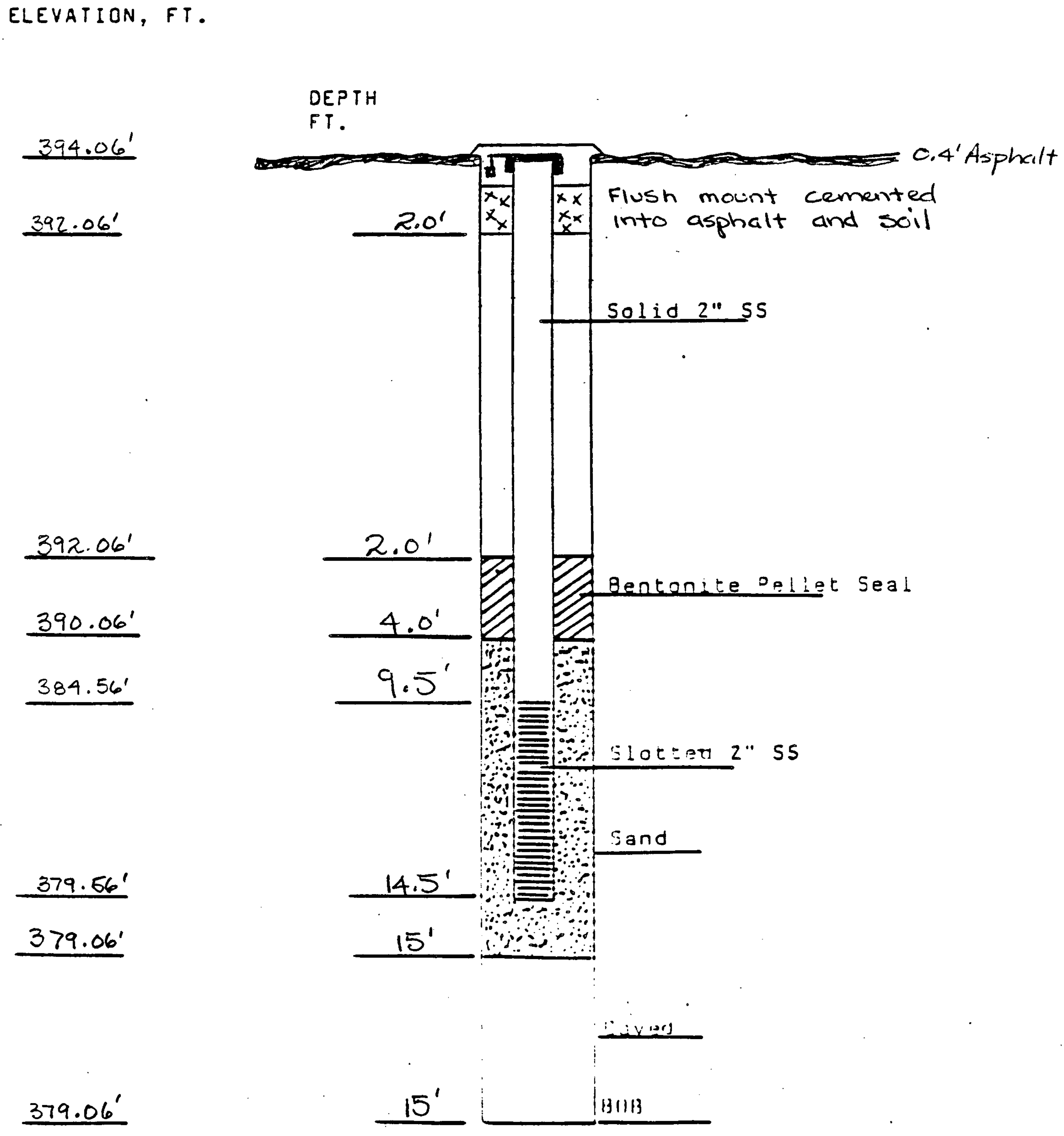
WELL INSTALLATION DETAILS

Project No. 4815-02	**Project Name** NYSEG COURT ST.	**Well No.** MW-1
Installed By J. PETERSON	**Date Installed** 1/7/86	**Boring Diameter** ~ 8"
Well Diameter 2"	**Well Material** STAINLESS STEEL	**Backfill Material** SAND (3 Q)



