

Seattle Regional Office

4636 E. Marginal Way S.
Suite 215
Seattle, WA 98134
(206) 763-7364
Fax (206) 763-4189

Formerly HAZCON, INC.

Clayton
ENVIRONMENTAL
CONSULTANTS

Soil and Groundwater Investigation Report
at
Orestes Site (14 Roy St.)
Seattle, Washington
for
Roy Street Holdings, Inc.
Vancouver, British Columbia
Clayton Project No. 66314.00

April 9, 1996

RECEIVED
OCT 10 1996
DEPT. OF ECOLOGY

CONTENTS

<u>Section</u>		<u>Page</u>
1.0	<u>EXECUTIVE SUMMARY</u>	1
2.0	<u>INTRODUCTION</u>	1
2.1	SITE LOCATION	1
2.2	PREVIOUS ENVIRONMENTAL STUDIES	2
2.3	SITE HISTORY	2
2.4	GEOPHYSICAL SURVEY FOR THE UNDERGROUND STORAGE TANK	2
3.0	<u>INITIAL SITE INVESTIGATION</u>	2
3.1	SOIL BORINGS	3
3.2	SOIL SAMPLES AND LABORATORY ANALYSES	3
3.3	GROUNDWATER MONITORING WELLS.....	4
3.4	GROUNDWATER SAMPLES AND LABORATORY ANALYSES.....	4
4.0	<u>INVESTIGATION OF THE EXTENT OF CONTAMIANCTION</u> ..	4
4.1	SOIL GAS INVESTIGATION	4
4.2	OFFSITE BOREHOLE AND// MONITORING WELLS	5
4.2.1	Soil Borings.....	5
4.2.2	Soil Samples and Laboratory Analyses	5
4.2.3	Groundwater Monitoring Wells.....	6
4.2.4	Groundwater Samples and Laboratory Analyses	6
4.2.5	Site Topographic Survey	6
5.0	<u>GEOLOGIC AND HYDROLOGIC CONDITIONS</u>	6
6.0	<u>FINDINGS AND CONCLUSIONS</u>	7
7.0	<u>LIMITATIONS</u>	7

Figures

1. Topographic Map of Surrounding Area
2. Boring and Monitoring Well location Map
3. Soil Gas Sample Locations and Contaminant Concentrations
4. PCE and TCE Concentrations in Soil
5. PCE and TCE Concentrations in Groundwater
6. Geologic Cross Sections

Tables

1. Summary of Analytical Results for Soil Samples
2. Summary of Analytical Results for Water Samples
3. Groundwater Monitoring Well Data

Appendices

- A. Select Information from Previous Environmental Studies in the Area
- B. Williamson and Associates Geophysical Survey
- C. Borehole Logs
- D. Chain of Custody and Laboratory Reports
- E. Quadrel Services Inc. EMUFLUX Passive, Non-Invasive Soil- Gas Survey Report
- G. Topographic Survey of Groundwater Monitoring Wells

1.0 EXECUTIVE SUMMARY

In the early 1990's GeoEngineers conducted a subsurface investigation of a former Unocal site at 700 Queen Anne Avenue North in Seattle, Washington. This investigation detected halogenated volatile organic compound (HVOCs) contamination in a monitoring well approximately 5 feet west of the subject property at 14 Roy Street. GeoEngineer's historical research revealed a dry cleaners operated on the subject property. Clayton Environmental Consultants (Clayton, formerly Hazcon Inc.) was contracted by Roy Street Holdings, Inc. to conduct a limited subsurface investigation of the subject property. HVOC contamination was detected in soil and groundwater collected from two monitoring wells installed on site at concentrations above Washington State Model Toxics Control Act (MTCA) cleanup levels. An investigation of the extent of contamination was then conducted using soil gas analyses and installation of additional monitoring wells and soil borings. Soil contamination appears to be limited to the west half of the subject property. Groundwater contamination was identified on the subject property and the properties to the west (Unocal) and the south.

2.0 INTRODUCTION

Clayton Environmental Consultants, Inc. (Clayton) was retained by Roy Street Holdings, Inc. to conduct a limited subsurface characterization at 14 Roy Street in Seattle, Washington. Historical records indicate that a dry cleaners operated onsite prior to 1973. During a subsurface investigation of the Unocal site adjacent to the west side of the subject property, GeoEngineers detected tetrachloroethene (PCE) and its degradation products, also referred to as HVOCs in this report, in the groundwater. GeoEngineers concluded the source of HVOC contamination was likely to be the subject property. Based on these data the current investigations were conducted.

Clayton's objectives of the investigations were to:

- Research historical data for information on the possibility of onsite underground storage tanks (USTs);
- Oversee a geomagnetic survey of the subject property;
- Collect and analyze soil and groundwater samples to determine if either medium was contaminated with petroleum hydrocarbons or HVOCs at levels exceeding Washington State Model Toxic Control Act (MTCA) cleanup levels;
- Determine the extent and magnitude of subsurface contamination, if present; and
- Prepare a report to document the findings of our investigations.

2.1 SITE LOCATION

The subject property, owned by Roy Street Holdings, Inc., is located at 14 Roy Street in Seattle, Washington (Figure 1). The site is located at the intersection of First Avenue and Roy Street, approximately 2 blocks north-northwest of the Seattle Center. The onsite building was originally built as a dry cleaners and subsequently modified into a restaurant and bar. The building is currently unoccupied. The subject property covers an area approximately 125 feet deep by 140 feet wide (Figure 2). Approximately eighty percent of the property is occupied by the building, and the remainder is covered by asphalt parking and driveways with landscaping along the perimeter.

Apartment complexes are located on the properties adjacent to the north and east, a vacant lot is adjacent to the west (formerly a Unocal gasoline station), and a parking garage, church and bookstore are located adjacent to the south.

2.2 PREVIOUS ENVIRONMENTAL STUDIES

In 1986 the Department of Ecology (Ecology) initiated environmental activities at the Monterey Apartments site, one block south southwest of the subject property, following notice that residents in the apartments were experiencing problems from gasoline odors in the building. Ecology retained GeoEngineers, Inc. to assess the situation. GeoEngineer's initial investigation involved installation of eight monitoring wells distributed at the apartment site and two sites upgradient: the Manhattan Express/Arnold's Texaco and the Unocal site (Appendix A). Significant groundwater contamination was found downgradient of the tanks at Arnold's Texaco and GeoEngineers concluded that the Texaco tanks were the source. They also detected groundwater contamination at the Unocal site, but determined it to be unrelated to the gasoline fumes in the apartments.

In 1989 GeoEngineers conducted a Subsurface Contamination Study of the Unocal Service Station and detected petroleum hydrocarbons in both soil and groundwater. A Site History Report was completed in 1992 and followed by underground storage tank (UST) removal and reporting. A Supplemental Subsurface Contamination Study was completed in 1993 during which additional groundwater monitoring wells were installed on the Unocal site. During this investigation, tetrachloroethene (PCE) and trichloroethene (TCE) were detected in two wells on the east side of the Unocal property. Their site history research found that a dry cleaners operated at 14 Roy Street. GeoEngineers concluded that the source of the PCE contamination was the former dry cleaners at 14 Roy Street. Petroleum contaminated soil was excavated at the Unocal site in 1993. Aquifer testing and a quarterly groundwater monitoring program also began in 1993. No groundwater remediation has been conducted at the Unocal site to date. In 1995, Roy Street Holdings, Inc. retained Clayton to investigate the possibility of subsurface contamination at the subject property.

2.3 SITE HISTORY

According to GeoEngineers review of the city directories Paramount Dry Cleaners was located at 14 Roy Street from 1955 through 1973. The site was then occupied by a retail plant store for a short time period followed by restaurants from approximately 1983 until at least 1992. It appears that the current building had been onsite since 1955 and the exterior was modified during this time. Building permits reviewed by Clayton indicate a 4,000 gallon underground storage tank (UST) for the storage of dry cleaning fluids was located onsite, however, the location was not specified. Historical maps indicate vent pipes were in the service drive and based on the age and location of the building it is likely that the tank was also located in the service drive or beneath the building east of the service drive (Appendix A).

