REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

REMEDIAL INVESTIGATION REPORT VOLUME NO. 1

Bedford Village Wells Shopping Arcade Site Westchester County, New York

prepared for the

New York State Department of Environmental Conservation

by

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
SYOSSET, NEW YORK

JUNE 1989

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July 18, 1989

Edward Beaudoin, Jr., Project Manager
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
New York State Department of Environmental
Conservation
50 Wolf Road
Albany, New York 12233

Re: Bedford Village Wells RI/FS
Shopping Arcade Site
D&B No. 842

Dear Mr. Beaudoin:

As discussed, please find enclosed seven (7) copies of the final draft Remedial Investigation Report for the Shopping Arcade Site. The enclosure incorporates essentially all of the Department's comments on the preliminary draft report for the Hunting Ridge Mall Site that pertained to the Shopping Arcade Site.

If you have any questions or require additional information, please call me.

Very truly yours,

Richard M. Walka
for Thomas F. Maher

TFM:cs
Enclosures
cc: Robert Foltin

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
BEDFORD VILLAGE WELLS
SHOPPING ARCADE SITE
WESTCHESTER COUNTY, NEW YORK

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VOLUME NO. 1

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S.0 SUMMARY

In 1978, a New York State Department of Environmental Conservation (NYSDEC) investigation of contamination of municipal water supply wells by volatile organic chemicals initiated concern regarding disposal of the solvent tetrachloroethene from dry cleaning establishments to on-site sanitary and drainage systems. As a result of this concern, the Westchester County Department of Health (WCDH) conducted a county wide survey of these potential sources of chemical releases which included the dry cleaner located in the Shopping Arcade in Bedford Village, New York. In 1979, because of suspected releases of chemical contamination from the dry cleaning establishment, a study was conducted in Bedford Village by WCDH and a number of samples were collected from private wells in the vicinity of the Shopping Arcade and the dry cleaner. Analysis of these samples identified an area of contaminated ground water located in the Village Green area immediately downgradient of the Arcade. Chemical analyses of the samples indicated the presence of high concentrations of tetrachloroethene and its breakdown compounds trichloroethene and cis-1,2-dichloroethene.

Between 1982 and 1984, studies performed by NYSDEC showed fluctuating levels of the volatile organic chemical contamination in the private water supply wells and in 1985, the Shopping Arcade building and the Theater building installed granular activated carbon (GAC) treatment filters.

In 1986, WCDH and United States Environmental Protection Agency (USEPA) investigations confirmed that volatile organic contamination existed in the private wells and low concentrations of volatile organic chemicals also appeared east and southeast of the Arcade in water supply wells which were previously uncontaminated.

Based on the aforementioned findings and the nature of the chemicals found, the source of contamination was thought to be from the dry cleaning establishment formerly located in the Shopping Arcade. It was suspected that the dry cleaner in the Arcade disposed of waste/wastewater containing the solvent tetrachloroethene into the Arcade's sanitary system which discharges to a leaching field behind the Arcade building and the adjacent Exxon gasoline station. In addition, surface soils behind the dry cleaner were believed to have also been contaminated from past disposal practices and that contamination may have entered the stormwater drainage system in the vicinity of the site. The drainage system becomes an open drainage ditch which eventually discharges to a series of surface water bodies (wetlands and ponds) in the study area before entering the Mianus River.

As a result of these findings, NYSDEC as part of the New York State Superfund Program, placed the Shopping Arcade Site on the State Superfund List and retained the services of Dvirka and Bartilucci Consulting Engineers to conduct a Remedial Investigation and Feasibility Study (RI/FS). The goals of the RI/FS were to determine/verify the nature, source and extent of contamination in the vicinity of the Arcade, assess impacts on human health and the environment, and depending on the results of the investigation, identify, evaluate and select a long-term cost-effective remedial action to mitigate contamination.

A separate RI/FS was also conducted simultaneously at the Hunting Ridge Mall Site located approximately one mile southwest of the Shopping Arcade. The results of the Hunting Ridge Mall study, which also involved contamination by a suspected dry cleaner and was similar in scope to the investigation of the Shopping Arcade, is contained in a separate report.

The Remedial Investigation of the Shopping Arcade Site, which is the subject of this report, was conducted from June 1987 to April 1989, and comprised a multi-phase, multi-matrix sampling program including ground water, surface water, stormwater drainage system sediment, surface water sediment, surficial soils, septic tank sludge and supernatant samples. Phase IA, conducted in August 1987, and Phase IB, conducted in May and June 1988, evaluated potential sources, surficial contamination and possible routes of migration. Information from these phases was used to design the Phase II investigation. Phase IIA, conducted from August 1987 to December 1989, and Phase IIB, conducted from April 1988 to January 1989, characterized the hydrogeology and ground water quality underlying the study area as well as provide an assessment for the potential for further migration.

Phases IA and IB comprised the sampling of the Shopping Arcade sanitary system (one sample), the Exxon gasoline station sanitary system (one sample), the stormwater drainage system in the vicinity of the Arcade including two catch basins on Route 22 and Court Road (two samples), the drainage ditch along the north side of Court Road to which the drainage system discharges (three samples), wetlands/ponds upgradient and downgradient of the point to which the drainage ditch discharges (eight samples) and the Mianus River to which the wetland/pond system discharges (four samples). In addition, soils were sampled behind the former location of the dry cleaner and at the Shopping Arcade's sanitary system leaching field (3 samples). Phase IA was comprised of approximately an equal number of analyses for Hazardous Substance List (HSL) compounds and volatile organic chemicals (VOCs), as was the Phase IB analyses.

Phase IIA and IIB involved the installation and sampling of 13 monitoring wells in and contiguous to the Shopping Arcade Site at nine locations, as well as the sampling of two existing/abandoned water supply wells, one owned by the Exxon gasoline station and one owned by the Bedford School. Soil samples were obtained during the construction of seven monitoring wells, all of which were located downgradient of the Shopping Arcade. A total of 21 ground water samples were collected from the monitoring wells (including the Exxon and Bedford School wells). The Phase IIA sampling program was comprised of approximately an equal number of HSL and VOC analyses, while Phase IIB was comprised of only VOC analyses.

In addition to the Phase I and II monitoring programs, as a result of concerns expressed by local residents regarding the quality of drinking water from private wells, a third phase not included in the original scope of work was undertaken (Water Supply Sampling Program) which involved the sampling of 39 private (residential and commercial) wells in the study area. This sampling program, which involved analysis primarily for VOCs, nitrates, and a limited number of analysis for HSL compounds, was conducted in October and November 1988.

The findings of the Remedial Investigation sampling program, health risk assessment and recommendations for potential remedial action to be considered in the Feasibility Study, are as follows:

1, <u>Source/Sanitary System Contamination</u>

The analysis of wastewater supernatant in the septic tank of the sanitary system that serves the Shopping Arcade (no sludge was found in the septic tank) showed low concentrations of solvents typically used in dry cleaning and their breakdown products. This, together with the results obtained from analysis of soils behind the former location of the dry cleaning establishment and at the Arcade's sanitary disposal system leaching field, indicate that there is little continuing contamination resulting from the past dry cleaning operation, and little residual contamination in the soil resulting from prior discharges. However, elevated concentrations of copper (1,750 ug/l), silver (332 ug/l) and phenol (46.8 ug/l) were detected in the Shopping Arcade's septic tank supernatant that exceeded effluent discharge standards. Although copper, silver, and phenol have not been found in ground water downgradient of the site at levels that exceed their respective ground water standards, the elevated concentrations of these parameters in the septic tank supernatant are still in contravention of effluent discharge standards.

Sampling of the Exxon gasoline station sanitary system septic tank sludge detected high levels of benzene (1,700 ug/kg) toluene (300,000 ug/kg), xylene (37,000 ug/kg) and other volatile aromatic hydrocarbons such as ethyl benzene (37,000 ug/kg) and 1,4-dichlorobenzene (2,500,000 ug/kg). The high levels of all of these compounds significantly exceed the ARARs for soil and sediment based on the New Jersey Department of Environmental Protection (NJDEP) cleanup guidelines for Total Volatile Organic (TVO) compounds. In addition, an elevated level of lead (1,000 mg/kg) was found in the sludge that exceeded the NJDEP cleanup guideline for lead of 100 mg/kg. Since benzene, toluene and xylene (as well as lead) continue to be found in the ground water downgradient of the site at concentrations that exceed ground water standards, it is possible that the sanitary system and underlying soil could be a continual source of this contamination.

Stormwater Drainage System Contamination

Sampling of the sediment in the catch basins as part of the stormwater drainage system serving the vicinity of the Shopping Arcade along Route 22 and Court Road and samples from the stormwater drainage ditch along Court Road, showed little contamination. The only sample locations that showed slightly elevated concentrations of volatile organic chemicals/analytes of concern was in the catch basin at the intersection of Court Road and Route 22 and where the stormwater drainage ditch merges with the outlet of the pond north of Court Road. The following analytes of concern were detected in the catch basin sediment sample: trichloroethene (5.0 ug/kg); 1,1-dichloroethene (7.0 ug/kg); 1,1,1-trichloroethane (5.0 ug/kg); benzene (6.0 ug/kg); toluene (9.0 ug/kg); 2-butanone (21.0 ug/kg); chlorobenzene (6.0 ug/kg) and 4-methyl-2-pentanone (7.0 ug/kg), and the ditch/pond confluence sample contained tetrachloroethene (5.0 ug/kg); 1,2-dichloroethene (9.0 ug/kg); benzene (3.0 ug/kg); toluene (41.0 ug/kg); total xylenes (52.0 ug/kg); and vinyl chloride (3.0 ug/kg). The pond sediment sample also contained several polycyclic aromatic hydrocarbons (PAHs) including pyrene (1,300.0 ug/kg), benzo (k) fluoranthene (930.0 ug/kg), benzo (a) anthracene (530.0 ug/kg), fluoranthene (922.0 ug/kg), benzo (b) flouranthene (690.0 ug/kg) and phenanthrene (280.0 ug/kg). These contaminant levels are not considered significant in relation to guidance values established by the New Jersey Department of Environmental Protection (NJDEP) used in determining the need for evaluation of remediation. (The guidance value for total PAHs/base neutral compounds is 10,000 ug/kg).

Wetland/Pond Contamination

Results of sediment samples obtained from the wetlands and ponds north and south of Court Road to which the stormwater drainage system discharges show little contamination. Overall it appears that the sediment in the three ponds sampled within the study area contain only low concentrations of the organic compounds of concern and there does not appear to be a concern for future significant releases to the study area and Mianus River from these sediments. Low levels of only two analytes of concern (1,1,1-trichloroethane [11 ug/kg] and benzene [3 ug/kg]) were found only in the pond sediment north of Court Road; however, elevated levels of phenols (740 ug/kg) were found in the last pond in series (Long Pond) located north of Pound Ridge Road as well as the first pond located north of Court Road (4,590 ug/kg). These concentrations of phenols/acid extractable compounds are less than the level established for evaluation of clean up which is 10,000 ug/kg.

Mianus River Contamination

Except for 2-butanone (methyl ethyl ketone), which was found in both upstream and downstream samples of water and sediment, the Mianus River showed little contamination. However, the sediment sample obtained at the confluence of the wetland/pond system discharge to the river contained elevated concentrations of several PAHs including fluoranthene (780.0 ug/kg), phenanthrene (520.0 ug/kg), benzo(a)pyrene (560.0 ug/kg) and pyrene (580.0 ug/kg), the total of which is substantially less than the NJDEP guidance levels for cleanup. In addition, a slightly elevated concentration of silver (28.0 ug/l) was found in the surface water sample taken at this location; but is less than the standard/ARAR established for this metal.

A review of the analytical results generated from the Mianus River sampling illustrates relatively unrelated low level occurrence of organic chemical contamination from analytes of concern in the Mianus River, as well as those in the other surface waters in the study area. It does not appear that the Shopping Arcade Study Area is significantly contributing to contamination found in the Mianus River, however, it does appear that an unidentified source(s) of 2-butanone exists upgradient and possibly in the vicinity of the study area. The PAH compounds most likely result from coal tar and asphaltic compounds in roadway/surface runoff.

Subsurface Soil Contamination

Low levels of contaminants were found in the soils of five (MW-1B, MW-3M, MW-5S, MW-5B and MW-11) of the seven monitoring well boreholes that were sampled. All of the wells were located downgradient of the Shopping Arcade and one exploratory borehole (MW-11) was located behind the former location of the dry cleaner. The highest concentrations of contaminants were found at MW-3M directly in front of the Arcade building. Three of the four samples collected contained detectable levels of contaminants. In the 5-7 foot sample, 6 ug/kg of toluene was detected. The 15-17 foot sample contained 22 ug/kg of trichloroethene and 32 ug/kg of toluene and the 20-22 foot sample (bedrock was encountered at 23 feet) contained 34 ug/kg of trichloroethene and 50 ug/kg of toluene.

In addition, an exploratory source boring (MW-11) drilled directly behind where the former dry cleaning establishment was located contained low levels of the indicated contaminants at the indicated depths: tetrachloroethene (10.4 ug/kg) at 0-2 feet; trichloroethene (7.4 ug/kg) at 4-6 feet; trichloroethene (6.1 ug/kg) at 22-24 feet; and trichloroethene (5.7 ug/kg) at 30-32 feet.

All of the aforementioned levels are not considered significant in relation to guidance values established by the New Jersey Department of Environmental Protection (NJDEP) used in determining the need for remediation.

Ground Water Contamination

Based on the results of sampling monitoring wells and water supply wells in the study area, three areas of ground water contaminated primarily by the dry cleaning chemical, tetrachloroethene and its breakdown compounds (as well as benzene, toluene and xylene compounds) have been identified. The first area consisting of elevated levels of contamination comprising tetrachloroethene and its breakdown compounds exists in the unconsolidated/overburden deposits in front of the Shopping Arcade. This fairly high contaminated "pocket" of contamination is centered around MW-3M where a total average (average of Phase IIA and IIB sampling results) concentration of tetrachloroethene and its breakdown products was found to be 213 ug/l. In addition, ground water in this area (at MW-2M and MW-3M) contains elevated levels of lead, chromium and barium that exceed ground water standards.

The second area of ground water contamination consisting of mainly tetrachloroethene and its degradation compounds is the large primary plume of significantly contaminated ground water in bedrock migrating/extending northeastward from the vicinity of the Shopping Arcade's private water supply well downgradient to approximately monitoring well MW-6B. The dimensions of this plume are approximately 800 feet in length and 200 feet in width at its widest point. The total average (average of Phase IIA and IIB sampling results) concentrations of tetrachloroethene and its breakdown compounds in this plume range between a low of 146 ug/l at MW-6B to a high of 746 ug/l at the Shopping Arcade water supply well. Other high values recorded were 468 ug/l at MW-1B, 284 ug/l at the Exxon gasoline station water supply well and 216 ug/l (as well as 514 ug/l of BTX contamination) in an abandoned water supply well that once served the Banks building located directly opposite/downgradient of the Exxon station as well as the Arcade.

The third area of ground water contamination, or secondary plume, is a portion of the primary plume of contaminated ground water in the bedrock that has migrated perpendicular to Court Road in a southeasterly direction along the east side of Route 22 near the center of the village. Concentrations of tetrachloroethene and its breakdown products ranged from a total averaged level of 26 ug/l in the private water supply well at a residence at 11 Court Road to 85 ug/l in the private water supply well serving the Fire Department building on the Village Green.

Based on the nature of the chemicals detected and the location of the dry cleaning establishment, all three areas of ground water contamination most likely resulted from prior discharges of tetrachloroethene to the Shopping Arcade's sanitary system, direct disposal to surface soils and contamination of the area's stormwater drainage system. The benzene, toluene and xylene compounds found in the ground water are most likely due to prior discharges of these contaminants to the Exxon gasoline station's sanitary system, underground fuel tank leakage and spills at the Exxon station and possibly the Bedford School, as well as roadway runoff. The lead contamination (and possibly chromium and barium) in ground water in the immediate vicinity of the Arcade and Exxon station is most likely due to contaminants released by the Exxon gasoline station as mentioned above. Based upon historic information and data obtained during the Remedial Investigation, it appears that contamination will persist in the subsurface environment of the study area above standards and guidance values established for ambient ground water quality.