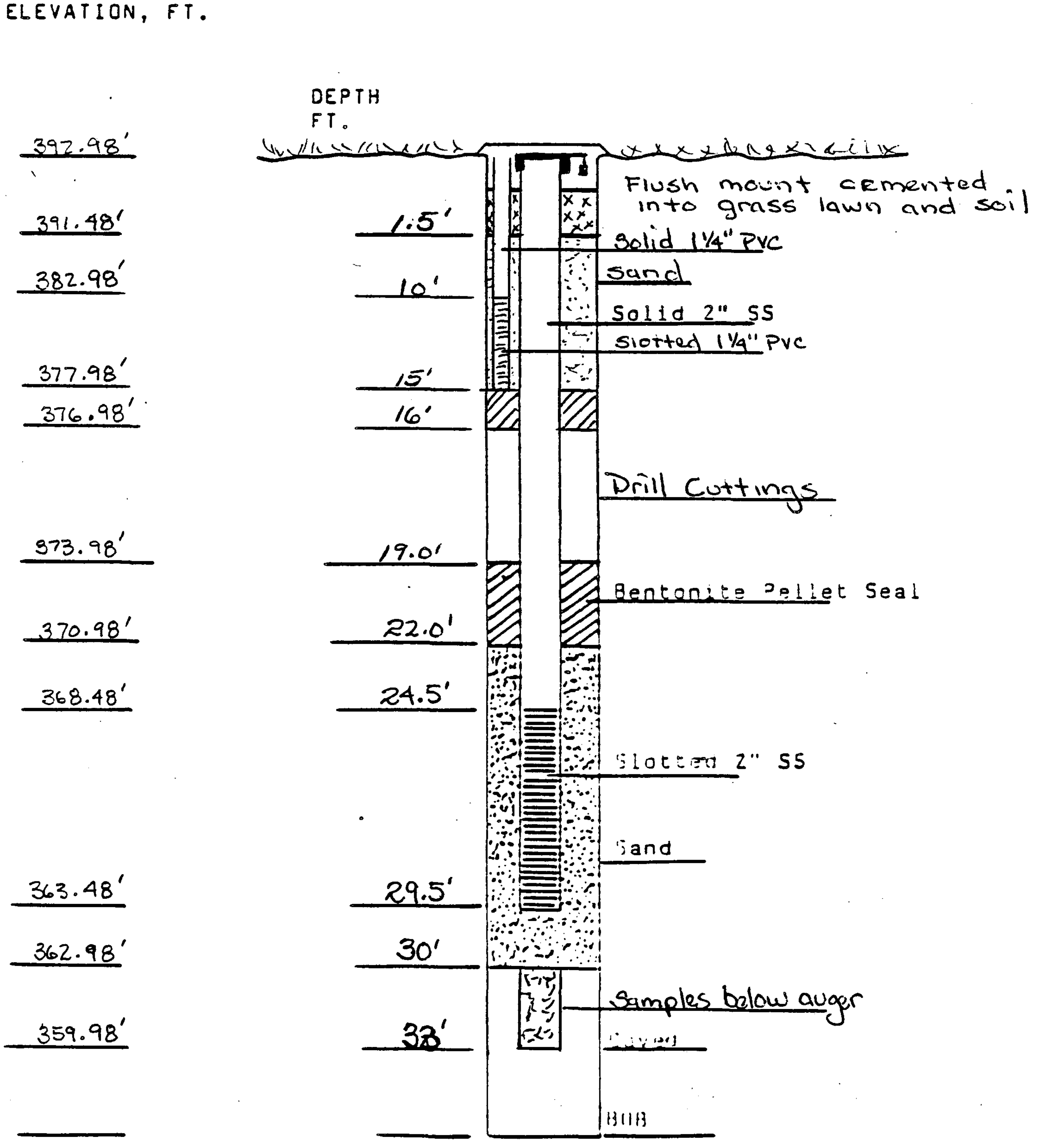
WELL INSTALLATION DETAILS

Project No. 4815-02	Project Name NYSEG COURT ST.	Well No. MW-2
Installed By J. PETERSON	Date Installed 1/10/86	Boring Diameter ~8"
Well Diameter 2"	Well Material STAINLESS STEEL	Backfill Material SAND 3Q



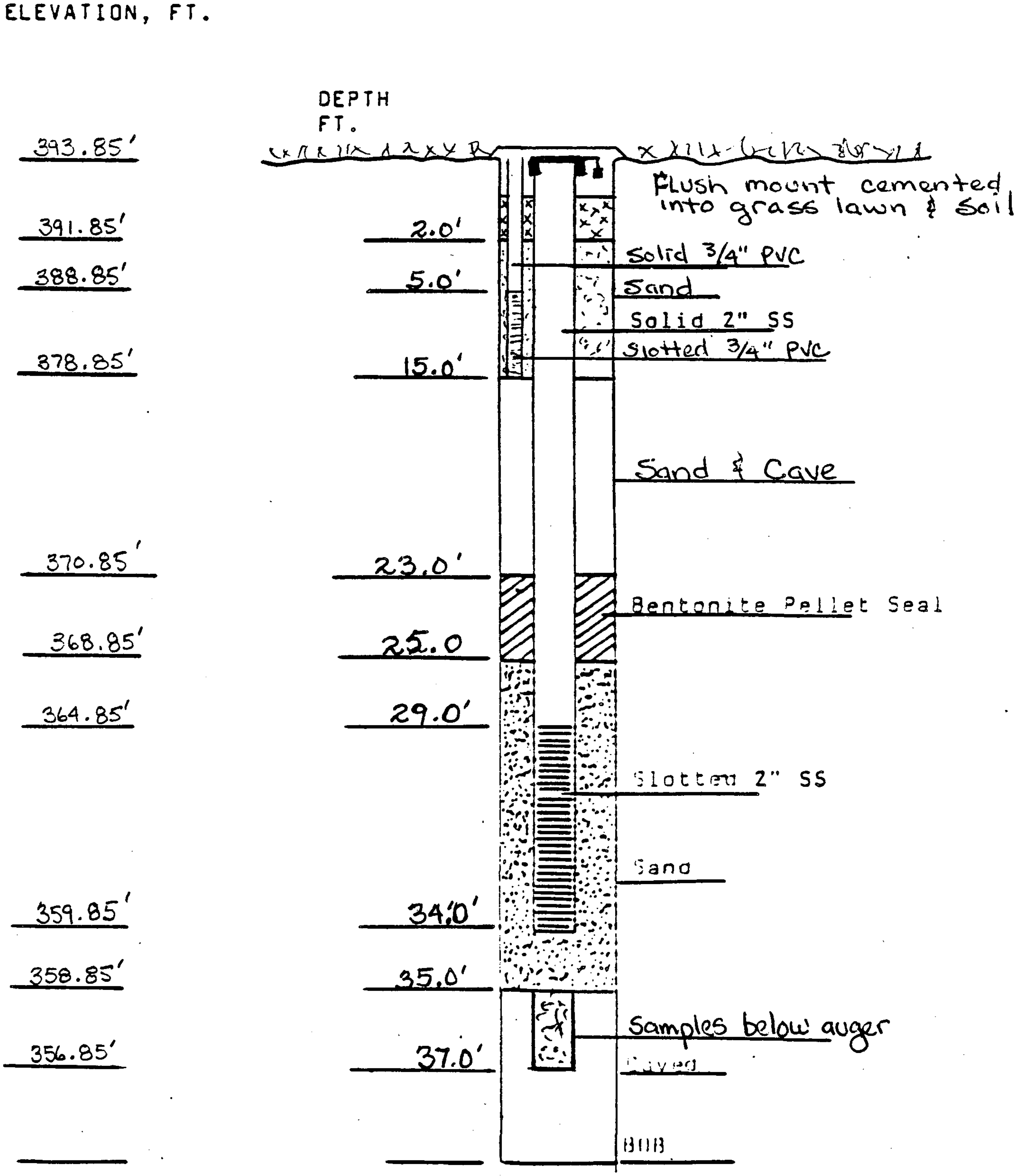
WELL INSTALLATION DETAILS

Project No.	4815-02	Project Name	NYSEG COURT ST.	Well No.	MW-3 / P-3
Installed By	J. PETERSON	Date Installed	1/9/86	Boring Diameter	~8"
Well Diameter	2"	Well Material	STAINLESS STELL	Backfill Material	SAND 3Q