2.4 GEOPHYSICAL SURVEY FOR THE UNDERGROUND STORAGE TANK

Clayton contracted Williams and Associates to conduct a geophysical survey of the service drive in June 1995. Their report is included in Appendix B. They concluded that an UST is not likely to be located in the service drive. Upon completion of the historical work and geophysical survey, Clayton conducted the subsurface investigation.

3.0 INITIAL SITE INVESTIGATION

To assess whether petroleum hydrocarbons and/or HVOCs had impacted the subsurface, Clayton conducted an initial investigation consisting of drilling two soil boreholes and

installing two monitoring wells onsite in June 1995. A GeoEngineer geologist, representing Unocal, was onsite to collect duplicate samples for analyses.

3.1 SOIL BORINGS

Prior to drilling activities, Clayton contacted Call-Before-You-Dig and Utility Locating Inc. to locate public and private utilities in the area. The utility locators marked the locations of identified utilities on the ground with spray paint.

On June 22, 1995 a Clayton geologist supervised the drilling of two onsite soil borings and monitoring wells to assess subsurface soils and groundwater. The borings were located in the service drive on the west side of the subject property building (Figure 2). One boring was located 15 feet south of the suspected location of the UST fill pipes and one boring was located adjacent to the Unocal boring in which HVOCs were identified.

The soil boreholes were drilled with a truck-mounted drill rig using 10-inch outside diameter, steam-cleaned, hollow-stem augers. The borings were drilled to an approximate depth of 15 feet below grade (bg). Samples were collected during drilling operations using stainless steel sleeves in a 2.5 inch modified California split-spoon sampler. Boring logs were completed for each well and are included in Appendix C. Monitoring wells were installed, as described below, upon completion of the borehole and collection of soil samples. All soil generated during the drilling operations was stored in Department of Transportation approved containers for disposal at a later date.

3.2 SOIL SAMPLES AND LABORATORY ANALYSES

Soil samples were collected from the borings at 2.5 foot intervals. All soil samples were logged in the field and classified using the ASTM Standard 2488, Standard Practice for Description and Identification of Soils. To aid in locating contamination, Clayton screened the soil samples using a photoionization detector (PID) and visual senses to detect petroleum hydrocarbons.

Laboratory soil samples were retained in the stainless steel sleeves. The ends of the sleeves were sealed with teflon tape and plastic caps. The sample was labeled and placed on ice in an insulated cooler for transport to Friedman and Bruya (F&B) for chemical analysis. Appropriate chain-of-custody documentation was followed for the transport of soil and water samples to the laboratory.

Two of the soil samples from near the top of the water table, B1-S2 and B2-S3, were submitted for laboratory analysis. The samples were analyzed for gasoline, diesel, heavy oil, total lead, and HVOCs using Washington State test methods WTPH-G, WTPH-D, and WTPH-418.1, and Environmental Protection Agency (EPA) test methods EPA 7421, EPA 8260, respectively. Analytical results for soil samples are summarized in Table 1. PCE and TCE concentrations in soil are summarized in Figure 4. Laboratory Reports are included in Appendix D. The WTPH-G analysis of sample B2-S3 detected approximately 2 ppm TPH in the gasoline range. In addition, approximately 2.3 ppm tetrachloroethene (PCE) was detected in sample B2-S3. Gasoline and HVOC concentrations were below the analytical detection limits in sample B1-S2. BTEX, Diesel and heavy oil concentrations in both samples were below the analytical detection limits. A maximum lead concentration of 5.7 ppm was detected in sample B2-S3 which is below the MTCA Method A cleanup level.

3.3 GROUNDWATER MONITORING WELLS

Upon completion of the boreholes and soil sampling the monitoring wells were constructed. The monitoring wells were installed to depths of approximately 15 feet bg. The wells were constructed of 2 inch diameter PVC casing. Ten feet of slotted PVC screen extended from 5 to 15 feet bg and was threaded to 5 feet of blank PVC casing from the surface to a depth of 5 feet. The annular space was filled with Colorado silica sand, bentonite and cement grout as depicted in the logs. Locking caps and traffic-rated street boxes were installed to provide access to the wells. Details of the construction of the monitoring wells are included on the boring logs in Appendix C.

The monitoring wells were developed and purged on July 6th. The wells were developed using a surge block and bailer. Surging and bailing the water circulates groundwater through the well and thereby removes fine particulate and accelerates proper sorting and settling of the sand pack. The monitoring wells were purged with a bailer by withdrawing four to five well casings of water and allowing fresh groundwater to enter the well. Groundwater removed during the purging process was stored in DOT-approved containers for disposal at a later date. Groundwater was then allowed to recharge and when the water table approached equilibrium conditions on July 12, 1995 the wells were sampled.

3.4 GROUNDWATER SAMPLES AND LABORATORY ANALYSES

Following the development and purging process, and stabilization of water levels, groundwater samples were obtained from each monitoring well. All water samples were collected from the top portion of the water column. The groundwater samples for gasoline and BTEX analyses were collected with a stainless steel bailer and the samples for HVOC analyses were collected with a bottom emptying disposable bailer. The samples were placed in 40-milliliter (ml) glass vials and 1-liter amber glass bottles. The containers were sealed with no air trapped inside. The samples were labeled, preserved on ice, and delivered with the chain-of custody to F&B for subsequent analysis.

Groundwater samples were analyzed using Washington State test methods WTPH-G, WTPH-D, and WTPH-418.1, and Environmental Protection Agency (EPA) test methods EPA 7421, EPA 8260. Analytical results for groundwater samples are summarized in Table 2. PCE and TCE concentrations in groundwater are summarized in Figure 5. Laboratory Reports are included in Appendix D. Approximately 1 ppm and 15 ppm of gasoline range hydrocarbons were detected in the samples from boring B1 and B2, respectively. Diesel concentrations of 1.5 and 0.5 ppm were also detected in groundwater samples B1 and B2. Analyses detected 0.012 ppm and 13 ppm PCE in samples from boring B1 and B2, respectively. PCE, TCE, and vinyl chloride concentrations were above MTCA cleanup levels. DCE and DCP contaminants were also detected, however MTCA Method A cleanup levels have not been assigned to these contaminants. BTEX, lead and heavy oil concentrations were below the analytical detection limits.

4.0 INVESTIGATION OF THE EXTENT OF CONTAMINATION

In November 1996 Clayton conducted an additional subsurface investigation to characterize the extent of contamination. Additional investigations involved installation and analysis of soil gas collection units and installation of offsite borings and a monitoring well.

4.1 SOIL GAS INVESTIGATION

On December 5, 1995 Clayton geologists installed 12 Emuflux soil gas collection units on and adjacent to the subject property. The locations of the units are shown in Figure 3 and described in Table 1 of Appendix E. The procedures for installation are included in Appendix E. The units were analyzed for HVOCs by Quadrel Service, Inc of Clarksburg, Maryland. The analytical report and table of results is included in Appendix E. The locations and concentrations of contaminants detected are plotted in Figure 3.

Many factors influence the soil gas contaminant concentrations and it is very difficult to correlate soil gas concentrations with concentrations in soil or groundwater. Three of the more significant factors influencing concentrations include depth to groundwater, distance to source of contamination, and type and extent of surfacing material (i.e. permeability of grass versus asphalt). A general comparison of soil gas concentrations with levels of contamination in groundwater and a basic knowledge of the geology of the area, allowed Clayton to assess the extent of contamination. Based on this survey it appears that contamination extends under the west half of the subject property, the southeast corner of the Unocal property to the west, and across the street adjacent to the property at 15 Roy Street.

4.2 OFFSITE BOREHOLES AND MONITORING WELLS

In December 1995 and January 1996 a Clayton geologist supervised the drilling of three offsite soil boreholes and installation of one monitoring well to assess whether petroleum hydrocarbons or HVOCs had impacted subsurface soils or groundwater. The procedures described earlier for the onsite investigation were followed for the offsite investigation.

4.2.1 Soil Borings

Three boreholes were drilled in the parking spaces along the south side of Roy Street on December 27, 1995 and January 2, 1996 (Figure 2). The boreholes were numbered B3 through B5; B1 and B2 were installed during the previous onsite investigation. Boring B3 was located mid-way between two high soil gas readings downgradient of the suspect source area, and borings B4 and B5 were located to the east in order to determine the eastern extent of contamination.