Water Supply Contamination

As described above, sampling of community and private wells in the study area revealed significant contamination of water supply based upon exceedance of ambient ground water standards and guidelines and drinking water standards, both within the boundary of the Shopping Arcade property and along Route 22 and in the Village Green, and Court Road. Although there is some contamination of benzene, toluene and xylene, most likely caused by reported gasoline and fuel leaks/spills at the Exxon gasoline station and Bedford School in the study area, most of the contaminants found in this investigation appear to be related to dry cleaning solvents and its degradation products. Based on trends in the levels of contaminant, it appears that in general the contaminant concentrations in the Shopping Arcade Study Area have slightly declined, most likely due to the cessation of waste discharges and periodic clean out/pump out of the Arcade's sanitary system. However, the most recent analytical results indicate that some private water supply wells (especially at the Arcade and Exxon station) showed increases in some contaminants.

Overall, a large portion of the study area still contains contaminated ground water ~~that is~~ above standards established by New York State for both ambient ground water and drinking water. Because it appears that this is basically residual contamination after the cessation of source releases, it is expected that the contaminant levels will persist for some time above standards established for drinking water, and thereby will continue to impair water supply until they are eventually displaced from the subsurface environment underlying the study area.

Health Risk Assessment

Carcinogenic and non-carcinogenic risks were computed for human receptors using domestic wells which utilize ground water as a source for water supply.

Results of non-carcinogenic risk estimation indicate that the average non-carcinogenic risk for the entire study area, as measured by the hazard index value, is well below the United States Environmental Protection Agency (USEPA) recommended acceptable ceiling of 1. However, non-carcinogenic risks (hazard index values) for exposure to ground water drawn from wells located within the bedrock contaminant plume downgradient of the Shopping Arcade Site approach the limit of 1. In addition, hazard index values calculated for residential exposure to untreated ground water taken from wells located at the Shopping Arcade are slightly above the acceptable limit.

Calculated increased lifetime cancer risk posed to human receptors using domestic wells which are supplied by ground water are examined using two approaches.

The first approach utilizes ground water data from monitoring wells screened at different zones of the water bearing strata. Results of this approach indicate that the carcinogenic risk posed by ground water in the overburden is well within the USEPA recommended acceptable range of 10^{-4} to 10^{-7}.

The carcinogenic risks lie in the range of 7.28×10^{-4} to 3.17×10^{-4} for the bedrock water bearing strata. These values of computed risk are slightly higher than the highest USEPA recommended value of 10^{-4}. Individual carcinogenic risks calculated for specific compounds indicate that the contaminants of concern which lead to this high carcinogenic risk for ground water in the bedrock are breakdown products associated with the dry cleaning solvent tetrachloroethene, specifically 1,2-dichloroethene and vinyl chloride.

The second approach toward evaluating the risks posed by ground water use involves computation of carcinogenic risks based upon data available at receptor points prior to filtration. Average increased lifetime cancer risk calculated for the entire study area falls within the range of 1.06×10^{-4} to 3.07×10^{-4}. These values fall slightly above the USEPA acceptable range of 10^{-4} to 10^{-7}.

In order to further identify areas within the study area which may pose greater or lesser risks due to ground water exposure, the study area is broken down into exposure scenarios based upon detected levels of contamination. Results of this analysis indicate that the lowest risk is posed for human receptors at points located hydraulically upgradient and laterally away from the suspected source. This scenario, as well as the scenarios which include wells within the overburden plume and wells along the fringe of the bedrock plume, all have calculated increased lifetime cancer risks within the acceptable range of 10^{-4} to 10^{-7}.

Data collected from wells located within the bedrock contaminant plume resulted in calculated increased lifetime cancer risks in the range of 2.59×10^{-3} to 7.05×10^{-3}. Within this plume, untreated ground water from the Shopping Arcade well has a calculated increased cancer risk of 2.50×10^{-3} to 5.83×10^{-3}, and untreated water from the abandoned Banks building well, across from the Shopping Arcade, has a calculated increased cancer risk of 4.83×10^{-3} to 1.03×10^{-2}. Review of data tables for these scenarios indicates that the contaminants giving rise to these elevated risks include tetrachloroethene and its breakdown product 1,2-dichloroethene for the Shopping Arcade well, and tetrachloroethene, 1,2-dichloroethene and benzene for the abandoned Banks building well.

It should be noted that, with the exception of untreated ground water from the Shopping Arcade well, the dermal route of exposure yields risks which are well within the acceptable range recommended by USEPA. Accordingly, ingestion and inhalation are the exposure routes of concern.

Remedial action to address the areas of contamination, routes of migration and potential receptors identified in this report will be addressed in the next phase of this investigation which is referred to as the Feasibility Study. The Feasibility Study will identify potential remedial alternatives, evaluate these alternatives based on effectiveness, implementability and cost, and select a remedial action plan which will include a conceptual design, preparation of a cost estimate, and schedule for implementation.

Section 1

1.0 INTRODUCTION

As part of the State of New York's efforts to clean-up inactive hazardous waste sites, the New York State Department of Environmental Conservation (NYSDEC) entered into a contract with the firm of Dvirka and Bartilucci Consulting Engineers of Syosset, New York to undertake a Remedial Investigation and Feasibility Study (RI/FS) for the Bedford Village Wells-Shopping Arcade Site located in Westchester County, New York (see Figure No. 1-1). The RI/FS for this site is being conducted with funds allocated under the New York State Superfund Program. The purpose of the overall RI/FS process is to determine the nature and extent of contamination at the site, the sources of contamination, the risk to public health and the environment, and to perform a Feasibility Study (FS) which will identify and evaluate mitigation alternatives, and recommend a cost-effective, environmentally sound and long-term remedial action. The Remedial Investigation (RI) portion of the project, which comprises primarily the field program and health risk assessment, began in August 1987 and was completed in April 1989. This report presents the results of the Remedial Investigation. After finalization of this report, the Feasibility Study will be undertaken. The Feasibility Study will take approximately five months to complete, after which, a second report describing the results of this study and recommended remedial action(s) will be prepared.

1.1 Site Background

In 1978, the Westchester County Department of Health (WCDH) became aware of ground water contamination and potential drinking water problems in areas where present and past dry cleaning establishments have been located. An investigative program was established which collected numerous well samples throughout the County. The results of the initial investigation revealed contaminated wells in Katonah Village, Armonk Village and Bedford Village (Shopping Arcade). Contaminated wells located at and contiguous to the Hunting Ridge Mall Site, also located in Bedford Village, were discovered by WCDH in 1983. The sources of contamination at these sites were suspected to be dry cleaning establishments which disposed of wastes into sanitary and stormwater drainage systems. Both Bedford Village sites involve private water supply well contamination.

MAP SOURCE: NYS DOT
MOUNT KISCO QUADRANGLE

SCALE: 1"=2000'

Dvirka and Bartilucci
CONSULTING ENGINEERS

LOCATION OF SHOPPING ARCADE STUDY AREA

FIGURE NO.
1–1

1.1.1 General Description

The Bedford Village Wells – Shopping Arcade Site is located in the Village business district (see Figure No. 1–2) where a dry cleaner had operated several years ago. The results of the Westchester County Department of Health testing program first revealed (April 1979) that three wells were contaminated with varying amounts of tetrachloroethene (11 to 470 ug/l), trichloroethene (2 to 80 ug/l), as well as cis–1,2–dichloroethene (4 to 51 ug/l). These wells serve the Bedford Theatre Building, the Bedford Shopping Arcade and an Exxon gasoline station. Initially, all three wells were placed under "boil water" notices by the Department of Health; however, monitoring data obtained from the Phase I study conducted by the New York State Department of Environmental Conservation in 1983 showed only the Shopping Arcade well to have unacceptable levels (greater than 50 ug/l) of tetrachloroethene.

Prior to this investigation, the most recent (1986) analytical data has shown that the levels of volatile organic chemicals (VOCs) in the three wells continued to fluctuate. Trace concentrations of these chemicals had also been found in water samples obtained to the east and southeast of the Arcade. Based on these findings and the nature of the chemicals found, the source of contamination was thought to be from the dry cleaner formerly located in the Shopping Arcade, however, the extent of the problem had not been defined. Granular activated carbon (GAC) filters have been installed on the water supply systems of the Shopping Arcade, Theatre Building and the Exxon gas station by the property owners. Where properly maintained, these systems appear to effectively reduce contaminant concentrations to levels which are below New York State Drinking Water Requirements. All other contaminated wells are under "boil water" notices issued by the WCDH.

1.1.2 Site History and Previous Investigations

1979 A Westchester County Department of Health (WCDH) testing program reveals three wells, located in the Theatre Building, the Shopping Arcade, and an adjacent Exxon gasoline station, are contaminated with varying amounts of tetrachloroethene, trichloroethene, and cis–1,2–dichloroethene. The WCDH places all three wells under "boil water" notices.

The Westchester County Commissioner of Health releases an "Information Bulletin" to certain dry cleaning establishments in Westchester County outlining proper storage and disposal methods of cleaning–wastes.

NO.	DATE	REVISION	INT.

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PROJECT ENGINEER	DRAWN BY
DESIGNED BY	CHECKED BY

Dvirka and Bartilucci

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE SITE AND STUDY AREA

PROJECT NO. 842
DATE:
SCALE: AS NOTED

FIGURE NO. 1-2

1980 The Westchester County Department of Health removes the "boil water" notice from the Exxon gasoline station.

1982 Updated sampling indicates that only the Shopping Arcade well has unacceptable (greater than 50 ug/l) levels of tetrachloroethene. WCDH removes the "boil water" notice from the Theatre Building well, but recommends sampling twice a year.

1983 Wehran Engineering submits the Bedford Village Wells Phase I Investigation Report. The Wehran report focuses only on the Shopping Arcade Site.

1984 Wehran Engineering completes the Bedford Village Wells Phase II Investigation Report for the New York State Department of Environmental Conservation. They conclude that volatile organic chemical (VOC) contamination still persists at the Shopping Arcade Site.

The Phase II report also contains sampling results for the Hunting Ridge Mall Site which was discovered in 1983. Although the Mall site is located just 4,000 feet southwest of the Shopping Arcade Site, researchers feel that the ground water contamination at the two sites is not related.

1985 The Shopping Arcade owner installs granular activated carbon (GAC) filters in May. The Theatre Building owner installs GAC filters in August.

1986 Sampling programs undertaken by the Westchester County Department of Health and the United Stated Environmental Protection Agency (USEPA) reaffirm the presence of VOCs in the three private wells. Low concentrations of VOCs also appear east and southeast of the Arcade in private wells which were previously uncontaminated.

NYSDEC requests five consulting firms to submit proposals for the Bedford Village Wells Remedial Investigation/Feasibility Study project.

1987 NYSDEC, with the cooperation of the Town of Bedford and the Westchester County Department of Health, selects Dvirka and Bartilucci (D&B) Consulting Engineers of Syosset, New York to undertake the project.

The State approves the Bedford Village Wells – Shopping Arcade Site and Hunting Ridge Mall Site RI/FS contract between D&B and the State of New York.

1.2 Nature and Extent of the Problem

The organic chemicals identified in the contaminated wells were primarily tetrachloroethene, trichloroethene and cis-1,2-dichloroethene. The source of these organic compounds, although unconfirmed, most probably originated from a former dry cleaning establishment located in the Arcade.

Additional sampling in the surrounding area has shown only trace amounts of contaminants or non-detectable levels of the same compounds. The extent of significant ground water contamination appeared to be limited to the area of and immediately contiguous to the Shopping Arcade in the vicinity of the suspected source. However, sampling by USEPA and the Town of Bedford indicated that low levels of volatile organic chemicals (10 ug/l) were present east and southeast of the Arcade. Based on this data, the extent of the problem had not been defined, nor was there sufficient data to characterize and confirm the source of contamination or ground water flow direction.

Since boring logs and water levels were not available at the site, ground water flow direction and the extent of the contaminant plume was to be determined by installing borings and constructing monitoring wells as part of this Remedial Investigation. In addition, there was the need for the identification of source(s) and its impact on the wetlands and streams downgradient of the Shopping Arcade resulting from possible discharges to the stormwater drainage system which serves the Arcade.

As mentioned previously, although it appears that the levels of ground water contamination have been generally declining, preliminary analysis of the data obtained from 1982 to 1986 does not indicate a clear trend of declining contamination for all wells. Based on this information, it was suspected that sources (including contaminated soils) may be continuing to release organic chemicals to the surrounding environment.

1.3 Discussion of Waste Types and Component Characteristics

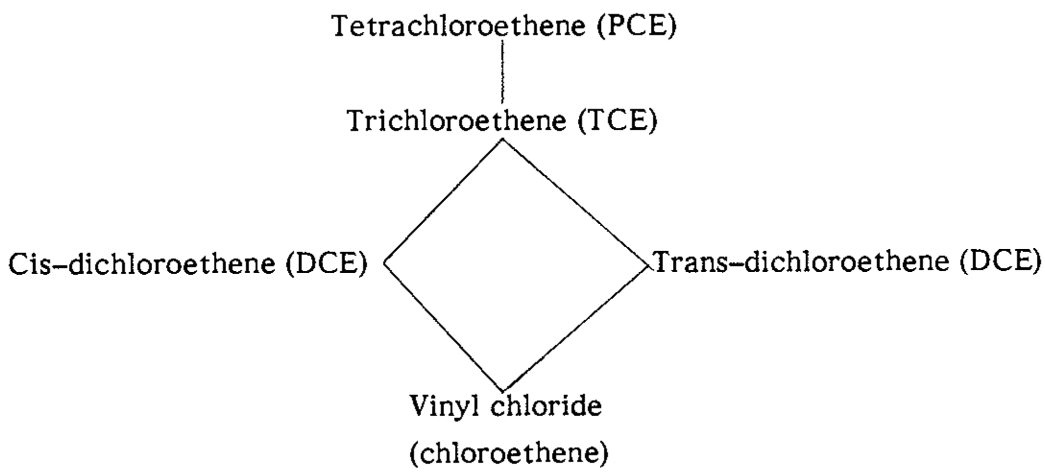
An understanding of the pathway of migration and degredation, and the resulting breakdown products of organic compounds in ground water and aquifer systems is essential to a site investigation. Characterizing the degradation pathway of organic compounds is important in determining to what extent a contaminant may have affected the system and can aid in locating the source of a particular chemical compound. This knowledge is pertinent from an environmental impact, and a health and safety standpoint, as the breakdown/daughter chemical products of certain organic contaminants may be more toxic than the initial parent compound.

As previously discussed, in the Shopping Aracade Study Area it was suspected that the dry cleaner in the Arcade disposed of waste/wastewater containing the solvent tetrachloroethene (perchloroethene [PCE]) into the Arcade's sanitary system. Tetrachloroethene is a common straight chain chlorinated aliphatic hydrocarbon. Two of the natural pathways by which residual tetrachloroethene is removed from soils and ground water are: 1) chemical degredation and 2) dissolution and advection via ground water flow.

Studies conducted on tetrachloroethene and its breakdown compounds have concluded that the major pathway by which PCE is lost from surface water (Dilling et al., 1975) is by evaporation. Reactivity studies found that sunlight had the greatest effect on the rate of PCE disappearance from surface water (Dilling et al., 1975).

Studies conducted on tetrachloroethene and its daughter products in the subsurface have concluded that PCE is resistant to biodegradation in aerobic environments except under specific conditions such as the presence of natural gas. However, several studies (Parsons et al., 1984) have documented a sequential reductive dechlorinated pathway of PCE in anaerobic subsurface environments. In the absence of light and oxygen, micro-organisms utilize the energy released from the oxidation and reduction reactions for cell growth and maintenance.

Tetrachloroethene exhibits the following anaerobic sequential degradation:



In general, the rates of transformation decrease as chlorine is removed (Vogel, McCarty, 1985). Studies (Fathepure, Nenguard Boyd, 1987) have identified the specific cultures of anaerobic bacteria that dechlorinate tetrachloroethene. However, to date no one has identified the specific bacteria responsible for the reductive dechlorination of chlorinated ethenes, although it is clearly a biological reaction.