WELL INSTALLATION DETAILS

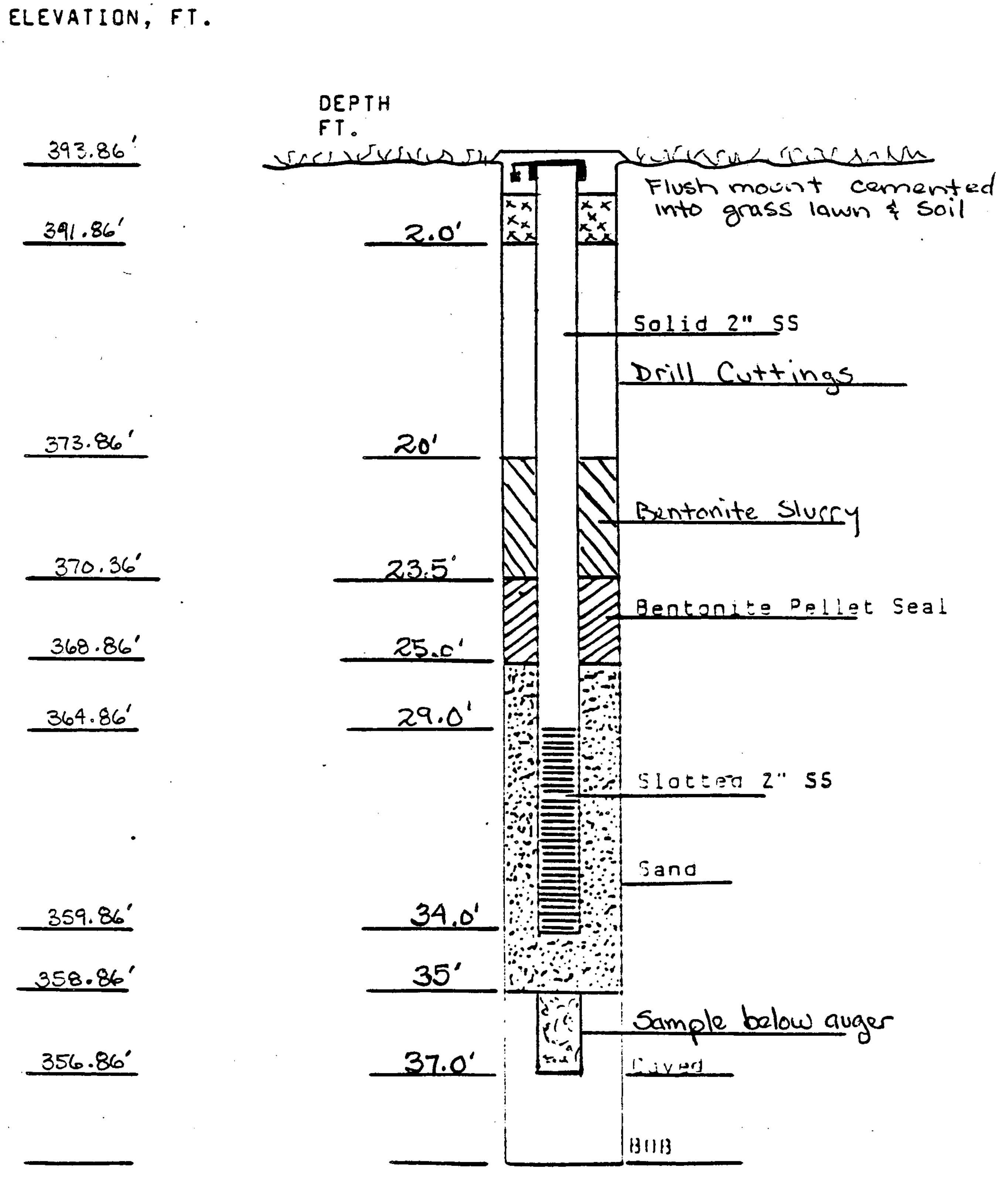
Project No. 4815 - 02	Project Name NYSEG COURT ST.	Well No. MW-4 / P-4
Installed By J. PETERSON	Date Installed 1/9/86	Boring Diameter ~ 8"
Well Diameter 2"	Well Material STAINLESS STEEL	Backfill Material SAND 3Q



EC JORDAN CO.

WELL INSTALLATION DETAILS

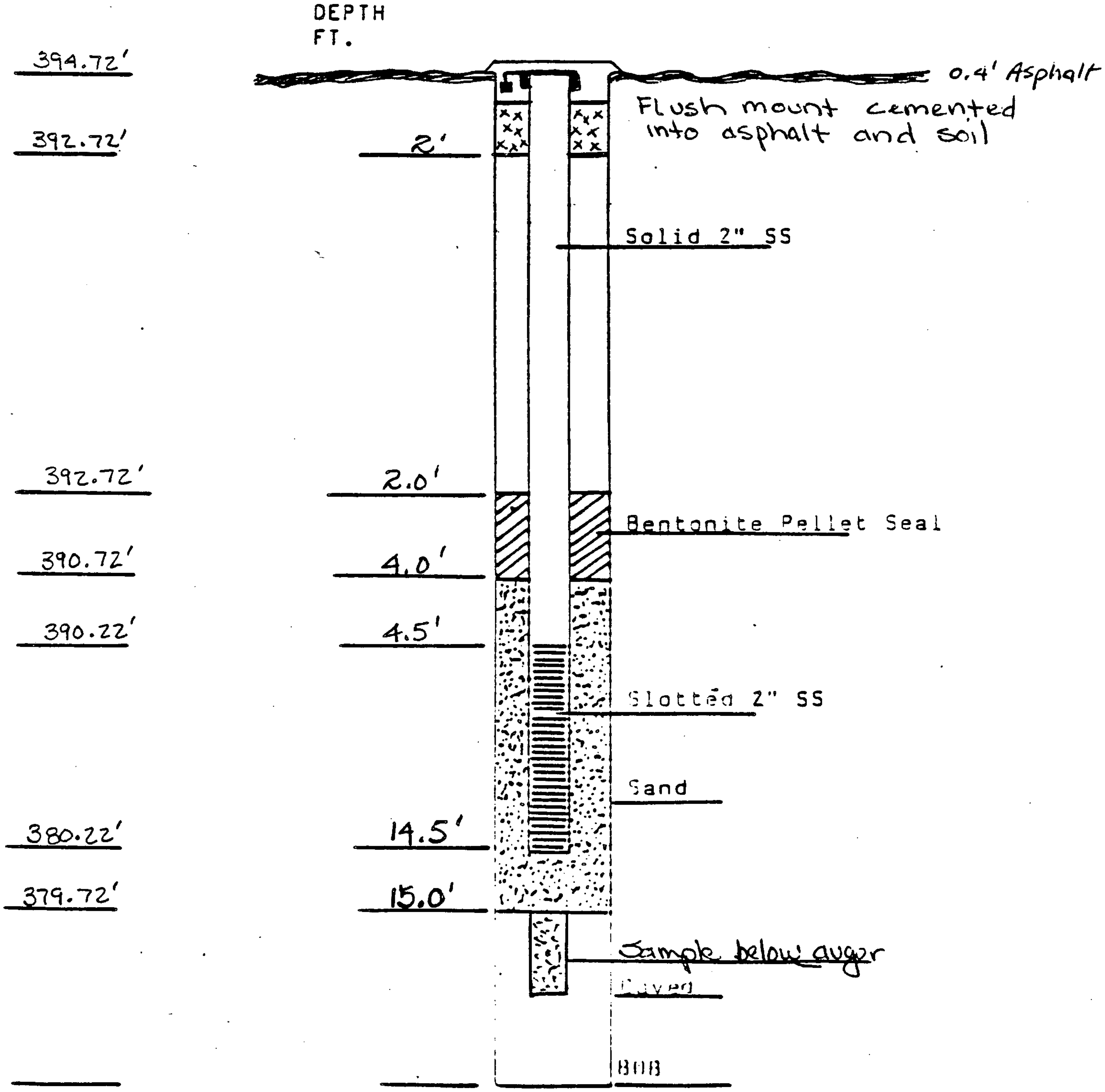
Project No. 4815-02	Project Name NYSEG COURT ST.	Well No. MW-5
Installed By J. PETERSON	Date Installed 1/8/86	Boring Diameter ~8"
Well Diameter 2"	Well Material STAINLESS STEEL	Backfill Material SAND 3Q



WELL INSTALLATION DETAILS

Project No. 4815-02	Project Name NYSEG COURT ST.	Well No. MW-6
Installed By J. PETERSON	Date Installed 1/13/86	Boring Diameter ~8"
Well Diameter 2"	Well Material STAINLESS STELL	Backfill Material SAND 4Q

ELEVATION, FT.