The soil boreholes were drilled with a truck-mounted drill rig using 10-inch outside diameter, steam-cleaned, hollow-stem augers. The borings were drilled to a depth of 15 to 19 feet bg. Boring logs were completed for each well and are included in Appendix C. One monitoring well was installed, as described earlier, upon completion of the borehole and collection of soil samples.

4.2.2 Soil Samples and Laboratory Analyses

Soil samples were collected from the borings at 2.5 foot intervals. The samples collected just above the water table and the samples from the base of the sand, were submitted for laboratory analyses. Laboratory soil samples were placed in laboratory supplied glass jars and sealed with teflon lined caps. Samples were labeled and placed on ice in an insulated cooler for transport to American Analytical Services, Inc. (AASI) for chemical analysis.

Soil samples were analyzed using Washington State test methods WTPH-G, EPA 8020, and EPA 8260. The samples collected just above the water table were analyzed for gasoline and BTEX and the samples from the base of sand were analyzed for HVOCs. Analytical results for soil samples are summarized in Table 1. Laboratory Reports are

included in Appendix D. Sample MW3-8.5 was analyzed for gasoline and BTEX and samples MW3-17.5 and B5-8.5, both from the base of the sand, were analyzed for HVOCs. No analytes were detected in the soil samples.

4.2.3 Groundwater Monitoring Wells

One monitoring well was installed in borehole B3 on December 27, 1995. The monitoring well was installed to a depth of approximately 19 feet bg. Details of the construction of the monitoring well is included in the boring logs of Appendix C. The screened section extended from a depth of 9 to 19 feet bg.

The monitoring well was developed on January 2, 1996. The well was developed using a surge block and bailer. Prior to sampling, the monitoring wells were purged with a bailer by withdrawing 10 well casings of water and allowing fresh groundwater to enter the well.

The static water level of the well was measured prior to development and measured again immediately prior to sampling to assure the water level had equilibrated. Monitoring wells MW1, MW2 and MW3 were purged on January 4, 1996. Groundwater data for all three monitoring wells is presented in Table 3.

4.2.4 Groundwater Samples and Laboratory Analyses

Following the development and purging process, groundwater samples were obtained from monitoring wells MW1, MW2, and MW3. Monitoring well MW3 was sampled on January 4, 1996 and MW1 and MW2 were sampled on January 5, 1996 since recharge was slower in these wells. Groundwater samples were analyzed using Washington State test methods WTPH-G and EPA test methods EPA 8020 and 8260. Analytical results for groundwater samples are summarized in Table 2. Laboratory Reports are included in Appendix D.

PCE and TCE were detected in the samples from all three wells. PCE concentrations ranged from 0.027 to 0.340 ppm. Vinyl chloride concentration of samples from MW1 and MW2 were also above cleanup levels. DCE and DCP were also detected in samples from MW1 and MW2, however MTCA Method A cleanup levels have not been assigned to these contaminants. All three water samples had TPH gasoline concentrations below the MTCA cleanup levels and BTEX, lead and heavy oil concentrations were below the analytical detection limits.

4.2.5 Site Topographic Survey

The monitoring well locations and elevations were surveyed by Larson Land Surveying, a licensed land surveyor, using a temporary benchmark at the Unocal site. A copy of the resulting topographic map for the site is included in Appendix F.

5.0 GEOLOGIC AND HYDROLOGIC CONDITIONS

The subject property is located on the south facing slope of Queen Anne Hill at an elevation of approximately 120 feet above mean sea level (msl)(Figure 1). Queen Anne hill has a maximum elevation of 450 feet. Locally the surface slopes steeply to the south and west. First Avenue South parallels the peak of a small ridge and east of First Avenue South, the surface slopes steeply to the east. Puget Sound is located approximately one-half mile to the southwest and Lake Union is located three-quarters of a mile to the east.

Work performed by GeoEngineers at the Unocal site indicate that sand, silty sand and sandy silts extend from the surface to a depth of 15 to 20 feet bg and is underlain by a continuous dark gray clay. Work performed by Ecology and Environment (E&E) at the Monterey Apartment in 1991 indicate that the clay is at least 25 feet thick. E&E's review of the geologic literature indicates the clay is the Lawton Clay Member of the Vashon Drift while the overlying sand and silt unit is thought to represent the Esperence Sand or a transitional zone between the Lawton Clay and Esperence Sand. The contact between the two generally appears to follow the topography. Geologic cross sections for the subject property are shown in Figure 5.

GeoEngineers investigations at the Unocal site indicate that a perched water table occurs a few feet above the upper surface of the clay unit. Their data from May 1993 indicates groundwater flow direction is to the southwest with an average gradient of 0.053 ft/ft. Water table elevations fluctuate significantly with the seasons. Between 1989 and 1993 the static water levels varied as much as 2 to 6 feet in various wells.

The groundwater gradient beneath the subject property is not known. However, investigations conducted by GeoEngineers at the Unocal site indicate the groundwater gradient beneath the subject property may be to the south and results of Clayton's soil gas investigation also suggests a southerly directed groundwater gradient.

6.0 FINDINGS AND CONCLUSION

The following findings and conclusions resulted from Clayton's limited subsurface investigations of the Orestes site:

- A geophysical survey of the service drive was conducted and no USTs were detected. The area under the building was not surveyed for USTs and should be investigated during site remediation.
- Sand, silty sand and sandy silts extend from the surface to a depth of 8 to 18 feet bg and is underlain by a dark gray clay. The sand/clay contact appears to slope to the south. A perched water table lies on top of the clay and the water table is 4 to 6 feet above the sand/clay contact. The depth to groundwater varies from approximately 6 to 12 feet below grade depending on the location of the well. In the area of the service drive the direction of groundwater flow appears to be to the south; paralleling the general slope of the sand/clay contact.
- Soil contamination appears to be limited to the west side of the subject property.
- Shallow groundwater of the subject property and properties to the west and south is contaminated with PCE and its degradation products at levels above the MTCA cleanup levels.

7.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities at the time the work was performed. Clayton's results and findings from the sampled areas do not necessarily reflect the subsurface

conditions in site areas not investigated. This report is not meant to represent a legal opinion. No other warranty, expressed or implied, is made.

Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

This report prepared by: Cynthia Torzynski
Cynthia Torzynski
Project Geologist

This report reviewed by: John F. Vargas
John F. Vargas, R.G.
Manager, Environmental Management and Remediation
Seattle Regional Office