Large volumes of chlorinated solvents are widely used in virtually every city in the country for cleaning and degreasing fibers, fabrics and metal surfaces. United States production records show about 750,000,000 pounds of tetrachloroethene and 325,000,000 pounds of trichloroethene are produced annually. A review of the annual production quantities of these chlorinated solvents makes it understandable how small amounts of these compounds could enter the environment as contaminants.

It has been suggested that in part or in whole, a contributing factor for the levels of breakdown products detected in ground water may be contained in the parent compound as impurities, or the repeated use of PCE in dry cleaning (many weeks at constant reflux, followed by repeated redistillation) might result in formation of daughter compounds by thermal-hydrolytic breakdown. However, laboratory analyses of new and used PCE have shown that vinyl chloride, trans- and cis-1,2-dichloroethene or 1,1-dichloroethene were not detected in the new or used PCE (Wood et al., 1981).

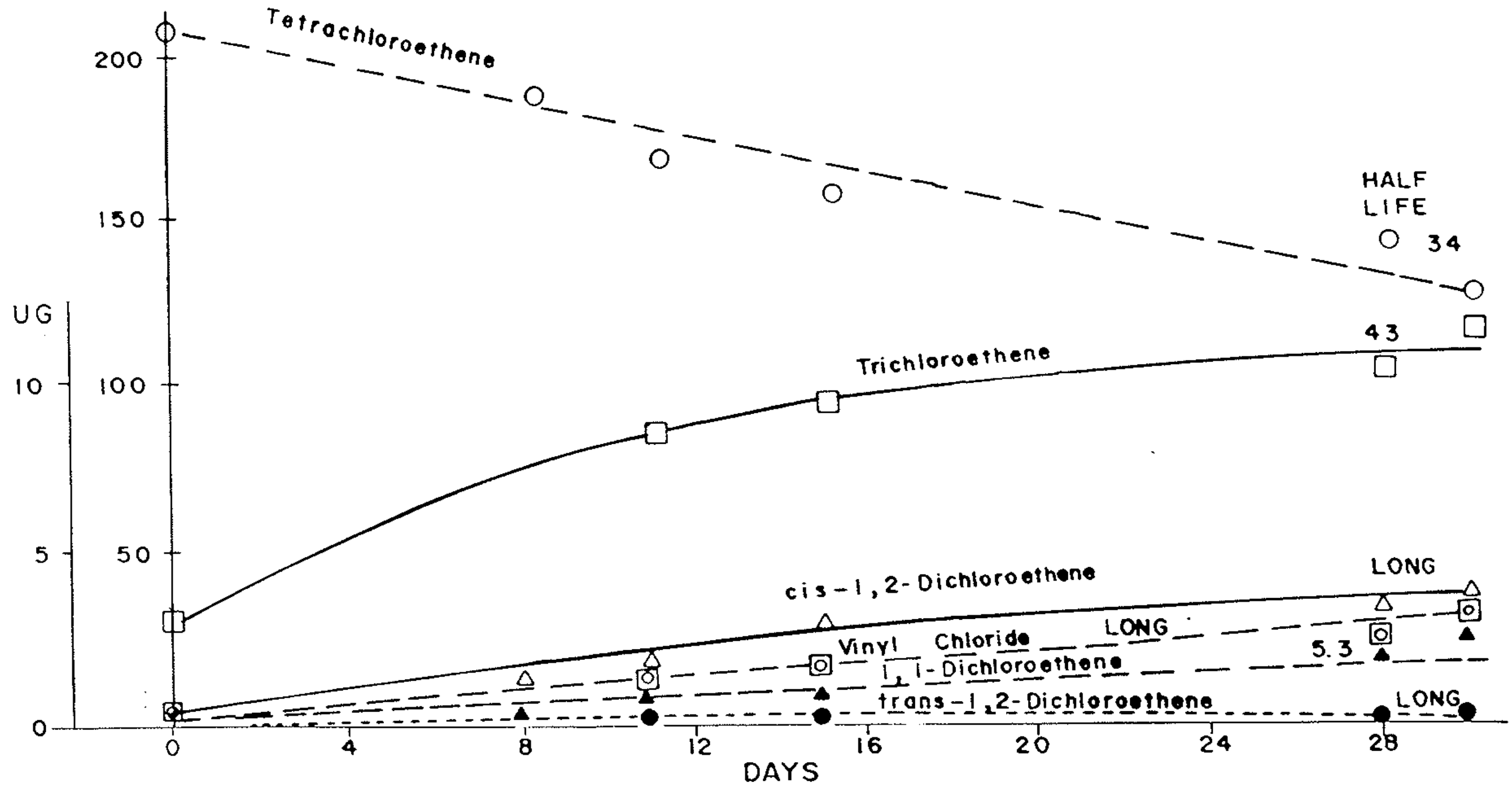
Studies performed (Jensen and Rosenberg, 1975) on the effect of heat on PCE degredation also support the results above. PCE levels in boiled, deionized water in a closed system did not exhibit any significant decrease after eight days.

Wood (1981) noted that at sites where only tetrachloroethene and trichloroethene were used and spilled, high levels of 1,1-dichloroethene were detected in ground water. In addition, high levels of trichloroethene were found associated with tetrachloroethene spills, and vinyl chloride was found only in ground water that initially contained high concentrations of trichloroethene and/or tetrachloroethene. Based on these results, it appears that the breakdown of tetrachloroethene in ground water is the result of anaerobic biotransformation as described above.

Laboratory experiments were performed on tetrachloroethene and biodegradation curves were assembled (see Figure No. 1-3). The half-life of tetrachloroethene was estimated to be approximately 34 days. During the 30 day test period, the breakdown/daughter compounds formed (trichloroethene, cis-1,2-dichloroethene, etc.) are also shown. The concentrations of the breakdown compounds are represented by the Y axis. Referring to this figure, it is possible to predict, based upon the half-life, which compound will be present in water long after the parent compounds have completely biodegraded.

Cis- and trans-1,2-dichloroethene and vinyl chloride all have a relatively long half-life and would be expected to persist in the ground water environment. It should be noted that the calculated half-life degredation curves and the formation of daughter products from tetrachloroethene are based upon ideal laboratory conditions. While the biological transformations of chlorinated aliphatic hydrocarbons have been reported on the basis of numerous laboratory studies, only three reported field observations are known to exist. Unfortunately, even these reported field cases are only briefly described, giving no details (Silka and Wallen).

In the natural environment, site specific conditions will most likely be somewhat less than ideal. Bacteria populations, temperature, nutrient resources and seasonal fluctuations all can and will effect the transformation of chlorinated aliphatics. A field study conducted at a site in the northeast contaminated with chlorinated solvents found no evidence for biotransformation (Smith, 1988). This observation led to the conclusion



Source: Wood et al.,1981

DECAY OF TETRACHLOROETHENE AND INCREASE OF BREAKDOWN COMPOUNDS

Dvirka and Bartilucci CONSULTING ENGINEERS

FIGURE NO. 1-3

that there was a lack of a sufficient carbon/nutrient source to sustain an adequate biological community. The retardation rate depends on the fraction of organic carbon in the aquifer. Potential carbon/nutrient sources that can affect bacteria populations may be commercial and residential sanitary systems that exist in the Shopping Arcade Study Area. The subsurface lithology can also affect the availability of the carbon/nutrient source. Fairly coarse grained high permeability sediments will allow perculation of nutrients into the water table, as also exists in the study area. This may be the reason why the breakdown products of tetrachloroethene have been readily found in ground water samples in and contiguous/downgradient of the Arcade site.

1.4 Corrective Measures Undertaken To Date

In addition to the sampling programs undertaken by WCDH and USEPA, the NYSDEC has prepared Phase I and II Investigation reports which resulted in the recommendation that a Remedial Investigation and Feasibility Study be undertaken. Limited sampling has also been performed by the Town of Bedford. At three locations in the Shopping Arcade area, individual GAC filtration systems have been installed by the well owners. Two of these systems appear to effectively reduce contaminant concentrations to levels which are below New York State Drinking Water Guidelines. All other seriously contaminated wells are under "boil water notices" issued by WCDH.

1.5 Overview of the Remedial Investigation

The Remedial Investigation was designed as a sequential progression of multiple phased sampling and data analysis programs. The objective of this strategy was to apply data generated from previous phases of work to the design of future phases. In this way, a cost-effective, targeted program was implemented which generated meaningful specific data.

The following subsections present a brief summation of the various phases of field work conducted during the Remedial Investigation. In addition, the individual programs incorporated into the particular phases of work, including health and safety, quality assurance and control, and data validation are also reviewed.

1.5.1 Description of the Phased Approach

The first component of the Remedial Investigation field effort was the Phase I sampling program. The Phase I sampling program was divided into two sub-phases (Phase IA and Phase IB) which were targeted to sampling commercial sanitary systems, stormwater drainage systems and the stream/pond system tributary to the Mianus River, as well as the river itself. The purpose of these phases was to determine/confirm the location of the sources and extent of contamination, and to assist in refining the location of any additional surficial sampling and/or ground water monitoring well locations in subsequent phases. The Phase IA and Phase IB programs were similar in scope except that greater emphasis was placed on analysis of volatile organic compounds (VOCs) in Phase IB rather than the Hazardous Substances List (HSL) compounds in the Phase IA program. The Phase IB sampling program was based on the results of the Phase IA program as well as the Phase IIA program discussed below.

The next phase of the Remedial Investigation field effort was the Phase II sampling program. The Phase II program was also broken into two sub-phases (Phase IIA and Phase IIB) which were designed to investigate the subsurface source(s), characterize site hydrogeology, and define migration of contamination at and away from the study area. The placement of the Phase IIA well locations and the projected completion depths resulted from the historical information gathered from prior ground water sampling programs performed in the study area and the Phase IA results.

The design of the Phase IIB sampling program reflected the incorporation of the data generated from the Phase IB and Phase IIA programs. The objective of the Phase IIB was to provide confirmatory data for defining the nature, extent and source(s) of ground water contamination. Similar to the Phase I sampling program, emphasis was placed on analysis of VOCs in Phase IIB (entirely) rather than the HSL Compounds in IIA.

1.5.2 Surface Geophysical Studies

A comprehensive geophysical seismic refraction survey was conducted in the Shopping Arcade Study Area as part of the Phase IA program. The purpose of this survey was to obtain data regarding the depth to ground water and depth to bedrock throughout the study area.

The data obtained from this survey was evaluated prior to the commencement of the Phase IIA well drilling program to aid in the placement of, and in projecting the depth to which overburden/bedrock interface and bedrock wells would need to be completed. The seismic data and resulting map also provided a regional conceptionalization of trends in the slope of bedrock and the thickness of the stratified drift deposits in the river valley. The details of this seismic refraction survey are discussed in Section 4.1.1 of this report.

In addition, although not included in the original scope of work, a limited terrain conductivity survey was undertaken on the Shopping Arcade property and at various locations in the project study area to determine the presence of buried underground tank(s) and other metal objects in order to assist in the placement of monitoring wells. The details of this survey are discussed in Section 4.1.1 (Surface Geophysical Studies) of this report.

1.5.3 Source and Surficial Sampling and Analysis

The review of existing data generated by previous studies conducted in the Shopping Arcade Study Area determined that it was necessary to design a surficial sampling program as part of the Remedial Investigation. The objective of the surficial sampling program was to document the type and concentrations of contamination in the sanitary, stormwater and stream/pond drainage systems at and contiguous to the site, and the downstream receiving water (the Mianus River).

The first phase source/surficial sampling and analysis program was targeted to the following matrices:

- o Septic tank sludge
- o Septic tank supernatant
- o Stormwater drainage system sediment
- o Wetlands and pond surface water
- o Wetlands and pond sediment
- o Mianus River water
- o Mianus River sediment

The companion component of the first phase (Phase IA) of the program was the Phase IB sampling program which targeted the same matrices. The Phase IB program was designed to further define possible source(s) of contamination, fill data gaps and re-confirm data generated as part of the initial Phase IA surficial sampling program.

1.5.4 Subsurface Sampling and Analysis

The second phase sampling and analysis program of the Remedial Investigation was comprised of a subsurface investigation designed to characterize the hydrogeologic regime underlying the study area. In addition, the data generated during the program was utilized to identify source(s) of ground water contamination and to define the lateral and vertical extent of contamination in the ground water.

As described in Section 1.5.1, the Phase II sampling program consisted of two sub-phases. The initial Phase IIA sampling program involved the installation of seven monitoring wells at five locations within the study area. Two of the locations consisted of a well cluster. The well clusters, as opposed to a single well, consisted of two wells constructed in individual boreholes screened at different depths at the same general location.

The Phase IIB sampling program involved the installation of six additional wells at four locations. The objective of the Phase IIB sampling program was to provide confirmatory data for the definition of the nature, extent and source(s) of ground water contamination.

A total of 13 monitoring wells at 9 locations were installed at the Shopping Arcade Study Area during the Remedial Investigation. All 13 monitoring wells were sampled for ground water quality data.

1.5.5 Organic Vapor Screening of Soil Samples

As part of the construction of the deepest monitoring well at each location/cluster, soil samples were obtained at five foot intervals using a split spoon sampler. These soil samples were utilized predominantly in characterizing the subsurface lithology of the study area. In addition, the soil samples were also screened in the field for the presence of total volatile organic compounds.

The results of this screening of volatile organic compounds were used in interpreting and differentiating zones of contaminant migration in the unconsolidated stratified drift deposits underlying the study area. Samples which recorded significant volatile organic values were collected and sent to a field laboratory for chemical analysis/screening.

1.5.6 Soil Gas Survey

The New York State Department of Environmental Conservation (NYSDEC) retained the services of the United States Environmental Protection Agency (USEPA) to conduct a soil gas survey in the Shopping Arcade Study Area. Under ideal conditions, the gas trapped in the soil can exhibit similar volatile organic chemical qualities as the ground water migrating beneath.

Soil gas sampling and analysis was utilized as a reconnaissance tool in an attempt to delineate the plume of ground water contamination underlying the study area. Based on the sampling results, a map was prepared by USEPA which illustrated the concentration gradients of soil gas contaminants. Once the data from the soil gas survey was examined, it was necessary to confirm the predictions of the location and concentrations of contaminants identified during the survey. The soil gas survey map assisted in determining the placement of the Phase IIB soil borings and the ground water monitoring well network. The results of the soil gas survey are discussed in Section 4.1.4.

1.5.7 Borehole Logging Tests

Downhole borehole logging tests were performed at three locations which were the deepest accessible bedrock wells within the Shopping Arcade Study Area (MW-5B and abandoned water supply wells at the Exxon gas station and the school on Court Road). The downhole borehole logging tests conducted included caliper, resistivity, gamma-ray and specific potential logging.

The predominant rationale for performing the downhole logging at these three well locations within the study area was to obtain a better understanding of the degree of fracturing within the metamorphic bedrock and assess its influence, if possible, on the pathway by which contaminants are migrating through the bedrock zone.

1.5.8 Permeability

Permeability is the capacity of a media for transmitting a fluid. It is a measure of the relative ease of fluid flow under a pressure gradient and used to estimate flow of ground water.

For the purpose of this investigation, permeabilities were estimated by applying the Hazen Equation to grain size information. The grain size data was derived from soil samples that were obtained at the screen depths of several representative monitoring well locations within the study area. The Hazen Equation is $K = Ad_{10}^2$, where the parameter K represents permeability. The parameter d_{10} represents effective grain size and is taken directly from the grain size gradation curve as determined by sieve analysis, and is the grain size diameter at which 10% by weight of the soil particles are fines and 90% are coarser. For K in cm/s and d_{10} in mm, the coefficient A is equal to 1.0.

1.5.9 Ground Water Level Measurements

Ground water level measurements were obtained from the completed wells in December 1987, May 1988, September 1988 and November 1988. These measurements were essential for:

- Calculating the direction and magnitude of lateral and vertical hydraulic gradient within the unconsolidated and bedrock units in the Shopping Arcade Study Area.

- Determination of seasonal fluctuation in water levels.

- Determination of hydraulic interconnection between the shallow and deep water table zones.