E.C.JORDAN CO.

Appendix A-5

Permeability Test Methods and Calculations

PERMEABILITY TEST RESULTS
ITHACA - COURT STREET SITE

GEOLOGIC FORMATION	TEST LOCATION	TYPE OF TEST	PERMEABILITY cm/sec	PERMEABILITY ft/day	REMARKS
Lacustrine sand	MH-1	In Situ	1.5×10^{-3}	4.3	Constant Head
	MH-3	In Situ	6.5×10^{-4}	1.8	Constant Head
	MH-4	In Situ	7.4×10^{-4}	2.1	Constant Head
	MH-5	In Situ	1.3×10^{-3}	3.7	Constant Head
Lacustrine Clayey Silt	P-3	In Situ	4.0×10^{-6}	0.01	Falling Head
	MH-6	In Situ	4.6×10^{-6}	0.01	Rising Head
Fill	MH-2	In Situ	5.0×10^{-4}	1.4	Constant Head

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-1

TYPE OF TEST : Constant Head

WATER LEVEL AT THE TIME OF THE TEST : 5.78 feet below ground

TEST DATA :

Q = Discharge Rate = 5 gpm

L = Length of monitored zone = 10 ft

D = Diameter of borehole = 0.67 ft

H_c = Constant head above or
below pre-pumping level = 14.7 ft

FORMULA :

$$K_h = \frac{Q \times \ln \left[2L/D + \sqrt{1 + (2L/D)^2} \right]}{2\pi \times L \times H_c}$$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-2

TYPE OF TEST : Constant Head

WATER LEVEL AT THE TIME OF THE TEST : 5.7 feet below ground

TEST DATA :

Q = Discharge Rate = 1.0 gpm

L = Length of monitored zone = 9.3 ft

D = Diameter of borehole = 0.67 ft

H_c = Constant head above or
below pre-pumping level = 7.8 ft

FORMULA : $$K_h = \frac{Q \times \ln \left[2L/D + \sqrt{1 + (2L/D)^2} \right]}{2\pi \times L \times H_c}$$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-3

TYPE OF TEST : Constant Head

WATER LEVEL AT THE TIME OF THE TEST : 5.96 feet below ground

TEST DATA :

Q = Discharge Rate = 1.8 gpm

L = Length of monitored zone = 3 ft

D = Diameter of borehole = 0.67 ft

H_c = Constant head above or below pre-pumping level = 14.54 ft

FORMULA : $$K_h = \frac{Q \times \ln \left[2L/D + \sqrt{1 + (2L/D)^2} \right]}{2 \pi \times L \times H_c}$$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-4

TYPE OF TEST : Constant Head

WATER LEVEL AT THE TIME OF THE TEST : 5.65 feet below ground

TEST DATA :

Q = Discharge Rate = 2.5 gpm

L = Length of monitored zone = 10 ft

D = Diameter of borehole = 0.67 ft

H_c = Constant head above or below pre-pumping level = 14.85 ft

FORMULA : $K_h = \frac{Q \times \ln \left[2L/D + \sqrt{1 + (2L/D)^2} \right]}{2 \pi \times L \times H_c}$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-5

TYPE OF TEST : Constant Head

WATER LEVEL AT THE TIME OF THE TEST : 5.28 feet below ground

TEST DATA :

Q = Discharge Rate = 4.5 gpm

L = Length of monitored zone = 10 ft

D = Diameter of borehole = 0.67 ft

H_c = Constant head above or below pre-pumping level = 15.22 ft

FORMULA : $$K_h = \frac{Q \times \ln \left[2L/D + \sqrt{1 + (2L/D)^2} \right]}{2 \quad \times L \times H_c}$$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : MW-6

TYPE OF TEST : Variable (rising) Head

WATER LEVEL AT THE TIME OF THE TEST : 7.26 feet below ground

TEST DATA :

H_1 = Peizometric head = 6.35 feet

H_2 = Peizometric head = 3.08 feet

t_1 = Time = 0 seconds

t_2 = Time = 5400 seconds

L = Length of monitored zone = 11 ft

D = Diameter of borehole = 0.67 ft

d = Diameter of the well = 0.17 ft

FORMULA :

$$K_h = \frac{d^2 \times \ln (2L)}{3 \times L (t_2 - t_1)} \times \ln (H_1 / H_2)$$

PERMEABILITY DATA SHEET
ITHACA - COURT STREET SITE

TEST LOCATION : P-3

TYPE OF TEST : Variable (falling) Head

WATER LEVEL AT THE TIME OF THE TEST : 6.4 feet below ground

TEST DATA :

H_1 = Peizometric head = 3.3 feet

H_2 = Peizometric head = 1.9 feet

t_1 = Time = 0 seconds

t_2 = Time = 2160 seconds

L = Length of monitored zone = 8.6 ft

D = Diameter of borehole = 0.67 ft

d = Diameter of the well = 0.1

FORMULA : $$K_h = \frac{d^2 \times \ln(2L)}{8 \times L(t_2 - t_1)} \times \ln(H_1 / H_2)$$

PERMEABILITY TEST METHODS

CONSTANT HEAD METHOD

In this method water is added to or withdrawn from the monitoring well/piezometer at a rate sufficient to maintain a constant water level for a period of not less than 10 minutes. Measurements of the amount of water added or withdrawn are recorded at regular intervals until an adequate determination of the permeability has been made.

FALLING HEAD METHOD

In this method the monitoring well/piezometer is filled with water which is then allowed to seep into the soil. Measurements are made of the water level in the monitoring well/piezometer over a given period of time. These measurements are continued until the rate of decrease becomes negligible or until sufficient readings have been obtained to satisfactorily determine the permeability.

RISING HEAD METHOD

This method consists of removing water from the monitoring well/piezometer and observing the rate of rise of the water level until the rise in water level becomes negligible. The rate is calculated from the elapsed time and the change in depth of the water surface.