April 9, 1996



0 1000 2000 ft

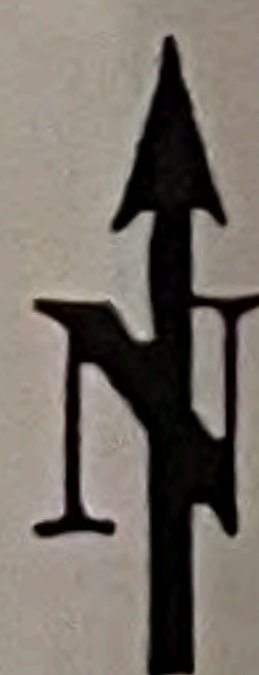


Figure 1 Topographic Map of the Surrounding Area

Clayton Project No. 66314

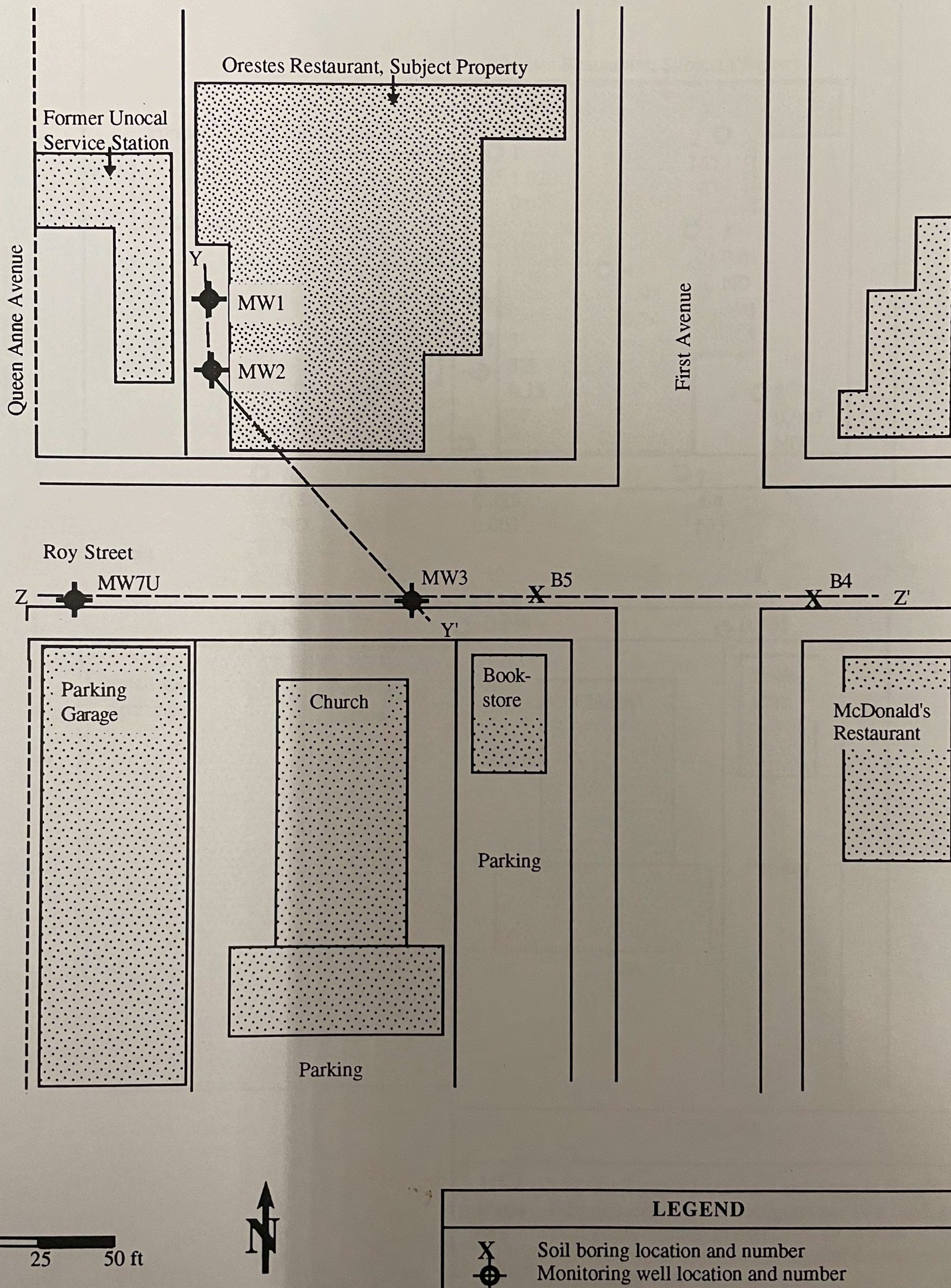
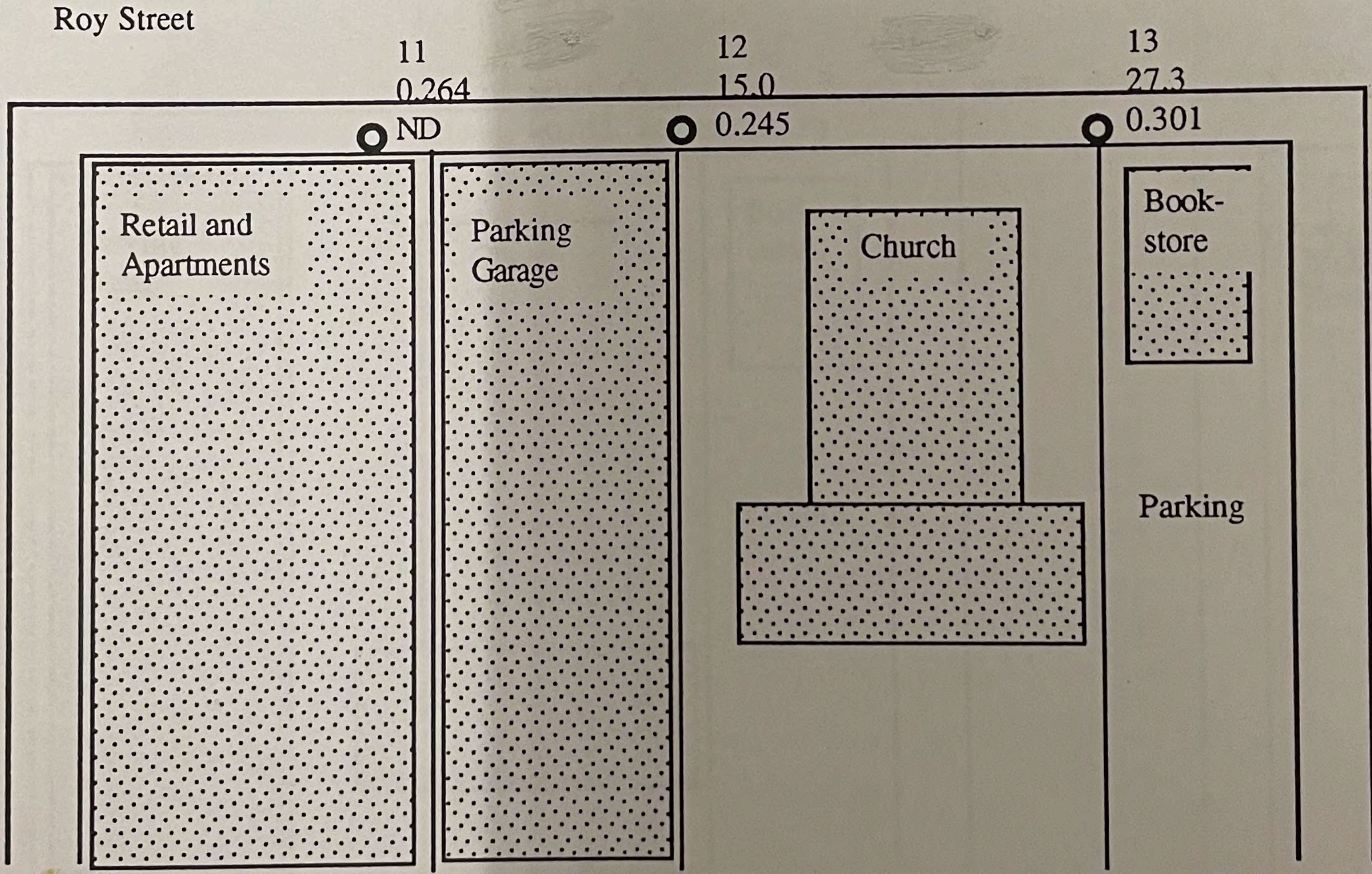
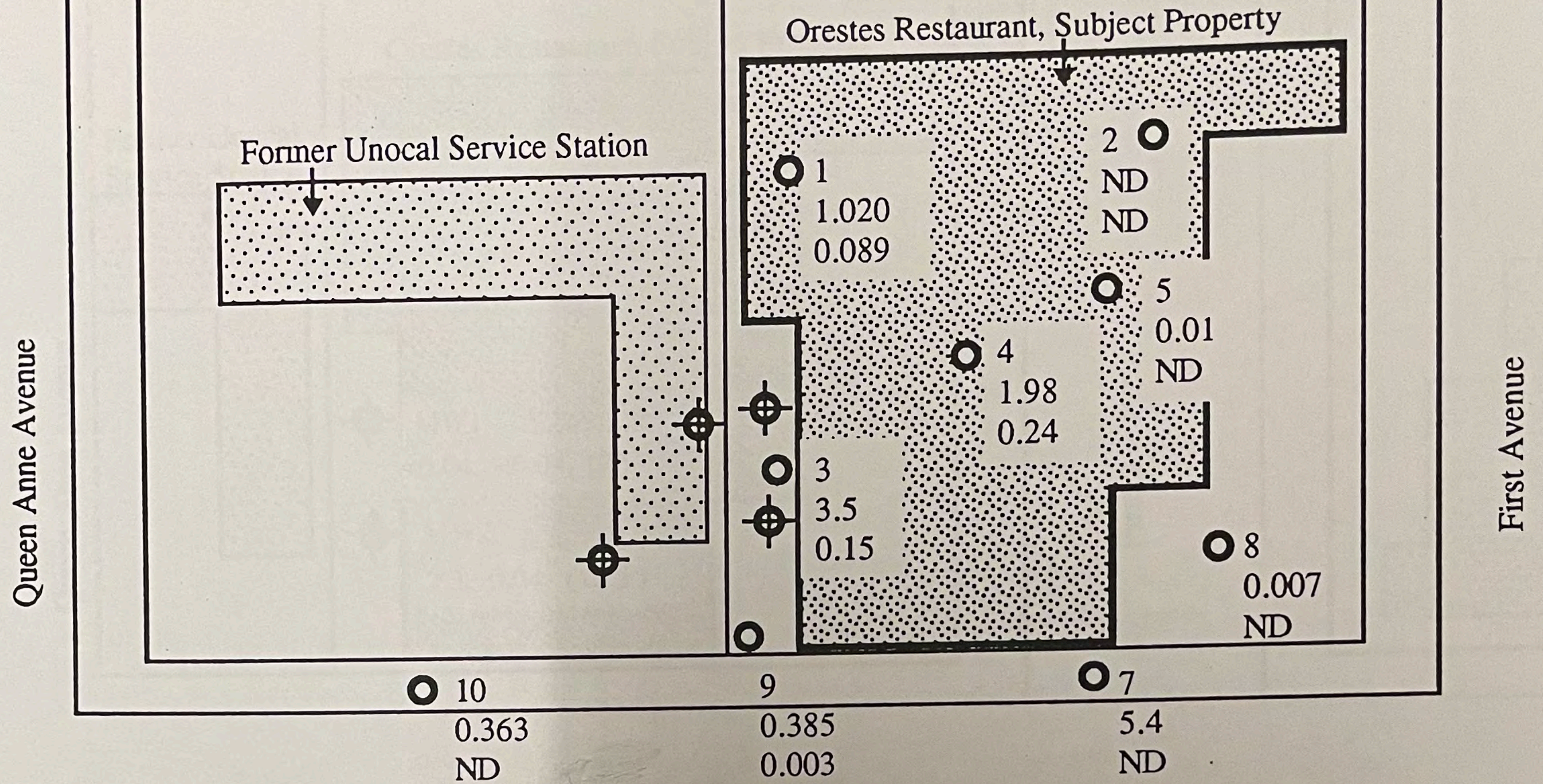