1.5.10 Surveying and Mapping

Upon completion of the well installation program, all monitoring wells were surveyed vertically to an accuracy of 0.01 of a foot in relation to mean sea level. The monitoring wells were also surveyed horizontally. The vertical elevations are essential in establishing water levels with respect to a common datum (mean sea level) to develop ground water elevation contour maps and flow direction, as well as profiling geologic cross-sections.

The horizontal data was incorporated into the construction of a site base map onto which all data obtained during the Remedial Investigation could be plotted and referenced.

1.5.11 Aerial Photography and Topographic Mapping

In order to provide an illustrative base map for the study area, an aerial photograph was obtained at a scale of 1 inch to 100 feet. This photograph was taken in April, 1984. In addition, to provide information on direction of surface drainage as well as ground water flow, topographic contours were plotted at five foot elevation intervals referenced to mean sea level. This aerial topographic map is contained in Appendix A.

1.5.12 Health and Safety Program

The Health and Safety Plan, as defined in detail in the work plan for the Shopping Arcade Study Area, was implemented during the remedial field investigation.

The principle chemical hazards of concern in the study area consisted of volatile organic chemicals. Routine monitoring was conducted at all drilling and sampling sites to evaluate the potential exposure hazards so that the proper health and safety precautions could be exercised. All monitoring and surveillance equipment (Century Organic Vapor Analyzer [OVA], Photovac Tip and portable combustible gas/oxygen detector) was operated, maintained and calibrated each working day in accordance with the manufacturer's manual and Dvirka and Bartilucci Consulting Engineers' Quality Assurance (QA) procedures. Organic vapor monitoring was undertaken prior to and following sampling at the site as well as throughout drilling operations. At no time during the remedial field investigation did the total VOC vapors exceed background (less than 1 ppm) in the breathing zone.

Level D protection was maintained throughout all phases of the remedial field investigation except during Phase I when septic tank samples were collected. As an extra precautionary measure, Level C protection (full-face respiratory protection, protective coveralls [tyveks], nitrile gloves, etc.) was utilized when the field team collected samples from the sanitary system at the Shopping Arcade and Exxon Gas Station. Although the ambient VOC concentrations in air did not exceed background levels during this sampling, Level C safety procedures were exercised as a precaution to possible vapor emissions.

1.5.13 Quality Assurance/Quality Control Program

The Quality Assurance/Quality Control (QA/QC) Plan, as defined in detail in the work plan for the Shopping Arcade Study Area, was implemented during the remedial field investigation.

All environmental samples collected as part of the field investigation were collected in accordance with the sampling procedures outlined in the QA/QC Plan.

Field management procedures, including the preparation of Sample Information Record Forms, Location Sketches, Chain-of-Custody Forms, Daily Quality Control Reports and maintenance of a daily field log book, were undertaken during all sampling and drilling activities.

QA/QC checks, including the utilization of trip blanks, field blanks, matrix spikes, matrix spike duplicates and method blanks, were performed as described in the QA/QC plan and in accordance with the NYSDEC 1986 Contract Laboratory Protocol (CLP).

1.5.14 Data Validation

Analytical data resulting from the sampling program was reviewed to determine compliance with the 1986 Contract Laboratory Protocol (CLP) QA/QC requirements developed by the New York State Department of Environmental Conservation (NYSDEC). The QA/QC parameters reviewed for organics were: holding time, instrument tune, initial and continuing calibration, method blanks, surrogate spikes, matrix spike/matrix spike duplicates, field blanks and trip blanks. For inorganics, the QA/QC parameters reviewed were: initial and continuing calibration blanks, laboratory control samples, ICP interference, spike sample analyses and duplicate samples.

The data validation process is used to ensure that the laboratory followed the requirements set forth by the NYSDEC and extraneous chemical contamination was not introduced into the environmental samples. Any samples that did not meet the QA/QC criteria, were resampled and reanalyzed.

A data validation report was prepared for each sampling phase of this project with a detailed discussion of the validation results. The results of data validation are discussed in Sections 3.0 and 4.0, and provided in detail in the Data Validation Reports prepared as part of this investigation and contained in separate documents.

1.6 Overview of the Report

As an introduction to the report and as presented above, Section 1.0 provides a general description into the site background that led up to conducting this Remedial Investigation. Also included in this section, is an overview of the nature and extent of the chemical contamination as documented by previous investigations, and a discussion of waste types and characteristics as they pertain to the contaminants of concern in the study area (tetrachloroethene) and its breakdown compounds. In addition, an outline of the phased approach undertaken during this Remedial Investigation is provided which includes a summary of the individual programs/tasks which made up the scope of work. Other sections which make up this report include the following:

Section 2.0 describes the regional and site physical features of the Shopping Arcade Study Area that can either be impacted by or can influence the migration of contaminants.

Section 3.0 provides the rationale for and investigative methods used in the Phase I (source and surficial) sampling program. Included in this section are the analytical sample results as reported by a NYSDEC certified laboratory.

Section 4.0 discusses the methodologies incorporated into the Phase II subsurface investigation. Analytical data is also provided from the soil and ground water samples obtained for this phase. In addition, this section presents a discussion of the regional and site specific geology and topography, as well as the surface and subsurface hydrology in the study area.

Section 5.0 provides a description and results of an extensive drinking water supply sampling program that was conducted as part of the Remedial Investigation.

Section 6.0 contains an overall discussion of the contamination encountered in the Shopping Arcade Study Area. A presentation is provided with respect to source and surficial contamination as well as subsurface and water supply contamination that was encountered in comparison to environmental standards and guidelines.

Section 7.0 provides an assessment of the public health and environmental concerns related to the contaminants found in the study area. Critical contaminants are identified along with potential migration pathways, routes of exposure and receptors.

Section 2

2.0 SITE FEATURES

2.1 Demography

In a ranking of the 14 towns of Westchester County, Bedford ranks the seventh largest in terms of population (approximatly 15,000). Between 1970 and 1980, the Town of Bedford's population decreased by 1.1 percent. From 1980–1985, however, the population of the Town is estimated to have increased by 4.7 percent. Table No. 2–1 indicates population changes between 1970 and 1985 for the Town of Bedford and for the North Westchester County towns. Projections to the year 2000, calculated by Westchester County Department of Planning (April 1985), are also shown.

The composition of the male and female population in Westchester County has shifted between 1970 and 1980. The female population became the prevalent group after the 18 years of age group and posed a modest gain over males in the 30 to 59 year age group. The greatest gain in age group was in the 22 to 29 year age group, with a 16.7 percent increase from 1970 to 1980. This age group is the forerunner in both household formation and entry into the labor force. The median age in Westchester County is 34.5 years of age, which is a higher median age than the New York Standard Metropolitan Statistical Area (SMSA), New York State and the region as a whole. Table No. 2–2 summarizes information from the 1980 census and indicates total population by age group for Westchester County, the Town of Bedford and all North County towns.

2.2 Land Use

The Town of Bedford is located in northeastern Westchester County. Bedford is bordered on the north by the Town of Somers and Lewisboro, on the east by the Town of Pound Ridge, on the south by the Town of North Castle and on the west by the Town of New Castle and the Town/Village of Mount Kisco. There are three unincorporated Hamlets in the Town of Bedford, these being Katonah, Bedford Hills and Bedford Village. The Town boundary is roughly square in shape and covers approximately 40 square miles or 25,600 acres of land.

The Town of Bedford is semi–rural in character making it an attractive residential community. The area immediately surrounding the Shopping Arcade (The Village Green Area) to the south and east has zoning for, and is occupied by small businesses and stores. The area immediately to the north and west is zoned for, and is occupied residential, with

Table No. 2-1

POPULATION CHANGE 1970 - 1985 AND
PROJECTED POPULATION TO 2000

Area	1970	1980	Estimated 1985	% Change 1970-1985	Projected 1990	Projected 2000
Westchester	894,104	866,599	879,708	1.6	872,700	868,900
Bedford	15,309	15,137	15,855	3.5	16,000	16,200
North County Towns	215,727	226,549	241,337	11.9	244,700	248,400

Source: Westchester County Department of Planning

Table No. 2–2

TOTAL POPULATION BY AGE GROUPS AND PERCENT OF TOTALS – 1980

Area	0–21	22–64	65 and Over
Westchester	271,938 31.4%	480,502 55.4%	114,159 13.2%
Bedford	5,174 33.4%	8,996 58.2%	1,302 8.4%
North County Towns	69,514 34.0%	114,291 56.0%	20,358 10.0%

Source: Westchester County Department of Planning lot sizes ranging from one and two acre occupancies. Surrounding the study area, the character of development changes to mostly four acre zoning (excluding the Village Green Area). Land use is mostly rural residential.

The Bedford Town Development Plan (adopted September 12, 1972) has made it an important objective to maintain its present rural historical character as it directs future development. Table No. 2-3 shows that the majority of vacant land with potential for development is privately owned in Bedford.

2.3 Natural Resources

The natural resources contained in and adjacent to the Shopping Arcade Study Area consist of a river, floodplains, wetlands and ponds, wooded tracts and ground water.

Approximately one-half mile to the southeast of the Shopping Arcade and bordering the downgradient portion of the study area is the Mianus River, its floodplain and associated wetlands. Within the study area, the Mianus River is a "Class AA - Special" water body as designated by NYSDEC. Its use is classified for drinking water supply because it is utilized as a primary drinking water source for a downstream community (Stamford, Connecticut).

Six hundred feet to the northeast of the Shopping Arcade and flowing to the southeast is a series of ponds and streams which ultimately discharge to the Mianus River. These surface waters are also classified as "AA-S" because they are tributary to the Mianus River. This area contributes to the extensive wetlands habitat which borders the Mianus River and its tributaries that are contained in and adjacent to the Shopping Arcade Study Area.

The area's macro-environments surrounding the site (river, floodplain, wetlands, ponds and woodlands) support an abundance of wildlife that is typical of southern New York.

The ground water underlying the site is an important natural resource to the residents in and around the study area. Ground water is the sole source water supply for the residents in the study area and is classified as "GA" by NYSDEC. The stratified glacial drift deposits that compose the Mianus River Valley sediments are very permeable, which makes the ground water very susceptible to contaminants spilled on the ground surface or discharged to subsurface disposal systems.

Table No. 2-3

TOWN OF BEDFORD
LAND USES - 1982

Use	Percent (%)
Residential	17.7
Commercial/Retail	0.8
Industrial/Manufacturing	0.3
Institutional/Public Facilities	1.4
Open Space	5.0
Undeveloped (privately owned)	74.8

Source: Westchester County Environmental Planning Atlas

2.4 Climatology

The climate of southeastern New York State, in which the study area is located, is broadly representative of the humid continental weather which prevails in the northeastern United States. The character of the topography and the relative proximity to a large body of water (Long Island Sound) have a pronounced effect on the overall climate.

General Climatic Features - The average climate for a particular region is the condition that can be expected over a period of time. Each locality, however, is influenced by the physiography and local topography. In addition, lakes, hills, forest cover and exposure can also create relatively striking differences within an isolated area. The average climatic condition in the vicinity of Bedford is considered to be moderate. There are extreme variations in heat and cold, but generally, the uncomfortable periods are of short duration.

Temperature - Over a period of years, weather records show the following averages:

January	-	Mean maximum temperature 38°F
		Mean minimum temperature 23°F
July	-	Mean maximum temperature 85°F
		Mean minimum temperature 61°F

Generally, winter temperatures are modified by nearby Long Island Sound. The coldest temperatures in most winters will range from 0° to 10°F for a period of five to six days.

In the summer, Bedford may experience rather warm high humidity periods with the temperatures exceeding 90°F for a period of 18 to 25 days.

Precipitation - The Bedford region has a fairly uniform distribution of rainfall. During the average year about 48 inches of rain falls in the region. The 1980–1981 period was an exception and a severe drought imperiled the major surface water storage basins/reservoirs (supplies) of the area and also had an impact on the ground water resources in the region.

Snowfall - Snowfall is also influenced by the Bedford physiography, topography and its proximity to Long Island Sound. Snowfall in the Town averaged between 40 and 50 inches a year with January generally being the month of greatest snowfall. Storms of freezing rain may be expected to occur one or more times each year.

Winds - The prevailing wind is generally from the west. A southwest flow of wind is dominant during the summer months and a northwest component is characteristic of the colder half of the year.

Thunderstorms and Hurricanes - The summer rain-thunderstorms occur on an average of 30 days in any given year. In the late summer and early fall, hurricanes occasionally sweep the area and strong winds and heavy rainfall result. These storm systems generally move quickly through the area.

2.5 Topography

The extent of elevation within the Shopping Arcade Study Area varies approximately 130 feet. Elevations range from 350 feet to 480 feet above sea level. The topography of the area reflects both the subsurface and surface geology of the Mianus River Valley. Directly upgradient and to the southwest of the Shopping Arcade, a ridge line rises steeply from 400 feet to a peak of 480 feet above mean sea level. The Arcade itself and adjacent Route 22 are situated within the Mianus River Valley. The area downgradient and to the east of the Arcade is moderately sloping to generally flat. The slope from the Arcade to the Mianus River drops approximately 50 feet in one-half mile distance. This area to the east contains ponds and wetlands which are associated with the surface water drainage system which discharges to the Mianus River. The Mianus River is also bordered by an area consisting of wetlands. The topographic map of the study area produced as part of the Remedial Investigation is provided in the map pocket as Exhibit 1 at the end of this document.

Section 3

3.0 SOURCE AND SURFICIAL INVESTIGATION

3.1 Description of the Phase IA Sampling Program

The goal of this first phase of the source and surficial sampling program was to collect and evaluate environmental data in order to make an initial determination regarding the location of the sources of contamination, to assess the transport of contaminants through the study area and to assist in making decisions on the specific sampling locations for subsequent phases of the Remedial Investigation. The following activities were undertaken during the Phase IA program.

- o Pertinent, available literature and technical reports and data were reviewed.

- o A limited number of private well depth measurements obtained from the Westchester County Department of Health (WCDH) were confirmed in discussions with local homeowners. This data was used in defining the Phase IIA program and expanded upon as part of the Water Supply Sampling Program, both of which are discussed later in this report.

- o Aerial photographs of the site were obtained and topographic maps were prepared to provide the most recent information on land use patterns, potential sources of contamination, local topography and drainage patterns.

- o Lastly, environmental sampling was undertaken at the following general locations:

  - Septic tank sludge (solids)
  - Septic tank supernatant (liquid)
  - Stormwater drainage system sediment
  - Surface water (wetlands/ponds)
  - Surface water sediment (wetlands/ponds)
  - Mianus River water
  - Mianus River sediment

3.1.1 Sample Collection Methods

As part of the Phase I program, specific types of sampling equipment were utilized to obtain the various types of sample matrices. In many instances samples were readily accessible (stream sediment samples, surface water samples, etc.) and only required a stainless steel scoop for collection. In other instances, accessibility was more complex (septic tank samples, pond sediment samples, etc.) and more sophisticated sampling equipment was incorporated.

The following briefly describes the types of sampling equipment incorporated in collecting the source/surficial samples as part of the Phase I Remedial Investigation.

3.1.1.1 Surface Water and Wastewater Sampling

Surface water samples were collected by using a stainless steel ladle. Stainless steel material was utilized due to its noncorrosive nature. The collection of the supernatant/wastewater samples from septic tanks was achieved by utilizing a grab subsurface sampler. The grab subsurface sampler is constructed of aluminum tubing making it light weight. A sample glass bottle was attached to the aluminum frame and lowered into the septic tank and a sample was obtained.

3.1.1.2 Sediment and Sludge Sampling

When a particular sample point was easily accessible, such as a stormwater catch basin or open culvert, sediments were collected by the use of a stainless steel ladle or trowel. Where access was more difficult, such as in the collection of a sludge sample from a septic tank, a grab subsurface sampler was used.

3.1.1.3 Sample Preservation and Handling

Once samples were obtained, containers provided by the analytical laboratory were removed from the sample coolers and filled with the sample matrix. Samples were transferred directly from the collection equipment into the laboratory containers. Preservation methods were utilized as required by the NYSDEC 1986 Contract Laboratory Protocol (CLP) and included pH control by chemical addition, refrigeration and protection from light.

Upon completion of daily sampling, Chain-of-Custody Forms were completed and the sample coolers were delivered to the laboratory within 48 hours as required by NYSDEC.