Appendix A-6

Groundwater Level Data

GROUNDWATER LEVEL DATA
ITHACA-COURT STREET SITE

LOCATION	GROUND SURFACE ELEVATION (FT. ABOVE MSL)	SOIL MONITORED	WATER ELEVATION (FT. ABOVE MEAN SEA LEVEL)						
			1/10/86	1/13/86	1/17/86	2/6/86	3/14/86	4/17/86	8/4/86
MW-1	395.3	SAND	389.6	390.1	389.5	390.1	390.1	390.4	389.2
MW-2	394.1	FILL	389.8	388.6	388.4	388.7	389.0	389.7	388.9
MW-3	393.2	SAND	387.8	387.9	387.3	387.8	387.9	388.2	387.9
P-3	393.2	CLAYEY SILT	388.8	388.6	386.8	387.6	388.2	388.7	NA
MW-4	393.9	SAND	388.8	389.2	388.2	389.6	388.8	389.1	388.8
P-4	393.9	CLAYEY SILT	387.2	387.1	386.5	386.8	386.9	387.3	386.9
MW-5	393.9	SAND	389.3	389.3	388.6	389.1	389.4	389.5	389.2
MW-6	394.7	CLAYEY SILT	NA	NA	387.6	388.0	388.2	389.1	387.6

NA = NOT AVAILABLE

Appendix A-7

Monitoring Well Sampling Procedures

MONITORING OF GROUNDWATER WELLS

1. Check the well for proper identification and location.
2. Measure and record the height of protective casing.
3. After unlocking the well and removing any well caps, measure and record the ambient and well-mouth organic vapor levels using the photoionization meter. If the ambient air quality at breathing level reaches 5 ppm, the sampler shall utilize the appropriate safety equipment as described in the Health and Safety Plan.
4. Using the electronic water level meter, measure and record the static water level in the well to the nearest 0.01 foot. Measure also the depth to the well bottom from a constant reference point on the top of the well riser. Upon removing the water level wire, rinse it with laboratory-grade isopropanol or ethanol and then distilled water.
5. Calculate the volume of stagnant water in the well casing. Volume in liters equals 0.154 times the square of the inside diameter of the casing (in inches) times the depth of water (in feet).

SAMPLING OF GROUNDWATER MONITORING WELLS

Following the measurements and calculations described above, sampling will commence in the sequence below:

1. Lower the submersible pump or peristaltic pump intake into the well. For shallow groundwater situations, the intake of the suction tubing or of the submersible pump will be lowered to the top of the well screen and the well purged three to five times the calculated volume. Alternatives to this procedure may be necessary if one of the following conditions exist:
    a. If the well screen is very large, making pumping from the top impractical, the suction line or submersible pump should be lowered to the approximate mid-point of the screened portion of the well.
    b. If the well is situated in tight formations such as tills, clays or rock, the purging of the well should be performed from very near the bottom of the well screen. This will facilitate complete removal of standing well water.
2. Connect the instrumentation header to the pump discharge and begin flushing the well. Monitor the in situ parameters (pH, Eh, temperature, and specific conductivity) and measure the volume of groundwater being pumped. Alternately, in situ parameters may be monitored in a beaker filled from the pump discharge. Purging of the standing well water is considered complete when one of the following is achieved:
    a. at least three well volumes have been purged and in situ parameters stabilized, or

   b. five well volumes have been purged, or

   c. the well has been pumped dry.

3. Record the in situ parameters.

4. After purging, lower the pump intake or bailer, as appropriate for the parameters of concern (i.e. bailer for volatiles; and bailer, peristaltic or submersible pump for all other parameters) to the middle of the screened interval. If the analysis to be performed is for lighter-than-water chemical species, then the pump or bailer should be lowered to the top of the water column for sample collection.

5. Collect the sample(s).

   Volatile and semi-volatile samples are filled directly from the bailer with as little agitation as possible.

   Other samples will be placed directly into the appropriate container from the discharge tubing of the pump or bailer. Where filtration is required, an in-line filter should be used, if possible. Vacuum filtration is an alternative to an in-line device (see attached Table).

6. Remove the pump from the well and decontaminate the pump and tubing by flushing with isopropanol; up to one gallon of the solvent is used as needed. Rinse the pump and tubing with one liter of distilled water for every 40 feet of tubing.

7. Complete sample data records after each well is sampled.

8. Secure the well cap and lock.

STANDARD FIELD FILTRATION PROCEDURES

A. IN-LINE FILTRATION

EQUIPMENT

1. A portable 102-mm acrylic backflushing filter unit

2. 102-mm diameter filter papers, 0.45 µm membrane filters

3. Reagent rinse water (ASTM Type II or better)

4. 20% v/v nitric acid rinse solution

PROCEDURES

1. Attach in-line filter assembly, after assembling filter paper into filter holder, to discharge line of sampling pump. Open by-pass valve completely.

2. Turn sampling pump on, slowly turn by-pass valve closed, allowing flow into the filter. Remove trapped air through the filter bleed valve, if necessary.

3. Discard the initial 100 mℓ ± of filtrate. Collect subsequent filtrate into sample bottle.

4. Rinse barrel and filter holder assembly between samples with three rinses of reagent water. The rinse sequence when elemental parameters will be analyzed is: reagent water - 20% v/v nitric acid - reagent water.

B. VACUUM FILTRATION

EQUIPMENT

1. Two sets of either glass funnel type or self-contained polysulfone filters with sintered glass discs or polysulfone filter plates
2. 47-mm diameter filter papers, 0.45 µm membrane filters
3. Vacuum pump or ISCO peristaltic pump with silicone tubing
4. Reagent rinse water (ASTM Type II or better)
5. 20% v/v nitric acid rinse solution

PROCEDURES

1. Thoroughly rinse sintered glass disc, filter funnel, and stem or polysulfone filter units with reagent water.
2. On the basis of visual clarity of sample, prefiltering with larger pore filters may be required. If sample has a heavy clay content, organics, or suspended matter, prefiltration through a 3.0- or 5.0-µm membrane filter may be necessary.
3. Place membrane filter on filter holder with minimum handling.
4. Attach filter holder with filter to filter funnel and receiver.
5. Swirl and slowly pour sample bottle into filter funnel.
6. Attach suction tubing to filter flask and vacuum pump (or ISCO pump). Pump is turned on in the vacuum mode.
7. Filter a small portion of the sample and discard filtrate after rinsing flask with sample filtrate.
8. If prefiltering was required, pass sample through a 0.45-µm membrane filter using another filtering apparatus.
9. Transfer filtered sample to appropriate bottles.
10. Rinse filtration equipment between samples with at least three rinses of reagent water. The rinse sequence, when elemental parameters are to be analyzed, is: reagent water - 20% v/v nitric acid - reagent water.