Figure 2 Boring and Monitoring Well Location Map

Clayton Project No. 66314



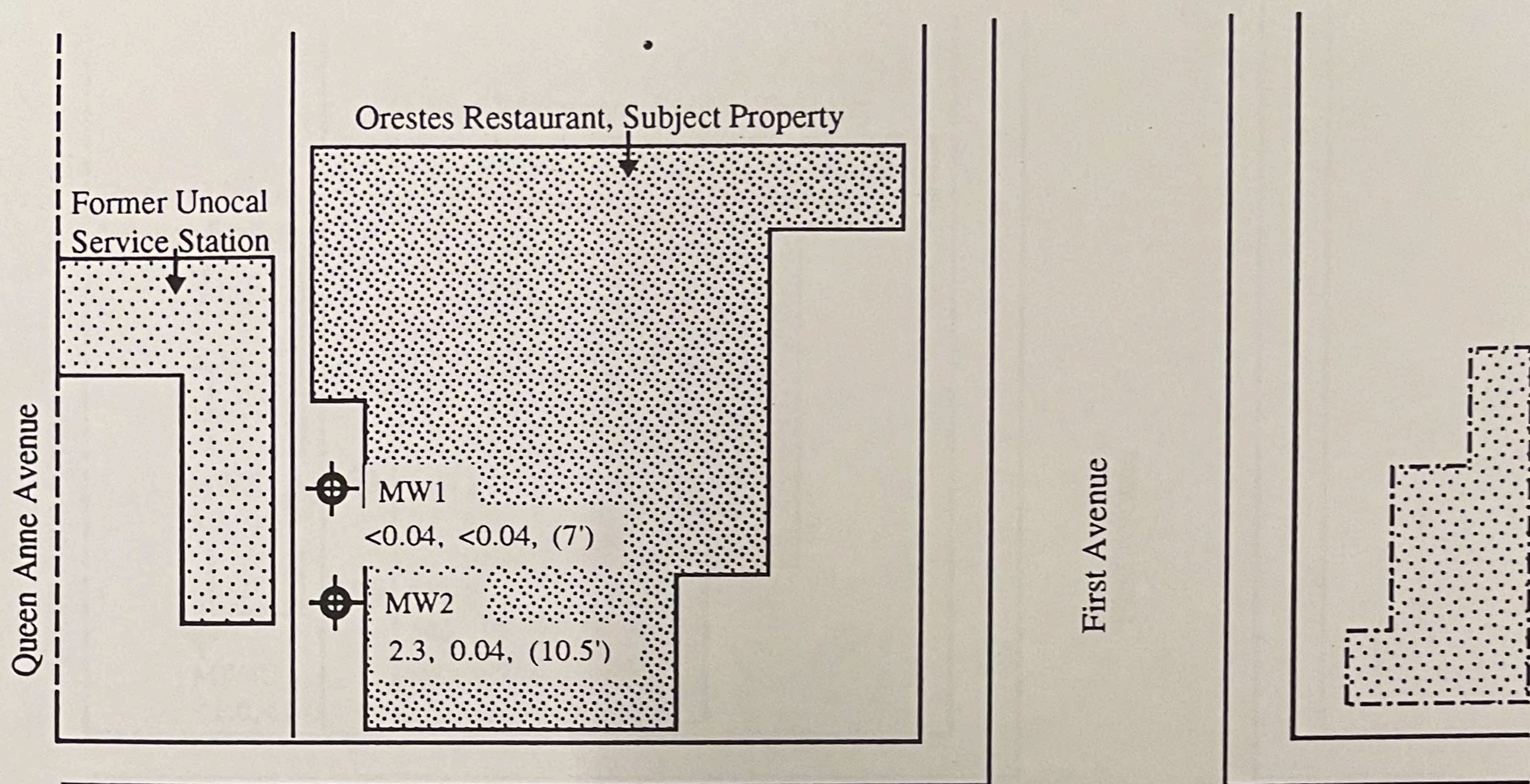
0 25 50 ft



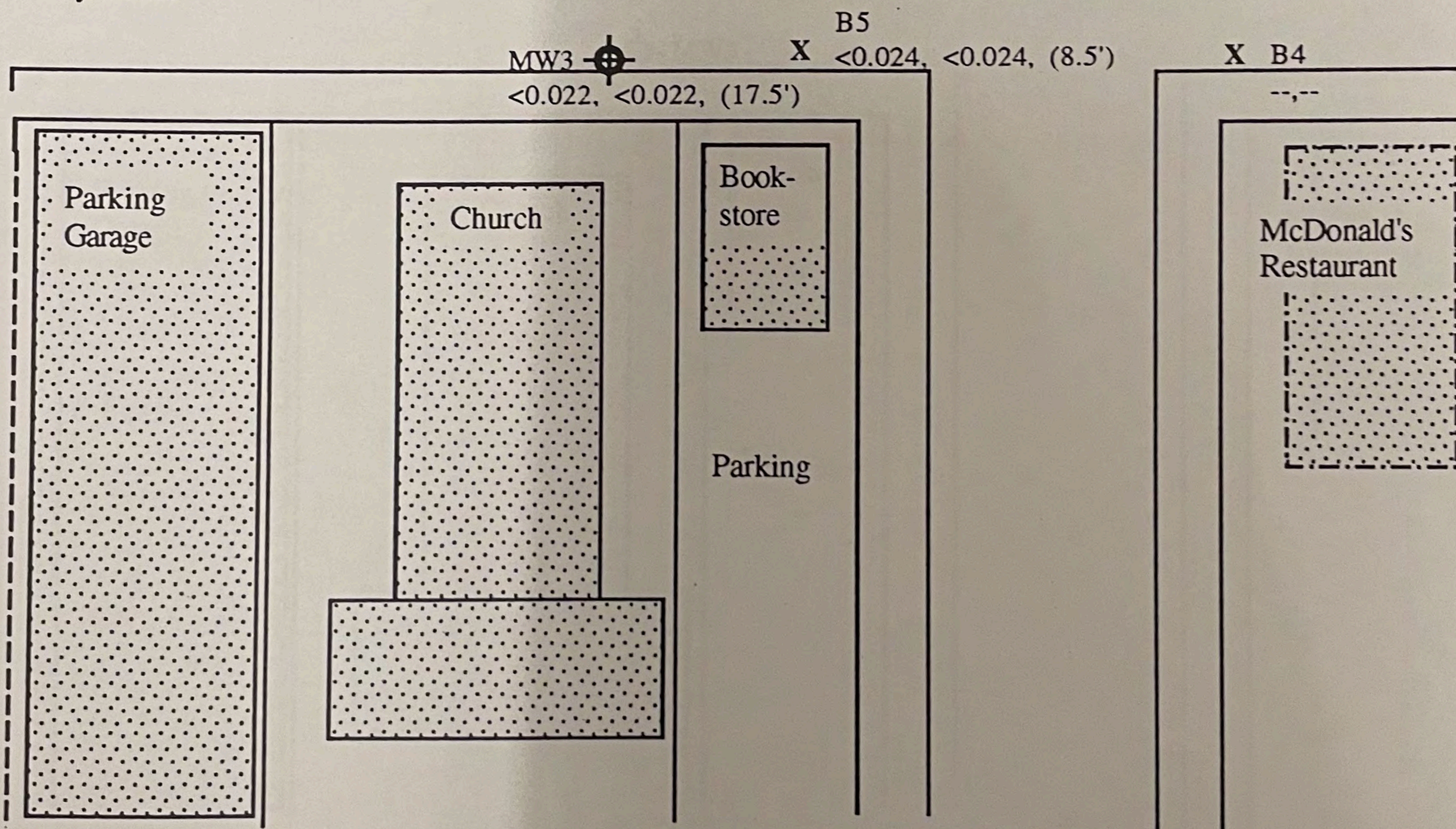
LEGEND

- 11○ Soil Gas Sample Locations and Sample Number
- 0.264 PCE concentration in nanogram per liter (ng/L)
- ND TCE concentration in ng/L.
- ND= concentration below analytical detection limit
- ⊕ Monitoring well

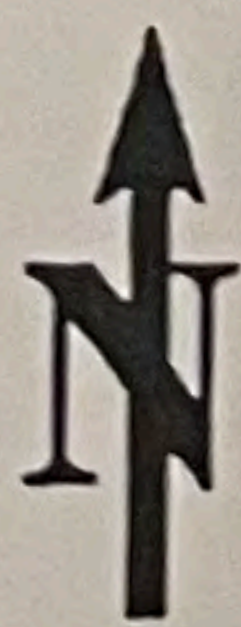
Figure 3 | Soil Gas Sample Locations and Contaminant Concentrations Map | Clayton Project No. 66314