3.1.1.4 Decontamination Procedures

Sampling equipment used during the Phase I investigation was decontaminated according to NYSDEC approved procedures. This involved the following in the sequence described below:

- Equipment was washed with laboratory detergent and rinsed with potable water, followed by distilled water.

- Equipment was then washed with a 50/50 mix of acetone and hexane (reagent grade), and allowed to air dry.

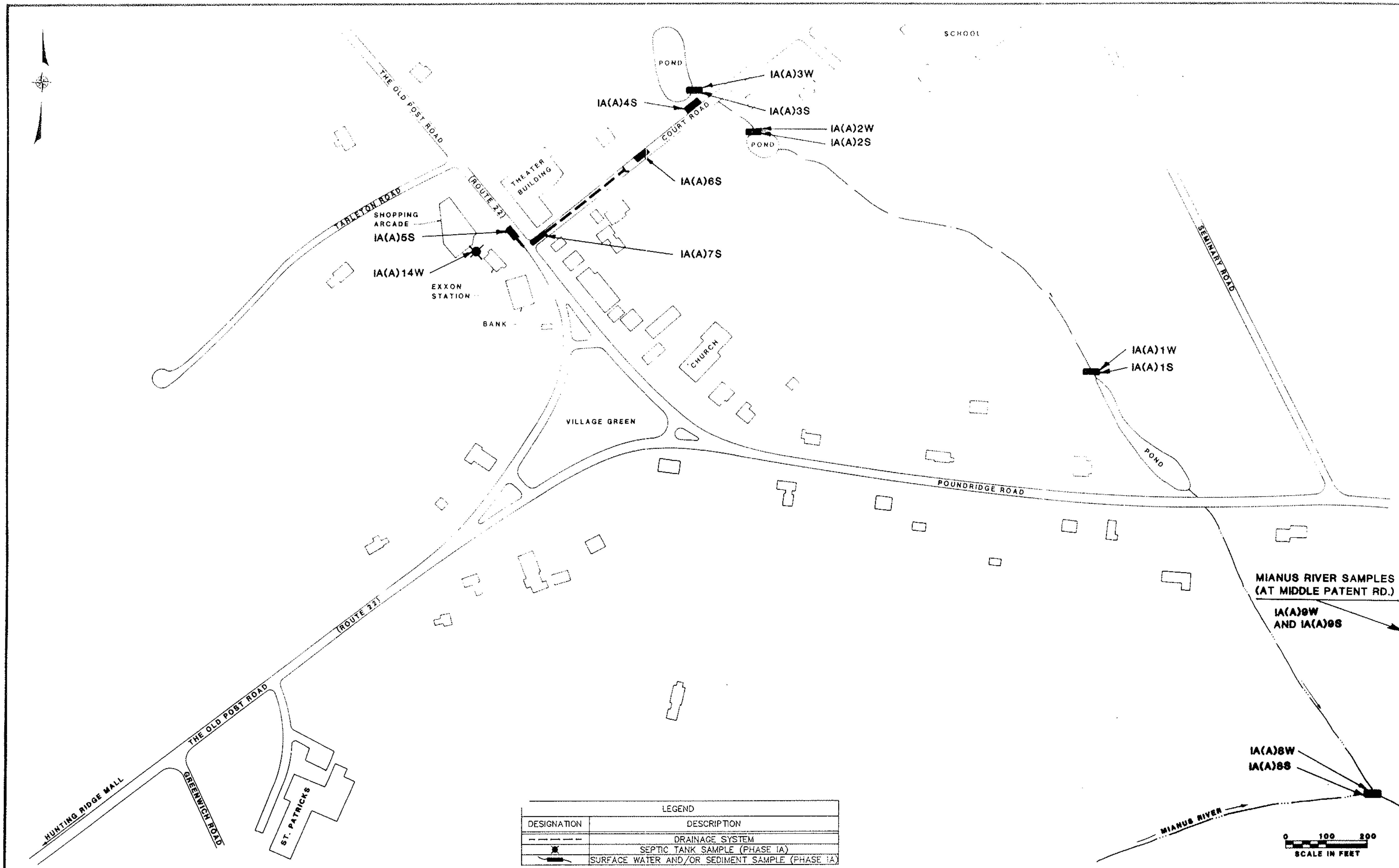
After equipment was dry, it was wrapped in aluminum foil (dull side against the equipment) until it was used for sample collection.

3.1.2 Selection of Sampling Locations and Sample Points

This section briefly reviews the rationale for selecting the various Phase IA sampling locations. The Phase IA sampling locations for the Shopping Arcade Study Area are illustrated in Figure No. 3-1.

Septic Tank Sludge - Sludge in the existing septic tank at the Shopping Arcade was thought to be a potential continuing source of contamination due to past disposal practices of the former dry cleaner located in the Arcade. Sampling the contents of the tank would confirm if the sanitary system located at the Arcade is a source of contamination. Provision was made to collect up to four sludge samples from the septic tank.

Septic Tank Supernatant - Supernatant samples from the septic tank were obtained in an effort to determine if the sanitary system was currently contributing chemical contamination due to past disposal practices. Provision was made to obtain a total of up to six samples from the septic tank.



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BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE I A
SAMPLING LOCATIONS

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FIGURE NO. 3-1

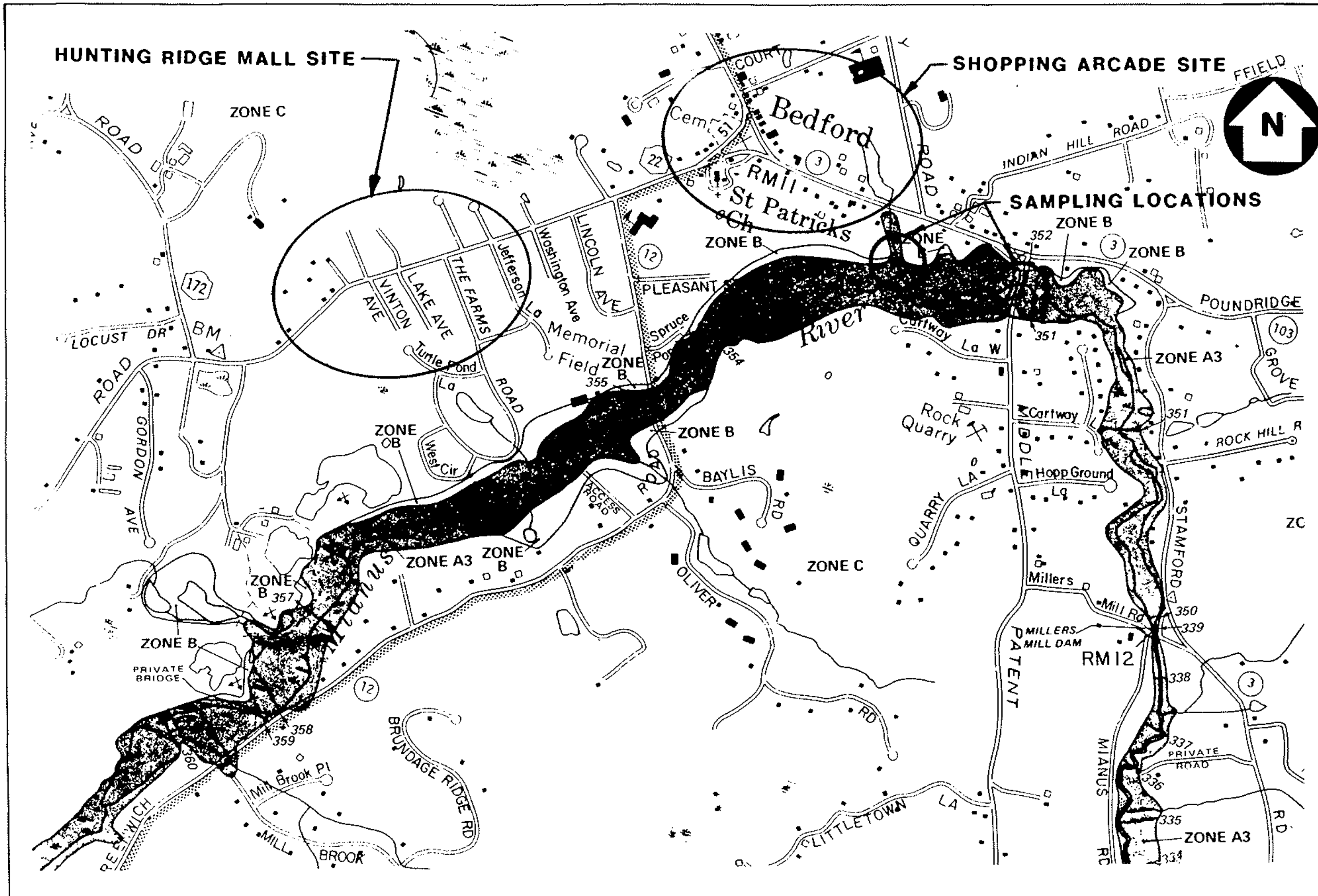
Stormwater Drainage System Sediment - Analyzing a limited number of sediment samples from the stormwater drainage system serving the Shopping Arcade would help determine if the system was/is contaminated and a pathway for contamination to migrate off-site. Provision was made to collect a total of up to four samples from along the stormwater drainage system that discharges to the stream adjacent to Court Road and downgradient of the Shopping Arcade site.

Surface Water (Wetlands/Ponds) - Surface water samples were collected from the wetlands and ponds east of the Shopping Arcade. Analyzing these samples assisted in determining if organic chemical contamination exists in the wetlands and ponds that drain the study area. Three samples were collected; one upstream and two downstream of the point where the stormwater drainage system along Route 22 and Court Road discharges to the wetlands/ponds.

Surface Water Sediment (Wetlands/Ponds) - A chemical evaluation of the sediments in the wetlands and ponds near the point where the Shopping Arcade drainage system discharges has never been conducted and would provide information on contamination in the study area. Organic chemicals such as those found in this study area often demonstrate a high affinity to adsorb to sediments in the environment. Provision was made to collect up to three samples from a point immediately below the sediment surface upstream (one) and downstream (two) from the point at which the stormwater drainage system discharges to the wetland/pond system.

River Water - Government officials and the public have raised concern over the extent of contamination in the study area and its possible impact on the Mianus River sediments and surface waters as this water body is used as a drinking water supply for a downstream community. River water samples were collected from a point immediately below the surface of the water upstream and downstream of the point where the pond/wetland system discharges to the Mianus River (see Figure No. 3-2). A total of two water samples were collected and analyzed as part of the Shopping Arcade Study Area. In addition, two river samples were collected from the Mianus River within the adjacent Hunting Ridge Mall Site Study Area resulting in a total of four samples being obtained from Mianus River.

River Sediment - Same rationale as above for River Water. Samples were collected immediately below the sediment surface at the same locations from which river water samples were collected.



Dvirka and Bartilucci CONSULTING ENGINEERS

SHOPPING ARCADE STUDY AREA
MIANUS RIVER SAMPLING LOCATIONS

FIGURE NO. 3-2

It should be noted that in the original scope of work, provisions were made to obtain effluent samples from leaching pools at the Shopping Arcade, as well as obtain split spoon soil samples adjacent to the leaching pools. However, when the Phase I sampling program commenced, it was noted that the construction of the Arcade's sanitary system did not include leaching pools, rather it was designed as a leaching field system. Therefore, these planned samples were not obtained.

The provision for sampling the leaching pools was applied (with the concurrence of NYSDEC to sampling the septic tank supernatant. The split spoon soil sampling and analysis provision for three samples was postponed to be used in a later phase of the investigation. Table No. 3-1 summarizes the Phase IA sample locations, the number of samples collected and analyzed, and the rational for conducting the sampling.

3.1.3 Analytes of Concern

Based on review of the results of samples previously collected in the study area, primary and secondary analytes of concern were identified and defined for the Shopping Arcade Site. The primary analytes of concern are those volatile organic chemicals resulting from dry cleaning operations comprising tetrachloroethene, trichloroethene, dichloroethene and vinyl chloride. The secondary analytes of concern include 1,1,1-trichloroethane and BTX compounds (benzene, toluene and xylene). For Phase IA samples taken, laboratory analysis was conducted to determine the presence of these analytes of concern and other volatile organic chemicals (VOCs). In addition, approximately 50% of the samples were analyzed for the complete array of Hazardous Substance List (HSL) compounds (see Appendix B).

3.1.4 Location of Background Sampling Points

The Phase IA sampling program was essentially designed to confirm data obtained in the past in an effort to better define the suspected source of contamination and recommend an appropriate remedial action, if required. During this and all subsequent phases of the program, samples were collected either upgradient (for ground water) from suspected sources of contamination or upstream/upriver (for surface water and sediment samples) as a control in the program. (Refer to Figure No. 3-2 for an illustration of the Mianus River background sampling location for Phase IA.)

Table No. 3-1

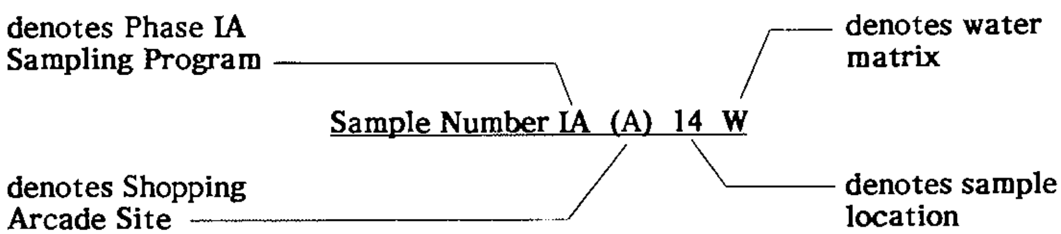
SUMMARY OF THE PHASE IA SAMPLING PROGRAM

Sampling Location	Number of Samples	Sample Identification Number	Rationale
Septic Tank (Sludge)	0 (no sludge present)	--	Determine if sludge in the septic tank at the Arcade is a continuing source of ground water contamination.
Septic Tank (Supernatant)	1	IA(A)14W	Determine if septage/effluent at the Arcade is a continuing source of ground water contamination.
Stormwater Drainage System Sediment	4	IA(A)4S IA(A)5S IA(A)6S IA(A)7S	Determine if the drainage system is contributing to any ground water or surface water contamination in the study area.
Surface Water (Wetlands/Ponds)	3	IA(A)1W IA(A)2W IA(A)3W	Determine if contamination exists in the wetlands and ponds.
Surface Water Sediment (Wetlands/Ponds)	3	IA(A)1S IA(A)2S IA(A)3S	Determine if contamination exists in the surface sediments of the wetlands and ponds.
River Water	2	IA(A)8W IA(A)9W	Determine if contamination exists in Mianus River surface water.
River Sediment	2	IA(A)8S IA(A)9S	Determine if contamination exists in Mianus River due to waste disposal in the study area.