C. PRESSURE FILTRATION

EQUIPMENT

1. Pressure filter apparatus consisting of 1 liter barrel filter, filter holder and pressure hose connectors
2. Source of pressurized gas, i.e., tank of nitrogen, argon, etc.
3. 147 mm filter papers, 0.45 µm membrane filter
4. Reagent rinse water (ASTM Type II or better)
5. 20% v/v nitric acid rinse solution

PROCEDURES

1. If filter barrel has sample valve, assemble filter assembly with 0.45 µm membrane filter and attach pressure hose.
2. If filter barrel does not have a sample valve, assemble filter paper on filter holder.
3. Turn barrel upside down and pour sample into barrel.
4. Place filter holder and filter onto barrel assembly, making sure to align O-ring for a positive seal.
5. Attach swing-away bolts and tighten hand-tight.
6. Turn over filter assembly and attach pressure hose assembly.
7. Slowly turn on pressurized gas and increase pressure regulator to a maximum of 20 psi.
8. Collect filtrate from bottom of barrel assembly.
9. Rinse barrel and filter holder assembly between samples with three rinses of reagent water. The rinse sequence when elemental parameters will be determined is: reagent water - 20% v/v nitric acid - reagent water.

Appendix A-8

Air Sampling Procedures
and
Hydrocarbon Survey Results

AIR SAMPLING PROCEDURES

The following discussion summarizes the methodologies employed to collect air samples at the Court Street Site. Three types of sampling systems were utilized: (1) high-volume (hi-vol) air samplers with particulate filters and PUF/XAD-2 sorbent cartridges, (2) low flow portable pumps with particulate filters and (3) a portable direct-reading total hydrocarbon analyzer.

High-Volume Air Samplers

High-volume sampling involved collection of particulate and vapor phase PAH compounds on a filter-sorbent cartridge system attached to a conventional high-volume air sampler. The high-volume sampler is comprised of a motor with a flow controller, a particulate filter assembly, and an aluminum throat extension containing a polyurethane foam (PUF) and XAD-2 resin. All parts of the sample train which come in contact with the air sample were precleaned to prevent sample contamination. Calibration of the high-volume air sampler was conducted daily using a calibrated venturi, manually adjusting the flow controller to achieve the desired flow rate.

The high-volume samplers were operated continuously for 6 hours at nominal flow rates of 0.3 m^3/minute for a total sample volume of approximately 100 m^3. After sampling, the throat assembly and the filter holder were removed, wrapped in hexane prerinsed aluminum foil, and labeled for shipment to the ERCO laboratory.

Low Flow Portable Pumps

Low flow portable pumps equipped with membrane particulate filters (0.8 μm pore size) in styrene filter cassettes were used to collect samples for iron. This collection procedure is a commonly used NIOSH-approved monitoring method for airborne metals. The pumps were calibrated daily with a bubble-tube flowmeter to nominal flow rates of 3 liters/minute.

Sampling involved 6-hour sampling runs for total volumes of approximately 1,000 liters. The styrene filter cassettes were transported to and from the field with the caps securely in place in precleaned zip-lock bags. Upon completion of sampling, the styrene filter caps were again securely fastened, the samples were labelled, sealed with GCA custody seals, and placed in zip-lock bags for delivery to the ERCO laboratory.

Portable Total Hydrocarbon Analyzer

Volatile organics were monitored at the sampling locations using an HNU PI-101 volatile organics analyzer. Periodic sweeps were made of each location, recording the instrument responses. This unit measures total hydrocarbon concentrations (in ppm) as benzene, for those compounds with ionization energies less than that of the photoionization detector UV light source. No specific compound identification is possible using this survey instrument.

TOTAL HYDROCARBON SURVEY RESULTS[1]
ITHACA-COURT STREET SITE

Sample Locations	A-1 Upwind	A-2 Onsite	A-4 Onsite	A-3 Downwind
Time	ppm, as benzene			
1020	1.0	0.7	0.3	0.3
1150	0.7	0.2	0.3	0.4
1245	0.3	0.3	0.1	0.2
1345	0.0	0.0	0.0	1.4
1445	0.0	0.3	0.1	0.1

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[1] Survey performed on May 19, 1986.

POTENTIALLY SENSITIVE LAND USES
ITHACA-COURT STREET SITE

Location	Land Use	Figure 13 Reference Number
Conway Park	Passive	1
Community Gardens	Garden plots used to grow vegetables	2
Docks	Boat slips and fishing	3
Washington Park	Passive	4
Park	Passive	5
Immaculate Conception Catholic School	Elementary education	6
Greater Ithaca Activities Center	Youth Center, day care, recreation, counseling	7
Central School	Elementary education	8
Southside Community Center	Day care	9
Reconstruction Home	Nursing home	10
McGraw House	High density elderly housing	11
Dewitt Park	Passive	12
IACC Day Care Center	Day care	13
Lutheran Church Nursery School	Day care	14
Thompson Park	Passive	15
Auburn Park	Passive	16
All water areas	Recreational fishing	17

POTENTIAL SOURCES OF CHEMICALS IN GROUNDWATER OR SURFACE WATER
ITHACA-COURT STREET SITE

Location	Land Use	Figure 13 Reference Number
Agricultural Supply Store	Chemical storage and distribution	1
Junk Yard	Scrap metal pile	2
Storage Yard	Petroleum storage tanks	3
Cayuga Inlet Docks	Boat yard	4
—	Tank farm (removed)	5
Gas Station	Gasoline storage and distribution	6 through 13
Agricultural Supply Store	Chemical storage and distribution	14

APPENDIX B

CHEMICAL DATA

Appendix B-1

Analytical Methods
and
Minimum Detection Limits

ANALYTICAL METHODS[1]
ITHACA - COURT STREET SITE

Analytical Parameter	Coal Tar	Soil	Groundwater	Air
Volatile Organic Compounds	Method 624 (aqueous) Method 8240 (coal tar)	Method 8020 with confirmatory analysis of 2 samples using Method 8240	Method 602 with confirmatory analysis of 2 samples per round using Method 624	Not Analyzed
Semi-Volatile Organic Compounds	Method 625 (aqueous phase) Method 8270 (coal tar)	Method 8310 with confirmatory analysis of 2 samples using Method 8270	Method 610 with confirmatory analysis of 2 samples per round using Method 625	Method 8310
Cyanide - Total and Ferro-Ferricyanide	Not Analyzed	Method 9010	Method 335.2	Not Analyzed
Total Organic Carbon	Not Analyzed	Method 9060	Method 415.1	Not Analyzed
Total Phenolics	Not Analyzed	Method 420.1	Method 420.1	Not Analyzed
Iron and Zinc	Not Analyzed	Method 200.7 with 3050	Method 200.7	NIOSH Method 7300 (Iron Only)
EP Toxicity (extraction)	Method 1330	Not Analyzed	Not Analyzed	Not Analyzed
Total Metals (As, Ba, Cd, Cr, Hg, Pb, Se, Ag, Cu, Ni, Zn, Ti)	Methods listed below[2]	Not Analyzed	Not Analyzed	Not Analyzed
Total Organic Halides	Method 9020	Not Analyzed	Not Analyzed	Not Analyzed
Ignitability	Method 1010 (coal tar)	Not Analyzed	Not Analyzed	Not Analyzed

---

[1] Method numbers refer to USEPA methods unless otherwise noted (USEPA, 1983).