Roy Street



0 25 50 ft

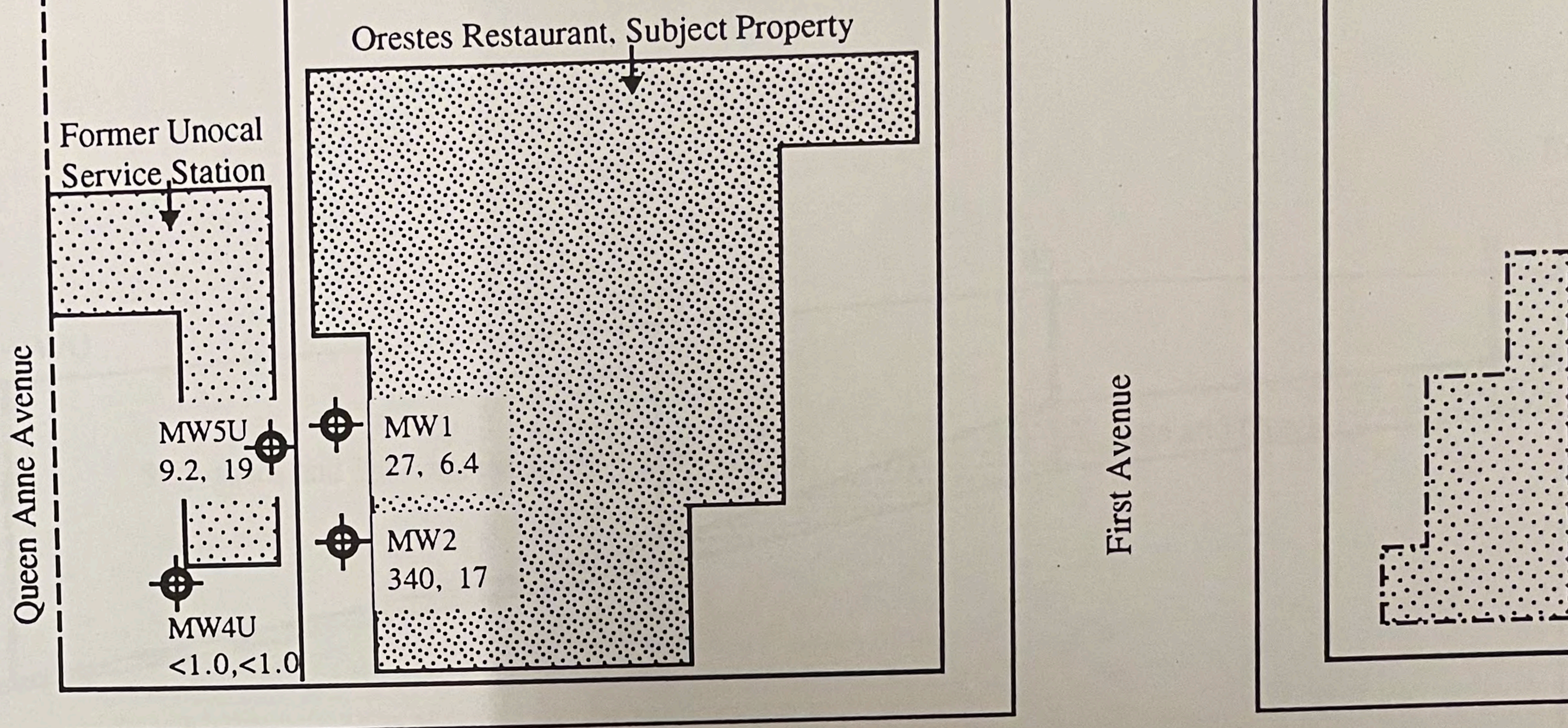


LEGEND

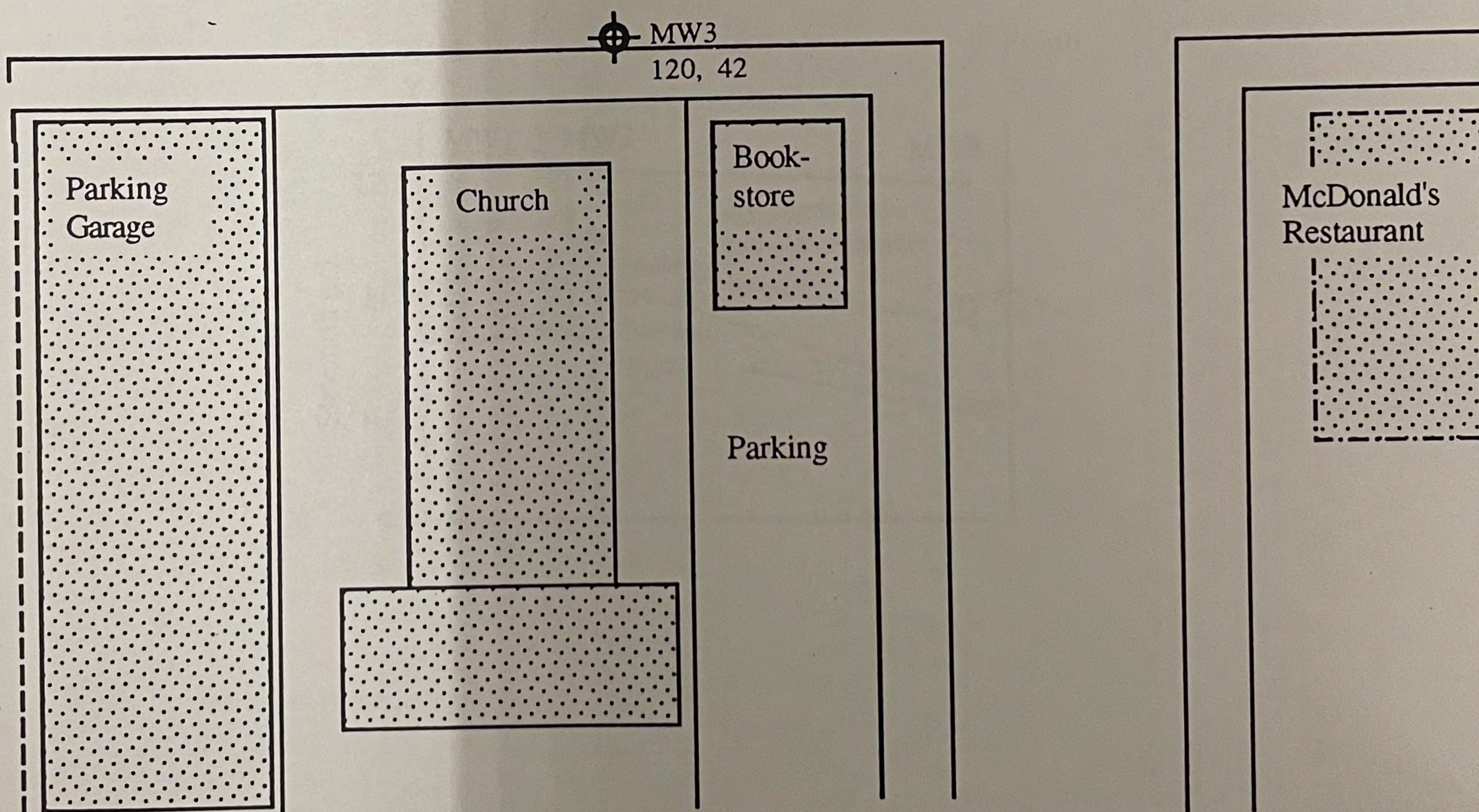
- X Soil boring location and number
- ⊕ Monitoring well location and number
- PCE and TCE concentrations (parts per million)
- 1, 3 (5') in soil and depth of sample (feet)
- Date of sampling: MW1, MW2: 6/22/95;