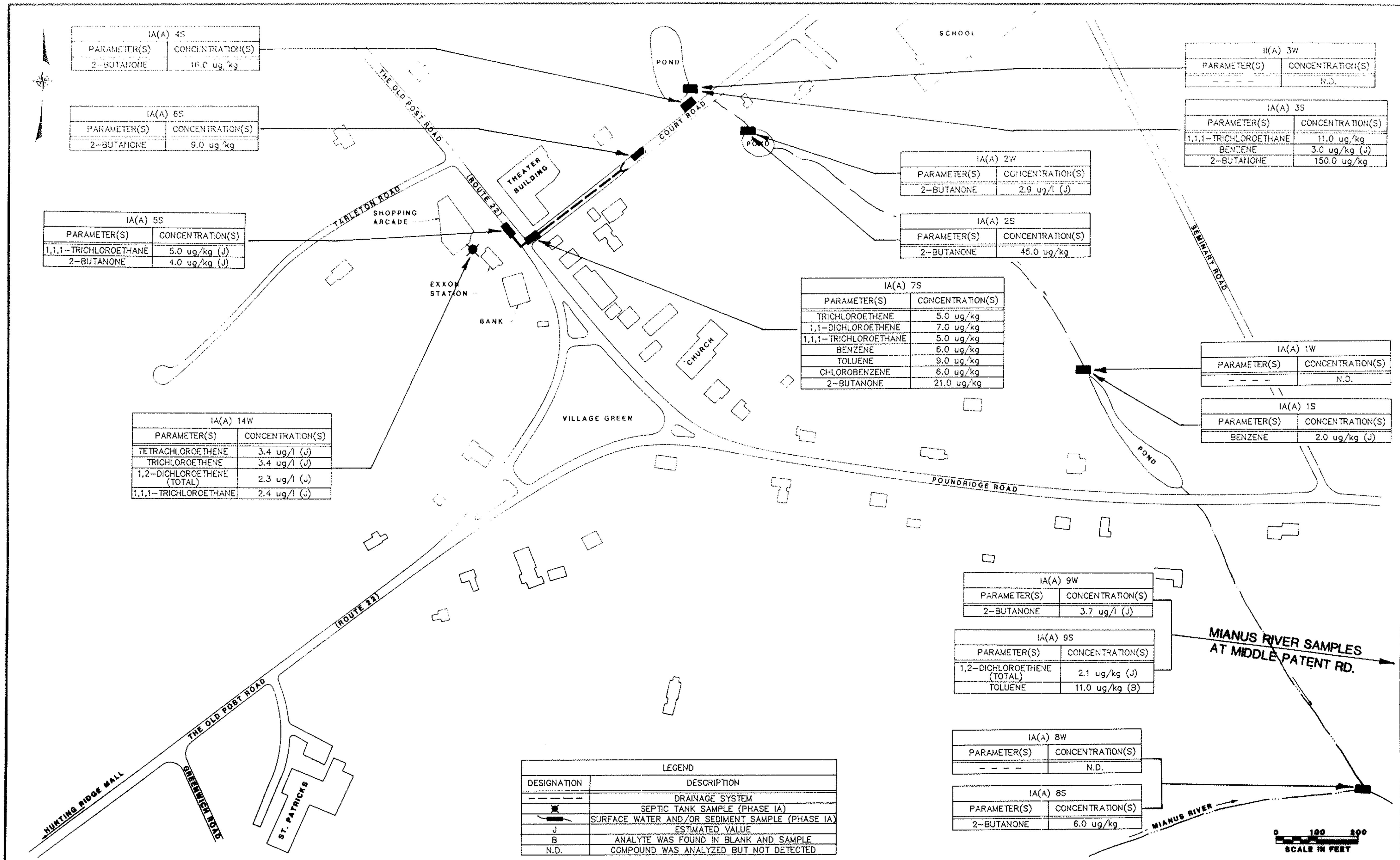
3.2 Analytical Results of the Phase IA Sampling Program

The purpose of this section of the Remedial Investigation Report is to present the analytical results of samples which were collected during the baseline component of the first phase of the source and surficial sampling program. As mentioned above, detailed discussion concerning these results and implication in relation to causes and extent of contamination is presented in Section 6.0.

Figure No. 3-3 presents a map of the study area which identifies the locations throughout the Shopping Arcade Study Area from which solid (sediment/sludge) and liquid (water/supernatant) matrix samples were collected along with the analytical results of each sample. For purposes of presenting sampling program results, each sampling point is identified by an identification number. For example, a sampling point labelled "IA(A)14W" would indicate the following. The "IA" portion of the identification number indicates that the sample was collected during the Phase IA portion of the sampling program. The "(A)" of the sample identification number designates that the sample was collected from within the Shopping Arcade Study Area. The next portion of the sample identification is a number such as "1", "2", "3"... through "25." This identifies the specific sampling location in the study area. The last element of the sample identification number is either a "W" or an "S." This indicates whether the sample collected was a water (wastewater/surface water) or solid (sludge/sediment) matrix, respectively. The following example summarizes the nomenclature of the sample identification number:



This sample identification number was also used on the Chain-of-Custody Forms and Field Log Forms. As such, background information regarding each sampling location including, location sketches, field personnel involved, date and time of sample collection, meterological conditions, etc. can be obtained from the Field Log Forms which are contained in separate Field Report documents by cross referencing them to the appropriate sample identification number from Figure No. 3-3.



IA(A) 4S	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	16.0 ug/kg

IA(A) 6S	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	9.0 ug/kg

IA(A) 5S	
PARAMETER(S)	CONCENTRATION(S)
1,1,1-TRICHLOROETHANE	5.0 ug/kg (J)
2-BUTANONE	4.0 ug/kg (J)

IA(A) 14W	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	3.4 ug/l (J)
TRICHLOROETHENE	3.4 ug/l (J)
1,2-DICHLOROETHENE (TOTAL)	2.3 ug/l (J)
1,1,1-TRICHLOROETHANE	2.4 ug/l (J)

II(A) 3W	
PARAMETER(S)	CONCENTRATION(S)
– – – –	N.D.

IA(A) 3S	
PARAMETER(S)	CONCENTRATION(S)
1,1,1-TRICHLOROETHANE	11.0 ug/kg
BENZENE	3.0 ug/kg (J)
2-BUTANONE	150.0 ug/kg

IA(A) 2W	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	2.9 ug/l (J)

IA(A) 2S	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	45.0 ug/kg

IA(A) 7S	
PARAMETER(S)	CONCENTRATION(S)
TRICHLOROETHENE	5.0 ug/kg
1,1-DICHLOROETHENE	7.0 ug/kg
1,1,1-TRICHLOROETHANE	5.0 ug/kg
BENZENE	6.0 ug/kg
TOLUENE	9.0 ug/kg
CHLOROBENZENE	6.0 ug/kg
2-BUTANONE	21.0 ug/kg

IA(A) 1W	
PARAMETER(S)	CONCENTRATION(S)
– – – –	N.D.

IA(A) 1S	
PARAMETER(S)	CONCENTRATION(S)
BENZENE	2.0 ug/kg (J)

IA(A) 9W	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	3.7 ug/l (J)

IA(A) 9S	
PARAMETER(S)	CONCENTRATION(S)
1,2-DICHLOROETHENE (TOTAL)	2.1 ug/kg (J)
TOLUENE	11.0 ug/kg (B)

IA(A) 8W	
PARAMETER(S)	CONCENTRATION(S)
– – – –	N.D.

IA(A) 8S	
PARAMETER(S)	CONCENTRATION(S)
2-BUTANONE	6.0 ug/kg

LEGEND

DESIGNATION	DESCRIPTION
– – – – – –	DRAINAGE SYSTEM
(symbol)	SEPTIC TANK SAMPLE (PHASE IA)
(symbol)	SURFACE WATER AND/OR SEDIMENT SAMPLE (PHASE IA)
J	ESTIMATED VALUE
B	ANALYTE WAS FOUND IN BLANK AND SAMPLE
N.D.	COMPOUND WAS ANALYZED BUT NOT DETECTED

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REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE I A
ORGANIC CHEMICAL SAMPLING RESULTS

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FIGURE NO. 3-3

In the following sections, the sequence of data presentation will be by sampling media, beginning with a potential source such as the septic tank and continuing with stormwater drainage system sediment, surface water (wetlands and ponds) and river sediment, and background sample points. For each media there is a discussion of organic (including the analytes of concern identified in Section 3.1.3) and inorganic sampling results as appropriate. As described previously, Figure No. 3-3 presents the location and identification numbers of each sampling location including the analytes of concern, along with the concentration detected. Cases where analytes of concern were reported as having non-detectable concentrations are reported as ND.

A summary of the organic and inorganic analytical results for all samples collected in the Shopping Arcade Study Area during Phase IA is presented in tabular format in Table No. 3-2. Samples reporting results for inorganic analyses were analyzed for HSL constituents. All other samples were analyzed for volatiles only.

It is important to note that as shown in Table No. 3-2, multiple samples were obtained and analyzed at several locations during the Phase IA sampling program because some of the initial analyses did not meet NYSDEC QA/QC requirements and the results were deemed invalid. Therefore, only those analytical results that met the NYSDEC QA/QC requirements for Hazardous Substance List (HSL) analysis and resultant valid data is shown in both Table No. 3-2 and Figure No. 3-3, and presented in this report for discussion.

As listed in Table No. 3-2, where a result is not provided for a specific compound, the following qualifiers are used:

- A <u>blank</u> space indicates that the analysis of the compound did not meet the NYSDEC CLP QA/QC requirements and was therefore deemed <u>invalid</u> and not shown.

- The symbol "ND" indicates that the analysis of this compound met the NYSDEC CLP QA/QC requirements, but was not measured above the analytical instrument's detection limits (IDL).

- The symbol "NA" indicates that the compound was not analyzed.

Qualifiers that accompany the concentrations reported in the table are NYSDEC CLP qualifiers.

Table No. 3-2
BEDFORD VILLAGE
REMEDIAL INVESTIGATION / FEASIBILTY STUDY
SHOPPING ARCADE PHASE IA SAMPLING PROGRAM
ANALYTICAL RESULTS

PARAMETERS	IA(A)1S 8/19/87 (ug/kg)	IA(A)1SA 5/31/88 (ug/kg)	IA(A)1W 8/19/87 (ug/l)	IA(A)1WA 5/31/88 (ug/l)	IA(A)2S 8/20/87 (ug/kg)	IA(A)2W 8/19/87 (ug/l)	IA(A)3S 8/19/87 (ug/kg)	IA(A)3SA 5/31/88 (ug/kg)	IA(A)3W 8/19/87 (ug/l)	IA(A)4S 8/20/88 (ug/kg)	IA(A)4SA 5/31/88 (ug/kg)
Volatiles:											
Acetone	57.0 B	NA	6.0 B	NA	220.0 B	21.0 B	1500.0 B	NA	27.0 B	156.0	NA
Benzene	2.0 J	NA	ND	NA	ND	ND	3.0 J	NA	ND	ND	NA
Bromodichloromethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Bromoform	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Bromomethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
2-Butanone	ND	NA	ND	NA	45.0	2.9 J	150.0	NA	ND	16.0	NA
Chlorobenzene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Carbon Disulfide	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Carbon Tetrachloride	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Chloroethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Chloroform	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Chloromethane	ND	NA	ND	NA	[illegible]	ND	ND	NA	ND	ND	NA
Dibromochloromethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,1-Dichloroethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,2-Dichloroethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,1-Dichloroethylene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,2-Dichloroethylene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,2-Dichloropropane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
cis-1,3-Dichloropropene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
trans-1,3-Dichloropropene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Ethyl Benzene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
2-Hexanone	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Methylene Chloride	25.0 B	NA	1.2 JB	NA	32.0 B	8.4 B	140.0	NA	28.0 B	38.0 B	NA
4-Methyl-2-Pentanone	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Styrene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,1,2,2-Tetrachloroethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Tetrachloroethylene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Toluene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
1,1,1-Trichloroethane	ND	NA	ND	NA	ND	ND	11.0	NA	ND	ND	NA
1,1,2-Trichloroethane	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Trichloroethene	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Vinyl Acetate	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Vinyl Chloride	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Total Xylenes	ND	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
Other:											
1-(2-Furanyl) Ethanone	34.0 J	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
2,4-Dimethyl Phenol	470.0 J	NA	ND	NA	ND	ND	ND	NA	ND	ND	NA
2-Methyl Phenol	110.0 J	NA	ND	NA	ND	ND	900.0 J	NA	ND	ND	NA
2-Methoxy Phenol	160.0 J	NA	ND	NA	ND	ND	2900.0 J	NA	ND	ND	NA
Nonanal	ND	NA	ND	NA	ND	7.0 J	ND	NA	ND	ND	NA
Phenol	ND	NA	ND	NA	ND	ND	540.0 J	NA	ND	ND	NA
4-Methyl Phenol	ND	NA	ND	NA	ND	ND	250.0 J	NA	ND	ND	NA
Unknown Alcohol	36.0 J	NA	ND	NA	ND	ND	570.0 J	NA	ND	ND	NA
Unknown Alkane	ND	NA	ND	NA	ND	ND	340.0 J	NA	ND	ND	NA
Unknown (total)	105.0 J	NA	ND	NA	ND	ND	900.0 J	NA	14.0 J	ND	NA

Table No. 3-2 (continued)