[2] Methods used for solids/liquids: As 7060/206.2, Ba 7091/210.1, Cd 7130/213.2, Cr 7190/218.2, Hg 7470/245.1, Pb 7420/239.2, Se 7740/270.2, Ag 7760/272.2, Cu 7210/220.2, Ni 7520/249.2, Zn 7950/289.1, and Ti 7841/279.2.

MINIMUM DETECTION LIMITS
ITHACA-COURT STREET SITE

BORINGS (MG/KG)

SAMPLE IDENTIFIER	B-1/S-2	B-2/S-1	B-3/S-2	B-4/S-2	B-5/S-1	B-6/S-1	B-7/S-2	B-8/S-1	B-9/S-1	B-9/S-2
VOLATILE AROMATICS	0.005	0.005	0.005	0.005	0.005	0.200	0.190	0.200	0.100	0.180
SEMIVOLATILE ORGANICS	1.000	5.000	1.000	1.000	1.000	1.000	10.000	5.000	20.000	20.000
METALS	20	20	20	20	20	20	20	20	20	20
CYANIDE	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
TOTAL RECOVERABLE PHENOLICS	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
TOTAL ORGANIC CARBON	5	5	5	5	5	5	5	5	5	5

TEST PIT SOILS (MG/KG)

SAMPLE IDENTIFIER	TP-1/S-1	TP-1/S-1 GC/MS	TP-2/S-1	TP-2/S-1 DUP	TP-2/S-1 GC/MS	TP-3/S-1	TP-3/S-1 DUP	TP-3/S-2	TP-3/S-2 GC/MS	TP-7/S-1	TP-8/S-1	TP-9/S-2
VOLATILE AROMATICS	0.008	0.002	0.200	0.100	0.002	0.0089	0.0057	0.010	0.0033	0.0077	9.500	0.190
ACETONE	--	0.050	--	--	0.050	--	--	--	0.082	--	--	--
METHYLENE CHLORIDE	--	0.005	--	--	0.005	--	--	--	0.0082	--	--	--
TETRACHLOROETHENE	--	0.002	--	--	0.002	--	--	--	0.0033	--	--	--
SEMIVOLATILE ORGANICS	10.000	20.000	25.000	10.000	5.800	5.800	3.000	2.300	5.600	0.630	6.200	2.900
METALS	20	--	20	20	--	10	10	10	--	10	10	10
CYANIDE	0.30	--	0.30	0.30	--	0.3	0.3	0.3	--	0.3	0.3	0.3
TOTAL RECOVERABLE PHENOLICS	0.10	--	0.10	0.10	--	0.5	0.5	0.5	--	0.5	0.5	0.5
TOTAL ORGANIC CARBON	5.0	--	5.0	5.0	--	25	25	25	--	25	25	25

GROUNDWATER (MG/L)

SAMPLE IDENTIFIER	MW-101	MW-201	MW-201 GC/MS	MW-301	MW-102	MW-102 GC/MS	MW-202	MW-202 DUP	MW-302	MW-302 GC/MS	MW-103	MW-103 DUP	MW-203	MW-303	MW-303 GC/MS
VOLATILE AROMATICS	0.001	0.001	0.002	0.001	0.010	0.002	0.001	0.001	0.010	0.010	0.001	0.001	0.001	0.001	0.002
ACETONE	--	--	0.05	--	--	0.05	--	--	--	0.25	--	--	--	--	0.05
SEMIVOLATILE ORGANICS	0.040	0.025	0.020	0.020	0.040	0.100	0.025	0.400	1.000	0.330	0.040	0.040	0.025	0.020	0.033
IRON	0.10	0.1	--	0.10	0.10	--	0.1	0.1	0.10	--	0.10	0.10	0.1	0.10	--
ZINC	0.010	0.01	--	0.010	0.010	--	0.01	0.01	0.010	--	0.010	0.010	0.01	0.010	--
LEAD	--	0.01	--	--	--	--	0.01	0.01	--	--	--	--	0.01	--	--
CYANIDE	0.010	0.01	--	0.010	0.010	--	0.01	0.01	0.010	--	0.010	0.010	0.01	0.010	--
TOTAL RECOVERABLE PHENOLICS	0.010	0.010	--	0.010	0.010	--	0.010	0.010	0.010	--	0.010	0.010	0.010	0.010	--
TOTAL ORGANIC CARBON	0.5	0.50	--	0.50	0.5	--	0.50	0.50	0.50	--	0.5	0.5	0.50	0.50	--

GROUNDWATER CONT. (MG/L)

SAMPLE IDENTIFIER	MW-104	MW-204	MW-304	MW-105	MW-205	MW-305	MW-106	MW-106 GC/MS	MW-206	MW-206 GC/MS	MW-306	MW-306 DUP
VOLATILE AROMATICS	0.001	0.001	0.001	0.001	0.001	0.001	0.500	0.002	0.100	0.100	0.010	0.010
ACETONE	--	--	--	--	--	--	--	0.050	--	2.5	--	--
SEMIVOLATILE ORGANICS	0.040	0.025	0.020	0.040	0.025	0.020	0.040	0.100	0.020	0.033	0.200	0.200
IRON	0.10	0.1	0.10	0.10	0.1	0.10	0.10	--	0.1	--	0.10	0.10
ZINC	0.010	0.01	0.010	0.010	0.01	0.010	0.010	--	0.01	--	0.010	0.010
LEAD	--	0.01	--	--	0.01	--	--	--	0.01	--	--	--
CYANIDE	0.010	0.01	0.010	0.010	0.01	0.010	0.010	--	0.01	--	0.010	0.010
TOTAL RECOVERABLE PHENOLICS	0.010	0.010	0.010	0.010	0.010	0.010	0.010	--	0.010	--	0.010	0.010
TOTAL ORGANIC CARBON	0.5	0.50	0.50	0.5	0.50	0.50	0.5	--	0.50	--	0.50	0.50

NOTES:
-- = NOT ANALYZED

Appendix B-2

Solubility Data

SOLUBILITIES OF PAHs IN WATER (mg/ℓ)[1]

Compound	Verschueren[2]	EPA Treatability Manual[3]
Acenaphthene	--	3.42
Acenaphthylene	3.93	3.93
Anthracene	1.29	0.073
Benzo(a)anthracene	0.044 at 24°C	0.014
Benzo(a)pyrene	0.003 at 20°C	0.0038
Benzo(b)fluoranthene	--	NA[4]
Benzo(k)fluoranthene	--	0.00055
Benzo(g,h,i)perylene	0.00026	0.00026
Chrysene	0.006	0.002
Dibenzo(a,h)anthracene	--	0.0005
Fluoranthene	0.120 at 24°C	0.26
Fluorene	1.9	1.98
Indeno(1,2,3-cd)pyrene	--	0.62
Naphthalene	30.0 at 20°C	34.4
Phenanthrene	0.816 at 21°C	1.29
Pyrene	0.032 at 24°C	0.14

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[1] All values are calculated at 25°C unless otherwise noted.