- MW3, B4: 12/27/95; B5: 1/2/96

Figure 4 PCE and TCE Concentrations in Soil

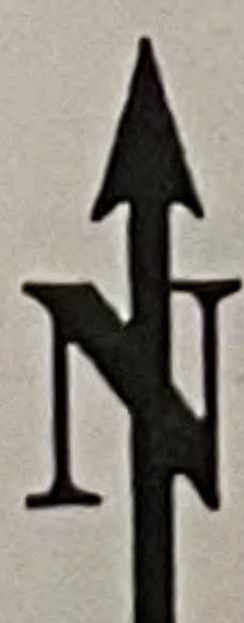
Clayton Project No. 66314



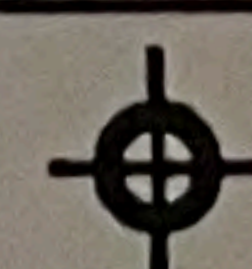
Roy Street



0 25 50 ft



LEGEND



Monitoring well location and number

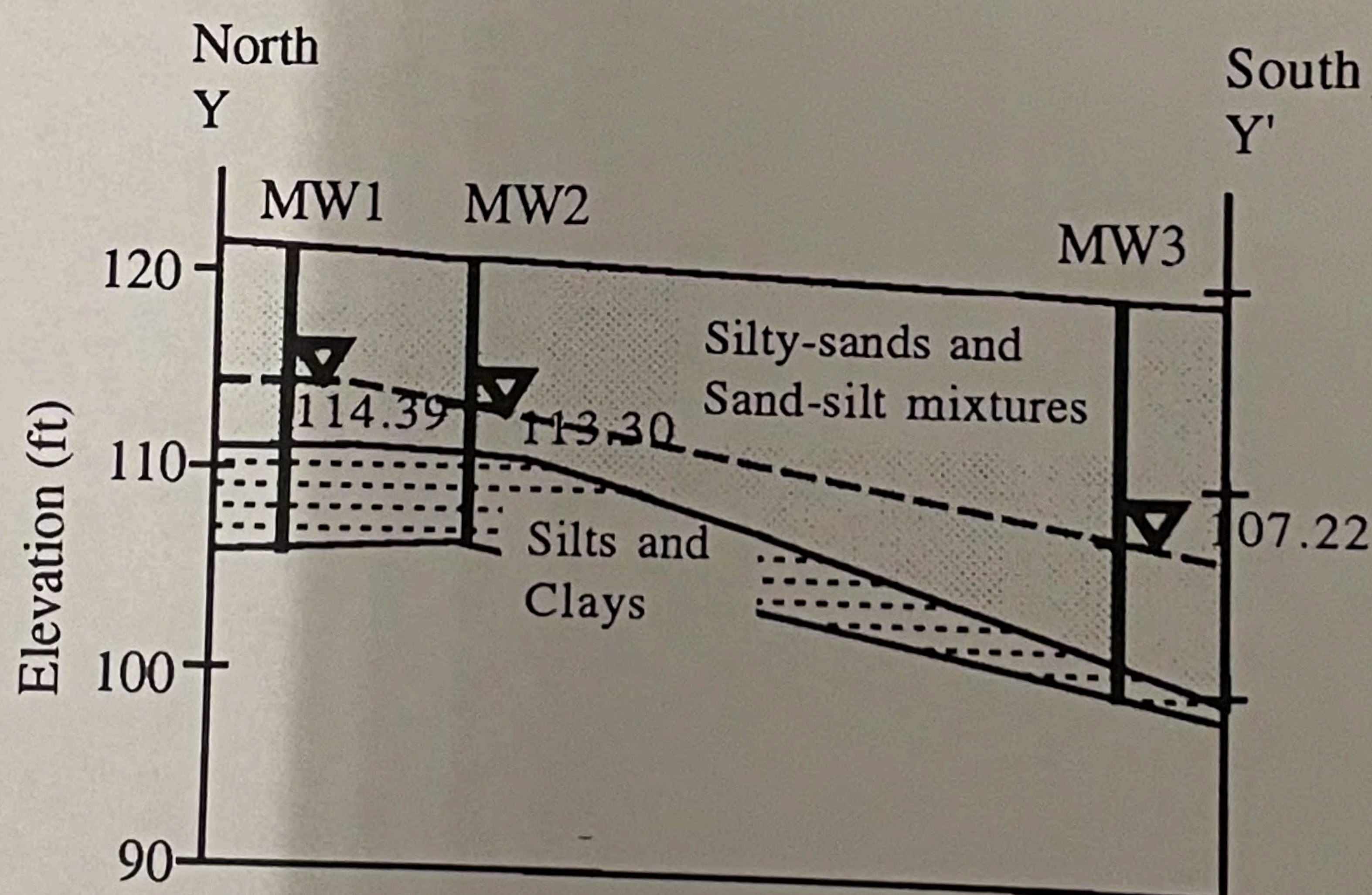
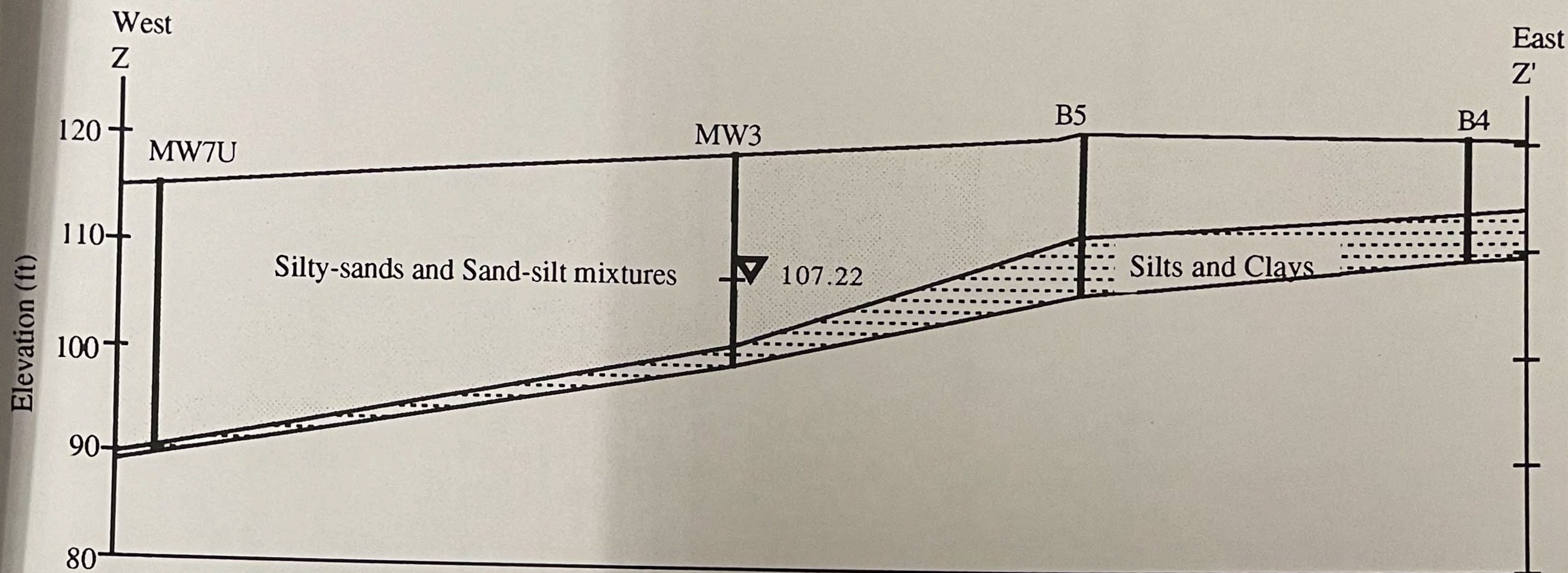
1, 3