Semi-Volatiles:	IA(A)1S 8/19/87 (ug/kg)	IA(A)1SA 5/31/88 (ug/kg)	IA(A)1W 8/19/87 (ug/l)	IA(A)1WA 5/31/88 (ug/l)	IA(A)2S 8/20/87 (ug/kg)	IA(A)2W 8/19/87 (ug/l)	IA(A)3S 8/19/87 (ug/kg)	IA(A)3SA 5/31/88 (ug/kg)	IA(A)3W 8/19/87 (ug/l)	IA(A)4S 8/20/88 (ug/kg)	IA(A)4SA 5/31/88 (ug/kg)
Acenaphthene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Acenaphthylene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Anthracene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Benz(a)anthracene	ND	NA	ND	NA	NA	NA	ND	NA	NA	530.0 J	NA
Benzoic Acid	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Benzyl Alcohol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Benzo(b)fluoranthene	ND	NA	ND	NA	NA	NA	ND	NA	NA	690.0	NA
Benzo(k)fluoranthene	ND	NA	ND	NA	NA	NA	ND	NA	NA	930.0	NA
Benzo(g,h,i)perylene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Benzo(a)pyrene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Bromophenyl Phenyl Ether	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Butyl Benzyl Phthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	660.0	NA
4-Chloroaniline	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
bis (2-Chloroethoxy) methane	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
bis (2-Chloroethyl) ether	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
bis (2-Chloroisopropyl) ether	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Chloro-3-Methylphenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
(p-Chloro-m-Cresol)	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Chloronaphthalene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Chlorophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Chlorophenyl Phenyl Ether	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Chrysene	ND	NA	ND	NA	NA	NA	ND	NA	NA	690.0	NA
Dibenz(a,h)anthracene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Dibenzofuran	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Di-n-Butylphthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	660.0 B	NA
1,2-Dichlorobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
1,3-Dichlorobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
1,4-Dichlorobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
3,3'-Dichlorobenzidine	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4-Dichlorophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Diethylphthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4-Dimethylphenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Dimethyl Phthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4-Dinitrophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4-Dinitrotoluene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,6-Dinitrotoluene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Di-n-Octyl Phthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
bis (2-ethylhexyl) phthalate	ND	NA	ND	NA	NA	NA	ND	NA	NA	440.0 B	NA
Fluoranthene	ND	NA	ND	NA	NA	NA	ND	NA	NA	922.0	NA
Fluorene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Hexachlorobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Hexachlorobutadiene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Hexachlorocyclopentadiene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Hexachloroethane	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)1S 8/19/87 (ug/kg)	IA(A)1SA 5/31/88 (ug/kg)	IA(A)1W 8/19/87 (ug/l)	IA(A)1WA 5/31/88 (ug/l)	IA(A)2S 8/20/87 (ug/kg)	IA(A)2W 8/19/87 (ug/l)	IA(A)3S 8/19/87 (ug/kg)	IA(A)3SA 5/31/88 (ug/kg)	IA(A)3W 8/19/87 (ug/l)	IA(A)4S 8/20/88 (ug/kg)	IA(A)4SA 5/31/88 (ug/kg)
Indeno(1,2,3-cd)pyrene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Isophorone	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Methylnaphthalene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Methyl Phenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Methyl Phenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Naphthalene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Nitroaniline	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
3-Nitroaniline	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Nitroaniline	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Nitrobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2-Nitrophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
4-Nitrophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
N-Nitroso-Diphenylamine	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
N-Nitroso-Dipropylamine	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Pentachlorophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Phenanthrene	ND	NA	ND	NA	NA	NA	ND	NA	NA	280.0 B	NA
Phenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Phenol (total)	ND	NA	ND	NA	NA	NA	700.0	NA	NA	ND	NA
Pyrene	ND	NA	ND	NA	NA	NA	ND	NA	NA	1300.0	NA
1,2,4-Trichlorobenzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4,5-Trichlorophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
2,4,6-Trichlorophenol	ND	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Others:											
1,2-Benzenedicarboxylic Acid Dibutyl Ester	1500.0 J	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
1,2-Benzenedicarboxilic Acid Bis(Methylpropyl)Ester 278	ND	NA	ND	NA	NA	NA	6000.0 J	NA	NA	ND	NA
2-Cyclohexene-1-one	ND	NA	9.0 J	NA	NA	NA	ND	NA	NA	ND	NA
Ethanone,1-(2-Furanyl)	34.0 J	NA	ND	NA	NA	NA	ND	NA	NA	ND	NA
Heptane, 2,6-Dimethyl	ND	NA	ND	NA	NA	NA	7400.0 J	NA	NA	ND	NA
3-Hexane-2,5-Dione	ND	NA	ND	NA	NA	NA	ND	NA	NA	3700.0 J	NA
Hexane,2-Methyl	ND	NA	ND	NA	NA	NA	ND	NA	NA	3700.0 J	NA
4-Hydroxy-4-Methyl-2-Pentanone	ND	NA	ND	NA	NA	NA	ND	NA	NA	16000 J	NA
Pentane, 2-Methyl	ND	NA	ND	NA	NA	NA	5800.0 J	NA	NA	ND	NA
Sulfur,Mol.(S8)	ND	NA	ND	NA	NA	NA	4200.0 J	NA	NA	ND	NA
Isomer of Dimethyl Benzene	ND	NA	ND	NA	NA	NA	ND	NA	NA	6000.0 J	NA
Unknown Alkane (total)	38000 J	NA	ND	NA	NA	NA	95000 J	NA	NA	16000 J	NA
Unknown (total)	72000 J	NA	120.0 J	NA	NA	NA	210000 J	NA	NA	76000 J	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)1S 8/19/87 (mg/kg)	IA(A)1SA 5/31/88 (mg/kg)	IA(A)1W 8/19/87 (ug/l)	IA(A)1WA 5/31/88 (ug/l)	IA(A)2S 8/20/87 (mg/kg)	IA(A)2W 8/19/87 (ug/l)	IA(A)3S 8/19/87 (mg/kg)	IA(A)3SA 5/31/88 (mg/kg)	IA(A)3W 8/19/87 (ug/l)	IA(A)4S 8/20/88 (mg/kg)	IA(A)4SA 5/31/88 (mg/kg)
Inorganics:											
Aluminum	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Antimony	17.1 U	NA	58.0 U	NA	NA	NA	38.7 U	NA	NA	16.1 U	NA
Arsenic	[1.4]N	NA	3.0 U	NA	NA	NA	2.0 U	NA	NA	0.8 U	NA
Barium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Beryllium	[0.2]N	NA	0.6 U	NA	NA	NA	0.4 U	NA	NA	0.2 U	NA
Cadmium	1.5 U	NA	5.0 U	NA	NA	NA	3.3 U	NA	NA	1.4 U	NA
Calcium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Chromium	12.9	NA	9.0 U	NA	NA	NA	22.7	NA	NA	11.4	NA
Cobalt	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Copper	8.5 N	NA	3.0 U	NA	NA	NA	[14.7]N	NA	NA	8.9	NA
Cyanide	0.1 U	NA	15.0	NA	NA	NA	0.3 U	NA	NA	0.1 U	NA
Iron	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Lead	25.9 N	NA	5.0 U	NA	NA	NA	42.0 N	NA	NA	51.1 N*S	NA
Magnesium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Manganese	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Mercury	0.1 U	NA	0.2 U	NA	NA	NA	0.3 U	NA	NA	0.1 U	NA
Nickel	[8.2]	NA	12.9 U	NA	NA	NA	[15.3]	NA	NA	[8.3]	NA
Potassium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Selenium	7.4 U	NA	5.0 U	NA	NA	NA	16.7 U	NA	NA	6.9 U	NA
Silver	2.9 U	NA	28.0 N	NA	NA	NA	6.7 U	NA	NA	3.1 U	NA
Sodium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Thallium	1.5 U	NA	5.0 U	NA	NA	NA	3.3 U	NA	NA	1.4 U	NA
Vanadium	NR	NA	NR	NA	NA	NA	NR	NA	NA	NR	NA
Zinc	25.3	NA	7.0 U	NA	NA	NA	25.3	NA	NA	33.1 N*	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)1S 8/19/87 (ug/kg)	IA(A)1SA 5/31/88 (ug/kg)	IA(A)1W 8/19/87 (ug/l)	IA(A)1WA 5/31/88 (ug/l)	IA(A)2S 8/20/87 (ug/kg)	IA(A)2W 8/19/87 (ug/l)	IA(A)3S 8/19/87 (ug/kg)	IA(A)3SA 5/31/88 (ug/kg)	IA(A)3W 8/19/87 (ug/l)	IA(A)4S 8/20/88 (ug/kg)	IA(A)4SA 5/31/88 (ug/kg)
Pesticides/PCBs:											
Aldrin		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1016		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1221		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1232		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1242		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1248		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1254		ND		ND	NA	NA		ND	NA		ND
AROCLOR-1260		ND		ND	NA	NA		ND	NA		ND
alpha-BHC		ND		ND	NA	NA		ND	NA		ND
beta-BHC		ND		ND	NA	NA		ND	NA		ND
delta-BHC		ND		ND	NA	NA		ND	NA		ND
gamma-BHC (Lindane)		ND		ND	NA	NA		ND	NA		ND
alpha-Chlordane		ND		ND	NA	NA		ND	NA		ND
gamma-Chlordane		ND		ND	NA	NA		ND	NA		ND
4,4'-DDD		ND		ND	NA	NA		ND	NA		ND
4,4'-DDE		ND		ND	NA	NA		ND	NA		ND
4,4'-DDT		ND		ND	NA	NA		ND	NA		ND
Dieldrin		ND		ND	NA	NA		ND	NA		ND
Endrin		ND		ND	NA	NA		ND	NA		ND
Endrin Ketone		ND		ND	NA	NA		ND	NA		ND
Endosulfan I		ND		ND	NA	NA		ND	NA		ND
Endosulfan II		ND		ND	NA	NA		ND	NA		ND
Endosulfan Sulfate		ND		ND	NA	NA		ND	NA		ND
Heptachlor		ND		ND	NA	NA		ND	NA		ND
Heptachlor Epoxide		ND		ND	NA	NA		ND	NA		ND
Methoxychlor		ND		ND	NA	NA		ND	NA		ND
Toxaphene		ND		ND	NA	NA		ND	NA		ND

! - Method blank noncompliance with NYSDEC clip
U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
NA - Not analyzed
ND - Not detected
blank space - Data is invalid

B - This flag is used when the the analyte is found in the blank as well as a sample.
* - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs
NR - Not required as an analyte by NYSDEC
[] - Indicates sample value is between IDL and CRDL.
- Indicates duplicate analysis was not within control limits.
S - Indicates value determined by the method of standard addition.

Table No. 3-2 (continued)

PARAMETERS	IA(A)5S 8/20/88 ! (ug/kg)	IA(A)5SA 6/1/88 * (ug/kg)	IA(A)5SAA 3/2/89 (ug/kg)	IA(A)6S 8/20/87 (ug/kg)	IA(A)7S 8/28/88 (ug/kg)	IA(A)8S 8/19/87 ! (ug/kg)	IA(A)8SA 5/31/88 (ug/kg)	IA(A)8W 8/19/87 ! (ug/l)	IA(A)8WA 5/31/88 (ug/l)	IA(A)9S 8/19/87 (ug/kg)	IA(A)9W 8/19/87 (ug/l)
Volatiles:											
Acetone	34.0 B	NA	NA	74.0 B	440.0 B	27.0 B	NA	20.0 B	NA	213.0 B	22.0 B
Benzene	ND	NA	NA	ND	6.0	ND	NA	ND	NA	ND	ND
Bromodichloromethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Bromoform	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Bromomethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
2-Butanone	4.0 J	NA	NA	9.0	21.0	6.0	NA	ND	NA	ND	3.7 J
Chlorobenzene	ND	NA	NA	ND	6.0	ND	NA	ND	NA	ND	ND
Carbon Disulfide	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Carbon Tetrachloride	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Chloroethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Chloroform	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Chloromethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Dibromochloromethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
1,1-Dichloroethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
1,2-Dichloroethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
1,1-Dichloroethylene	ND	NA	NA	ND	7.0	ND	NA	ND	NA	ND	ND
1,2-Dichloroethylene	ND	NA	NA	ND	ND	ND	NA	ND	NA	2.1 J	ND
1,2-Dichloropropane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
cis-1,3-Dichloropropene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
trans-1,3-Dichloropropene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Ethyl Benzene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
2-Hexanone	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Methylene Chloride	20.0 B	NA	NA	25.0 B	6.0 B	2.0 JB	NA	19.0 B	NA	19.0 B	28.0 B
4-Methyl-2-Pentanone	ND	NA	NA	ND	7.0	ND	NA	ND	NA	ND	ND
Styrene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
1,1,2,2-Tetrachloroethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Tetrachloroethylene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Toluene	ND	NA	NA	ND	9.0	ND	NA	ND	NA	11.0 B	ND
1,1,1-Trichloroethane	5.0	NA	NA	ND	5.0	ND	NA	ND	NA	ND	ND
1,1,2-Trichloroethane	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Trichloroethene	ND	NA	NA	ND	5.0	ND	NA	ND	NA	ND	ND
Vinyl Acetate	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Vinyl Chloride	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Total Xylenes	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Other:											
3-Methyl Phenol	9.0 J	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Phenol	10.0 J	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
1,1,2-Trichloro-1,2,2-Tri-fluoro-ethane	ND	NA	NA	ND	110.0 J	ND	NA	ND	NA	ND	ND
Thiobis Methane	ND	NA	NA	ND	ND	ND	NA	ND	NA	26.0 J	ND
Unknown (Total)	8.0 J	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND
Limonene	ND	NA	NA	ND	ND	ND	NA	ND	NA	ND	ND

Table No. 3-2 (continued)

PARAMETERS	IA(A)5S 8/20/88 ! (ug/kg)	IA(A)5SA 6/1/88 * (ug/kg)	IA(A)5SAA 3/2/89 (ug/kg)	IA(A)6S 8/20/87 (ug/kg)	IA(A)7S 8/20/88 (ug/kg)	IA(A)8S 8/19/87 ! (ug/kg)	IA(A)8SA 5/31/88 (ug/kg)	IA(A)8W 8/19/87 ! (ug/l)	IA(A)8WA 5/31/88 (ug/l)	IA(A)9S 8/19/87 (ug/kg)	IA(A)9W 8/19/87 (ug/l)
Semi-Volatiles:											
Acenaphthene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Acenaphthylene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Anthracene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benz(a)anthracene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzoic Acid	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzyl Alcohol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(k)fluoranthene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA	560.0	NA	9.3 J	NA	NA	NA
4-Bromophenyl phenyl ether	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Butyl benzyl phthalate	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Chloroaniline	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroethoxy) methane	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroethyl) ether	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroisopropyl) ether	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Chloro-3-methylphenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
(p-chloro-m-cresol)	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Chloronaphthalene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Chlorophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Chlorophenyl Phenyl Ether	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Chrysene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Dibenz(a,h)anthracene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Dibenzofuran	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Di-n-Butylphthalate	ND	NA	NA	NA	NA	ND	NA	3.0 J	NA	NA	NA
1,2-Dichlorobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
1,3-Dichlorobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
1,4-Dichlorobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
3,3'-Dichlorobenzidine	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4-Dichlorophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Diethylphthalate	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4-Dimethylphenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Dimethyl Phthalate	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4-Dinitrophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4-Dinitrotoluene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,6-Dinitrotoluene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Di-n-Octyl Phthalate	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
bis (2-ethylhexyl) phthalate	ND	NA	NA	NA	NA	ND	NA	6.7 J	NA	NA	NA
Fluoranthene	ND	NA	NA	NA	NA	780.0	NA	ND	NA	NA	NA
Fluorene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Hexachlorobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Hexachlorobutadiene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Hexachlorocyclopentadiene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Hexachloroethane	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)5S 8/20/88 ! (ug/kg)	IA(A)5SA 6/1/88 ! (ug/kg)	IA(A)5SAA 3/2/89 (ug/kg)	IA(A)6S 8/20/87 (ug/kg)	IA(A)7S 8/20/88 (ug/kg)	IA(A)8S 8/19/87 ! (ug/kg)	IA(A)8SA 5/31/88 (ug/kg)	IA(A)8W 8/19/87 ! (ug/l)	IA(A)8WA 5/31/88 (ug/l)	IA(A)9S 8/19/87 (ug/kg)	IA(A)9W 8/19/87 (ug/l)
Indeno(1,2,3-cd)pyrene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Isophorone	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Methylnaphthalene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Methyl Phenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Methyl Phenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Naphthalene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Nitroaniline	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
3-Nitroaniline	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Nitroaniline	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Nitrobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2-Nitrophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
4-Nitrophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
N-Nitroso-Diphenylamine	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
N-Nitroso-Dipropylamine	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Pentachlorophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Phenanthrene	ND	NA	NA	NA	NA	520.0 J	NA	ND	NA	NA	NA
Phenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Phenol (total)	ND	NA	NA	NA	NA	500.0	NA	ND	NA	NA	NA
Pyrene	ND	NA	NA	NA	NA	580.0	NA	ND	NA	NA	NA
1,2,4-Trichlorobenzene	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4,5-Trichlorophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
2,4,6-Trichlorophenol	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Other:											
2-Methyl Hexane	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
3-Hexene-2,5-Dione	1200.0 J	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Caffeine	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Unknown Carboxylic Acid (total)	ND	NA	NA	NA	NA	ND	NA	ND	NA	NA	NA
Unknown Alkane (total)	3400.0 J	NA	NA	NA	NA	17000 J	NA	ND	NA	NA	NA
Unknown Hydrocarbon	ND	NA	NA	NA	NA	ND	NA	130.0 J	NA	NA	NA
Unknown Ketone	ND	NA	NA	NA	NA	ND	NA	9.0 J	NA	NA	NA
Unknown (total)	75000 J	NA	NA	NA	NA	13000 J	NA	ND	NA	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)5S 8/20/88 ! (mg/kg)	IA(A)5SA 6/1/88 * (mg/kg)	IA(A)5SAA 3/2/89 (mg/kg)	IA(A)6S 8/20/87 (mg/kg)	IA(A)7S 8/20/88 (mg/kg)	IA(A)8S 8/19/87 ! (mg/kg)	IA(A)8SA 5/31/88 (mg/kg)	IA(A)8W 8/19/87 ! (ug/l)	IA(A)8WA 5/31/88 (ug/l)	IA(A)9S 8/19/87 (mg/kg)	IA(A)9W 8/19/87 (ug/l)
Aluminum	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Antimony	14.1 UN	NA	NA	NA	NA	15.7 U	NA	58.0 U	NA	NA	NA
Arsenic	0.9 N	NA	NA	NA	NA	0.8 U	NA	3.0 U	NA	NA	NA
Barium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Beryllium	0.1 UN	NA	NA	NA	NA	0.2 U	NA	0.6 U	NA	NA	NA
Cadmium	1.2 U	NA	NA	NA	NA	1.4 U	NA	5.0 U	NA	NA	NA
Calcium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Chromium	10.7	NA	NA	NA	NA	10.3	NA	9.0 U	NA	NA	NA
Cobalt	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Copper	28.5	NA	NA	NA	NA	22.7 N	NA	3.0 U	NA	NA	NA
Cyanide	0.1 U	NA	NA	NA	NA	0.1 U	NA	10.0 U	NA	NA	NA
Iron	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Lead	45.9 N	NA	NA	NA	NA	20.9 SN	NA	25.0 U	NA	NA	NA
Magnesium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Manganese	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Mercury	0.1 U	NA	NA	NA	NA	0.1 U	NA	0.2 U	NA	NA	NA
Nickel	13.7	NA	NA	NA	NA	[8.1]	NA	12.0 U	NA	NA	NA
Potassium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Selenium	6.1 UN	NA	NA	NA	NA	6.8 U	NA	5.0 U	NA	NA	NA
Silver	16.3 N	NA	NA	NA	NA	2.7 U	NA	28.0 N	NA	NA	NA
Sodium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Thallium	1.2 U	NA	NA	NA	NA	1.4 U	NA	5.0 U	NA	NA	NA
Vanadium	NR	NA	NA	NA	NA	NR	NA	NR	NA	NA	NA
Zinc	101.0 N	NA	NA	NA	NA	46.2	NA	7.0 U	NA	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)5S 8/20/88 ! (ug/kg)	IA(A)5SA 6/1/88 * (ug/kg)	IA(A)5SAA 3/2/89 (ug/kg)	IA(A)6S 8/20/87 (ug/kg)	IA(A)7S 8/20/88 (ug/kg)	IA(A)8S 8/19/87 ! (ug/kg)	IA(A)8SA 5/31/88 (ug/kg)	IA(A)8W 8/19/87 ! (ug/l)	IA(A)8WA 5/31/88 (ug/l)	IA(A)9S 8/19/87 (ug/kg)	IA(A)9W 8/19/87 (ug/l)
Pesticides/PCBs:											
Aldrin			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1016			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1221			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1232			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1242			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1248			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1254			ND	NA	NA		ND		ND	NA	NA
AROCLOR-1260			ND	NA	NA		ND		ND	NA	NA
alpha-BHC			ND	NA	NA		ND		ND	NA	NA
beta-BHC			ND	NA	NA		ND		ND	NA	NA
delta-BHC			ND	NA	NA		ND		ND	NA	NA
gamma-BHC (Lindane)			ND	NA	NA		ND		ND	NA	NA
alpha-Chlordane			ND	NA	NA		ND		ND	NA	NA
gamma-Chlordane			ND	NA	NA		ND		ND	NA	NA
4,4'-DDD			ND	NA	NA		ND		ND	NA	NA
4,4'-DDE			ND	NA	NA		ND		ND	NA	NA
4,4'-DDT			ND	NA	NA		ND		ND	NA	NA
Dieldrin			ND	NA	NA		ND		ND	NA	NA
Endrin			ND	NA	NA		ND		ND	NA	NA
Endrin Ketone			ND	NA	NA		ND		ND	NA	NA
Endosulfan I			ND	NA	NA		ND		ND	NA	NA
Endosulfan II			ND	NA	NA		ND		ND	NA	NA
Endosulfan Sulfate			ND	NA	NA		ND		ND	NA	NA
Heptachlor			ND	NA	NA		ND		ND	NA	NA
Heptachlor Epoxide			ND	NA	NA		ND		ND	NA	NA
Methoxychlor			ND	NA	NA		ND		ND	NA	NA
Toxaphene			ND	NA	NA		ND		ND	NA	NA