[2] Verschueren, K. Handbook of Environmental Data on Organic Chemicals, Van Nostrand Reinhold Company, New York, New York 1977.

[3] USEPA, Treatability Manual Volume I: Treatability Data, Office of Research and Development, Washington, DC EPA-600/2-82-001a. September 1981 (Revised).

[4] NA - Not available.

Appendix B-3

Groundwater Quality Assurance Sample Results

QUALITY ASSURANCE SAMPLES
ITHACA-COURT STREET SITE

SHEET 1 OF 2

SITE IDENTIFIER	SAMPLER BLANK			TRIP BLANK			FILTRATION BLANK		
SAMPLE IDENTIFIER	SB-101	SB-201	SB-301	TB-101	TB-201 GC/MS(1)	TB-301 GC/MS	FB-101	FB-201	FB-301
DATE OF SAMPLE COLLECTION	2/4/86	4/16/86	8/5/86	2/4/86	4/17/86	8/4/86	2/4/86	4/16/86	8/6/86
VOLATILE ORGANICS (MG/L)									
-VOLATILE AROMATICS-									
BENZENE	ND (2)	ND	ND	ND	ND	ND	-- (3)	--	--
TOLUENE	ND	ND	ND	ND	ND	ND	--	--	--
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	--	--	--
STYRENE	ND	ND	ND	ND	ND	ND	--	--	--
TOTAL XYLENE	--	--	--	--	ND	ND	--	--	--
m - XYLENE	ND	ND	ND	ND	--	--	--	--	--
o - XYLENE	ND	ND	ND	ND	--	--	--	--	--
p - XYLENE	ND	ND	ND	ND	--	--	--	--	--
TRIMETHYLBENZENE	ND	ND	ND	ND	--	--	--	--	--
-OTHER-							--	--	--
ACETONE	--	--	--	--	ND	ND	--	--	--
TOTAL VOLATILE AROMATICS	ND	ND	ND	ND	ND	ND	--	--	--
SEMIVOLATILE ORGANICS (MG/L)									
-PAH-									
ACENAPHTHENE	ND	ND	ND	--	--	--	--	--	--
ACENAPHTHYLENE	ND	ND	ND	--	--	--	--	--	--
ANTHRACENE	ND	ND	ND	--	--	--	--	--	--
BENZO(b)FLUORANTHENE	ND	ND	ND	--	--	--	--	--	--
BENZO(k)FLUORANTHENE	ND	ND	ND	--	--	--	--	--	--
BENZO(g,h,i)PERYLENE	ND	ND	ND	--	--	--	--	--	--
BENZO(a)ANTHRACENE	ND	ND	ND	--	--	--	--	--	--
BENZO(a)PYRENE	ND	ND	ND	--	--	--	--	--	--
CHRYSENE	ND	ND	ND	--	--	--	--	--	--
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	--	--	--	--	--	--
FLUORANTHENE	ND	ND	ND	--	--	--	--	--	--
FLUORENE	ND	ND	ND	--	--	--	--	--	--
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	--	--	--	--	--	--
NAPHTHALENE	ND	ND	ND	--	--	--	--	--	--
PHENANTHRENE	ND	ND	ND	--	--	--	--	--	--
PYRENE	ND	ND	ND	--	--	--	--	--	--
-OTHER-									
2-4 DIMETHYLPHENOL	--	--	--	--	--	--	--	--	--
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	--	--
PHENOL	--	--	--	--	--	--	--	--	--
TOTAL PAH	ND	ND	ND	--	--	--	--	--	--
OTHER CHEMICALS (MG/L)									
-METALS-									
IRON	ND	0.21	ND	--			ND	ND	ND
LEAD	--	ND	ND	--			--	ND	ND
ZINC	ND	ND	ND	--			0.011	ND	ND
-CYANIDE-									
TOTAL CYANIDE	ND	ND	ND	--			--	--	--
AMENABLE CYANIDE	ND	ND	ND	--			--	--	--
FERRO-FERRI CYANIDE	ND	ND	ND	--			--	--	--
-OTHER-									
TOTAL RECOVERABLE PHENOLICS	ND	0.035	ND	--			--	--	--
TOTAL ORGANIC CARBON	ND	ND	ND	--			ND	ND	0.9

NOTES:
(1) INDICATES SAMPLE VALUES WERE OBTAINED BY GC/MS(EPA METHODS 624 AND 625).
(2) ND = NOT DETECTED (SEE APPENDIX B-1 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED.

MINIMUM DETECTION LIMITS
QUALITY ASSURANCE SAMPLES
ITHACA-COURT STREET SITE

SHEET 2 OF 2

SITE IDENTIFIER	SAMPLER BLANK			TRIP BLANK			FILTRATION BLANK		
SAMPLE IDENTIFIER	SB-101	SB-201	SB-301	TB-101	TB-201 GC/MS(1)	TB-301 GC/MS	FB-101	FB-201	FB-301
DATE OF SAMPLE COLLECTION	2/4/86	4/16/86	8/5/86	2/4/86	4/17/86	8/4/86	2/4/86	4/16/86	8/6/86
VOLATILE AROMATICS	0.001	0.001	0.001	0.001	0.002	0.010	--	--	--
ACETONE	-- (2)	--	--	--	0.050	0.250	--	--	--
SEMIVOLATILE ORGANICS	0.070	0.025	0.020	--	--	--	--	--	--
IRON	0.10	0.1	0.10	--	--	--	0.10	0.1	0.10
LEAD	--	0.01	0.010	--	--	--	--	0.01	0.010
ZINC	0.010	0.01	0.010	--	--	--	0.010	0.01	0.010
CYANIDE	0.010	0.01	0.010	--	--	--	--	--	--
TOTAL RECOVERABLE PHENOLICS	0.010	0.01	0.010	--	--	--	--	--	--
TOTAL ORGANIC CARBON	0.5	0.50	0.05	--	--	--	0.5	0.50	0.50

NOTES:

(1) INDICATES ORGANIC VALUES WERE OBTAINED BY GC/MS (METHODS 624 AND 625). ORGANIC CONCENTRATIONS IN REMAINING SAMPLES WERE OBTAINED BY HPLC (METHODS 602 AND 610).

(2) -- = NOT ANALYZED

Appendix A-9

Land Use Survey Data