PCE and TCE concentrations in groundwater in ppb (parts per billion)

Date of sampling: MW1, MW2: 1/5/96;
MW3: 1/4/96; MW4U, MW5U: 9/30/94

Figure 5 | PCE and TCE Concentrations in Groundwater

Clayton Project No. 66314



0 25 50 ft



LEGEND	
107 ▽	Groundwater elevation (ft) on 1/9/96
Clayton Project No. 66314	

Figure 6 Geologic Cross-Sections

Table 1
Summary of Laboratory Analyses for Soils
at
Orestes Site
Seattle, WA
Clayton Project No. 66314.00

Sample Number	Gasoline ¹ ppm ²	Diesel ³ ppm	Heavy Oil ⁴ ppm	Lead ⁵ ppm	BETX ⁶ ppm				HVOC's ⁷ ppm				
					B	E	T	X	PCE	TCE	DCE	DCP	VC
B1-S2	<1	<10	<50	3.8	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.2
B2-S3	2 ⁸	<10	<50	5.7	<0.04	<0.04	<0.04	<0.04	2.3	0.04	<0.04	<0.04	<0.2
MW3-8.5	<10	—	—	—	<0.10	<0.10	<0.10	<0.10	—	—	—	—	—
MW3-17.5 ⁹	—	—	—	—	—	—	—	—	<0.022	<0.022	<0.022	<0.022	<0.022
B5-8.5 ¹⁰	—	—	—	—	—	—	—	—	<0.024	<0.024	<0.024	<0.024	<0.024
MTCA	100	200	200	250	0.5	20.0	40.0	20.0	0.5	0.5	—	—	—

¹ WTPH-G Washington State Test Method for gasoline range petroleum hydrocarbons
² Parts per million (ppm)
³ WTPH-D Washington State Test Method for diesel range petroleum hydrocarbons
⁴ WTPH-418.1 Washington State Test Method for heavy oil range petroleum hydrocarbons
⁵ EPA 7421 EPA Test Method for total lead
⁶ EPA 8260 Test Method for HVOCs
⁷ PCE: tetrachloroethene, TCE: trichloroethene, DCE: cis 1,2 -dichloroethene, DCP: 1,2-dichloropropane, VC: vinyl chloride
⁸ Material in gasoline range appeared as a single peak.
⁹ Sample MW3-17.5 had 29 ppb trans-1,2-dichloroethene and 12 ppb chloroform.
¹⁰ Sample B5-8.5 had 6.0 ppb chlorobenzene. The concentrations detected is below normal reporting level.
 Note: All other HVOC's were below the detection limit

Table 2
Summary of Groundwater Analytical Results
at
Orestes Site
Seattle, WA
Clayton Project No. 66314.00

Sample Number	Date Sampled	Gasoline ¹ ppm ²	Diesel ³ ppm	Heavy Oil ⁴ ppm	Lead ⁵ ppb	BETX ⁶ ppb				HVOC's ⁷ ppb				
						B	E	T	X	PCE	TCE	DCE	DCP	VC
WS1a	7/12/95	<0.050	1.5	<0.25 0	<5	<1	<1	<1	<1	12	8	46	23	15
MW1-8	1/5/96	0.8	—	—	<2	<2	<2	<2	--	—	—	—	—	—
MW1-15	1/5/96	--	—	—	—	--	—	—	—	27	6.4	5U	9.6	5U
WS2	7/12/95	15	0.5	<0.25	<5	<1	<1	<1	<1	13,000	140	160	22	14
MW2-7	1/5/96	0.5	—	—	<2	<2	<2	<2	--	—	—	—	—	—
MW2-15	1/5/96	--	—	—	—	--	—	—	—	340	17	5U	5U	5U
MW3-11	1/4/96	<0.2	—	—	<2	<2	<2	<2	—	—	—	—	—	—
MW3-19	1/4/96	--	—	—	—	--	—	—	—	120	42	5U	5U	5U
MTCA		1	1	1	5.0	5.0	30.0	40.0	20.0	5.0	5.0	—	—	2

¹ WTPH-G Washington State Test Method for gasoline range petroleum hydrocarbons
² Parts per million (ppm), Parts per billion (ppb)
³ WTPH-D Washington State Test Method for diesel range petroleum hydrocarbons
⁴ WTPH-418.1 Washington State Test Method for heavy oil range petroleum hydrocarbons
⁵ EPA 7421 EPA Test Method for total lead
⁶ EPA 8260 Test Method for HVOCs
⁷ PCE: tetrachloroethene, TCE: trichloroethene, DCE: cis 1,2 -dichloroethene, DCP: 1,2-dichloropropane, VC: vinyl chloride
⁸ Diluted results, peaks present could be indicative of solvents.
⁹ Exceeded calibration range, peaks present could be indicative of solvents

Table 3
Groundwater Monitoring Well Data
at
Orestes Site
Seattle, WA
Clayton Project No. 66314.00

Well Number	Elevation of well ¹ (feet)	Date Measured	Depth to Groundwater ² (feet)	Groundwater Elevation (feet)
MW1	120.81	7/5/95	9.44	111.37
		1/9/96	6.42	114.39
MW2	120.3	7/5/95	9.84	110.46
		1/9/96	7.00	113.30
MW3	118.88	1/9/96	11.66	107.22

¹Elevation of top of monument, monument flush with grade.
²Elevations are relative to assumed datum of 100 feet established at the southwest corner of new catch basin located at the southwest corner of the Unocal site

APPENDIX A

SELECT INFORMATION FROM PREVIOUS ENVIRONMENTAL STUDIES IN THE AREA