! - Method blank noncompliance with NYSDEC clip
U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
NA - Not analyzed
ND - Not detected
blank space - Data is invalid

B - This flag is used when the the analyte is found in the blank as well as a sample.
* - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs
NR - Not required as an analyte by NYSDEC
[] - Indicates sample value is between IDL and CRDL.
S - Indicates value was determined by the method of standard addition.

Table No. 3-2 (continued)

PARAMETERS	IA(A)14W 8/21/87 * (ug/l)		IA(A)14WA 6/2/88 * (ug/l)	IA(A)14WAA 3/3/89 (ug/l)
Volatiles:				
Acetone	4500.0		NA	NA
Benzene	ND		NA	NA
Bromodichloromethane	ND		NA	NA
Bromoform	ND		NA	NA
Bromomethane	ND		NA	NA
2-Butanone	ND		NA	NA
Chlorobenzene	ND		NA	NA
Carbon Disulfide	ND		NA	NA
Carbon Tetrachloride	ND		NA	NA
Chloroethane	ND		NA	NA
Chloroform	4.5	J	NA	NA
Chloromethane	ND		NA	NA
Dibromochloromethane	ND		NA	NA
1,1-Dichloroethane	ND		NA	NA
1,2-Dichloroethane	ND		NA	NA
1,1-Dichloroethylene	ND		NA	NA
1,2 Dichloroethylene	2.3	J	NA	NA
1,2-Dichloropropane	ND		NA	NA
cis-1,3-Dichloropropene	ND		NA	NA
trans-1,3-Dichloropropene	ND		NA	NA
Ethyl Benzene	ND		NA	NA
2-Hexanone	ND		NA	NA
Methylene Chloride	100.0	B	NA	NA
4-Methyl-2-Pentanone	ND		NA	NA
Styrene	ND		NA	NA
1,1,2,2-Tetrachloroethane	ND		NA	NA
Tetrachloroethylene	3.4	J	NA	NA
Toluene	ND		NA	NA
1,1,1-Trichloroethane	2.4	J	NA	NA
1,1,2-Trichloroethane	ND		NA	NA
Trichloroethene	3.4	J	NA	NA
Vinyl Acetate	ND		NA	NA
Vinyl Chloride	ND		NA	NA
Total Xylenes	ND		NA	NA
Other:				
3-Methyl Phenol	ND		NA	NA
Phenol	ND		NA	NA
1,1,2-Trichloro-1,2,2-Tri-fluoro-ethane	ND		NA	NA
Thiobis Methane	ND		NA	NA
Unknown (total)	ND		NA	NA
Limonene	2400.0	J	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)14W 8/21/87 ! (ug/l)	IA(A)14WA 6/2/88 * (ug/l)	IA(A)14WAA 3/3/89 (ug/l)
Semi-Volatiles:			
Acenaphthene	ND	NA	NA
Acenaphthylene	ND	NA	NA
Anthracene	ND	NA	NA
Benz(a)anthracene	ND	NA	NA
Benzoic Acid	ND	NA	NA
Benzyl Alcohol	ND	NA	NA
Benzo(b)fluoranthene	ND	NA	NA
Benzo(k)fluoranthene	ND	NA	NA
Benzo(g,h,i)perylene	ND	NA	NA
Benzo(a)pyrene	ND	NA	NA
4-Bromophenyl phenyl ether	ND	NA	NA
Butyl benzyl phthalate	ND	NA	NA
4-Chloroaniline	ND	NA	NA
bis (2-Chloroethoxy) methane	ND	NA	NA
bis (2-Chloroethyl) ether	ND	NA	NA
bis (2-Chloroisopropyl) ether	ND	NA	NA
4-Chloro-3-methylphenol	ND	NA	NA
(p-chloro-m-cresol)	ND	NA	NA
2-Chloronaphthalene	ND	NA	NA
2-Chlorophenol	ND	NA	NA
4-Chlorophenyl Phenyl Ether	ND	NA	NA
Chrysene	ND	NA	NA
Dibenz(a,h)anthracene	ND	NA	NA
Dibenzofuran	ND	NA	NA
Di-n-Butylphthalate	ND	NA	NA
1,2-Dichlorobenzene	ND	NA	NA
1,3-Dichlorobenzene	ND	NA	NA
1,4-Dichlorobenzene	ND	NA	NA
3,3'-Dichlorobenzidine	ND	NA	NA
2,4-Dichlorophenol	ND	NA	NA
Diethylphthalate	ND	NA	NA
2,4-Dimethylphenol	ND	NA	NA
Dimethyl Phthalate	ND	NA	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	NA
2,4-Dinitrophenol	ND	NA	NA
2,4-Dinitrotoluene	ND	NA	NA
2,6-Dinitrotoluene	ND	NA	NA
Di-n-Octyl Phthalate	ND	NA	NA
bis (2-ethylhexyl) phthalate	ND	NA	NA
Fluoranthene	ND	NA	NA
Fluorene	ND	NA	NA
Hexachlorobenzene	ND	NA	NA
Hexachlorobutadiene	ND	NA	NA
Hexachlorocyclopentadiene	ND	NA	NA
Hexachloroethane	ND	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)14W 8/21/87 ! (ug/l)	IA(A)14WA 6/7/88 * (ug/l)	IA(A)14WAA 3/3/89 (ug/l)
Indeno(1,2,3-cd)pyrene	ND	NA	NA
Isophorone	ND	NA	NA
2-Methylnaphthalene	ND	NA	NA
2-Methyl Phenol	ND	NA	NA
4-Methyl Phenol	240.0	NA	NA
Naphthalene	ND	NA	NA
2-Nitroaniline	ND	NA	NA
3-Nitroaniline	ND	NA	NA
4-Nitroaniline	ND	NA	NA
Nitrobenzene	ND	NA	NA
2-Nitrophenol	ND	NA	NA
4-Nitrophenol	ND	NA	NA
N-Nitroso-Diphenylamine	ND	NA	NA
N-Nitroso-Dipropylamine	ND	NA	NA
Pentachlorophenol	ND	NA	NA
Phenanthrene	ND	NA	NA
Phenol	ND	NA	NA
Phenol (total)	46.8	NA	NA
Pyrene	ND	NA	NA
1,2,4-Trichlorobenzene	ND	NA	NA
2,4,5-Trichlorophenol	ND	NA	NA
2,4,6-Trichlorophenol	ND	NA	NA
Other:			
2-Methyl Hexane	ND	NA	NA
3-Hexene-2,5-Dione	ND	NA	NA
Caffeine	90.0 J	NA	NA
Unknown Carboxylic Acid (total)	3800.0 J	NA	NA
Unknown Alkane (total)	ND	NA	NA
Unknown Hydrocarbon	ND	NA	NA
Unknown Ketone	ND	NA	NA
Unknown (total)	3200.0 J	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)14W 8/21/87 ! (ug/l)	IA(A)14WA 6/2/88 * (ug/l)	IA(A)14WAA 3/3/89 (ug/l)
Aluminum	NR	NA	NA
Antimony	132.0	NA	NA
Arsenic	15.0 UN	NA	NA
Barium	NR	NA	NA
Beryllium	0.6 U	NA	NA
Cadmium	17.0 N	NA	NA
Calcium	NR	NA	NA
Chromium	43.0	NA	NA
Cobalt	NR	NA	NA
Copper	1750.0	NA	NA
Cyanide	10.0 U	NA	NA
Iron	NR	NA	NA
Lead	5.0 UN	NA	NA
Magnesium	NR	NA	NA
Manganese	NR	NA	NA
Mercury	1.1 N	NA	NA
Nickel	[30.0]	NA	NA
Potassium	NR	NA	NA
Selenium	5.0 U	NA	NA
Silver	332.0 N	NA	NA
Sodium	NR	NA	NA
Thallium	5.0 UN	NA	NA
Vanadium	NR	NA	NA
Zinc	3003.0	NA	NA

Table No. 3-2 (continued)

PARAMETERS	IA(A)14W 8/21/87 ! (ug/l)	IA(A)14WA 6/2/88 * (ug/l)	IA(A)14WAA 3/3/89 (ug/l)
Pesticides/PCBs:			
Aldrin			ND
AROCLOR-1016			ND
AROCLOR-1221			ND
AROCLOR-1232			ND
AROCLOR-1242			ND
AROCLOR-1248			ND
AROCLOR-1254			ND
AROCLOR-1260			ND
alpha-BHC			ND
beta-BHC			ND
delta-BHC			ND
gamma-BHC (Lindane)			ND
alpha-Chlordane			ND
gamma-Chlordane			ND
4,4'-DDD			ND
4,4'-DDE			ND
4,4'-DDT			ND
Dieldrin			ND
Endrin			ND
Endrin Ketone			ND
Endosulfan I			ND
Endosulfan II			ND
Endosulfan Sulfate			ND
Heptachlor			ND
Heptachlor Epoxide			ND
Methoxychlor			ND
Toxaphene			ND

! - Method blank noncompliance with NYSDEC clip
U - Indicates compound was analyzed for but not detected.
Reported with the instrument detection limits
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
NA - Not analyzed
ND - Not detected
blank space - Data is invalid

Table No. 3-2 (continued)

PARAMETERS	Field Blank 8/19/87 (ug/l)	Trip Blank 8/19/87 (ug/l)	Field Blank 8/20/87 (ug/l)	Trip Blank 8/20/87 (ug/l)	Field Blank 8/21/87 (ug/l)	Trip Blank 8/21/87 (ug/l)	Field Blank 5/31/88 (ug/l)	Trip Blank 5/31/88 + (ug/l)	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)
Volatiles:										
Acetone	24.0	43.0	19.7	5.8 J	ND	4.0 B	NA			
Benzene	ND	ND	ND	ND	1.2 J	ND	NA			
Bromodichloromethane	ND	ND	ND	ND	ND	ND	NA			
Bromoform	ND	ND	ND	ND	ND	ND	NA			
Bromomethane	ND	ND	ND	ND	ND	ND	NA			
2-Butanone	ND	ND	ND	ND	19.7	ND	NA			
Chlorobenzene	ND	ND	ND	ND	ND	ND	NA			
Carbon Disulfide	ND	ND	ND	2.3 J	ND	ND	NA			
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	NA			
Chloroethane	ND	ND	ND	ND	ND	ND	NA			
Chloroform	ND	ND	ND	ND	ND	ND	NA			
Chloromethane	ND	ND	ND	ND	ND	ND	NA			
Dibromochloromethane	ND	ND	ND	ND	ND	ND	NA			
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	NA			
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	NA			
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	NA			
1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND	NA			
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	NA			
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NA			
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	NA			
Ethyl Benzene	ND	ND	ND	ND	ND	ND	NA			
2-Hexanone	ND	ND	ND	ND	ND	ND	NA			
Methylene Chloride	11.0 B	17.0 B	7.1 B	8.7 B	4.6 J	3.0 B	NA			
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	NA			
Styrene	ND	ND	ND	ND	ND	ND	NA			
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	NA			
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	NA			
Toluene	ND	ND	ND	ND	ND	ND	NA			
1,1,1-Trichloroethane	ND	ND	ND	ND	2.2 J	ND	NA			
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	NA			
Trichloroethene	ND	ND	ND	ND	ND	ND	NA			
Vinyl Acetate	ND	ND	ND	ND	ND	ND	NA			
Vinyl Chloride	ND	ND	ND	ND	ND	ND	NA			
Total Xylenes	ND	ND	ND	ND	ND	ND	NA			
Other:										
Unknown Alkane	ND	ND	ND	ND	ND	ND	NA			

Table No. 3-2 (continued)

PARAMETERS	Field Blank 8/19/87 (ug/l)	Trip Blank 8/19/87 (ug/l)	Field Blank 8/20/87 (ug/l)	Trip Blank 8/20/87 (ug/l)	Field Blank 8/21/87 (ug/l)	Trip Blank 8/21/87 (ug/l)	Field Blank 5/31/88 (ug/l)	Trip Blank 5/31/88 (ug/l)	Field Blank 6/1/88 (ug/l)	Trip Blank 6/1/88 (ug/l)
Semi-Volatiles:										
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Bromophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
bis (2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
bis (2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
bis (2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
(p-chloro-m-cresol)	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Chlorophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4,6-Dinitro-2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Di-n-Octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
bis (2-ethylhexyl) Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA

Table No. 3-2 (continued)

PARAMETERS	Field Blank 8/19/87 (ug/l)	Trip Blank 8/19/87 (ug/l)	Field Blank 8/20/87 (ug/l)	Trip Blank 8/20/87 (ug/l)	Field Blank 8/21/87 (ug/l)	Trip Blank 8/21/87 (ug/l)	Field Blank 5/31/88 (ug/l)	Trip Blank 5/31/88 (ug/l)	Field Blank 6/1/88 (ug/l)	Trip Blank 6/1/88 (ug/l)
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
N-Nitroso-Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
N-Nitroso-Dipropylamine	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Phenol (total)	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA

Other:

Table No. 3-2 (continued)

PARAMETERS	Field Blank 8/19/87 (ug/l)	Trip Blank 8/19/87 (ug/l)	Field Blank 8/20/87 (ug/l)	Trip Blank 8/20/87 (ug/l)	Field Blank 8/21/87 (ug/l)	Trip Blank 8/21/87 (ug/l)	Field Blank 5/31/88 (ug/l)	Trip Blank 5/31/88 (ug/l)	Field Blank 6/1/88 (ug/l)	Trip Blank 6/1/88 (ug/l)
Inorganics:										
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	60.0 U	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	60.0 U	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	3.0 U	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	25.0 U	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	5.0 U	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	600.0 U	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	10.0 U	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	15.0 U	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	10.0 U	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	10.0 U	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	[75.0]	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	[1.9]	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	900.0 U	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	2.0 U	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	15.0 U	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	1300.0 U	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	2.0 U	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	10.0 U	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	70.0 U	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	2.0 U	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	10.0 U	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	47.0	NA

Table No. 3-2 (continued)

PARAMETERS	Field Blank 8/19/87 (ug/l)	Trip Blank 8/19/87 (ug/l)	Field Blank 8/20/87 (ug/l)	Trip Blank 8/20/87 (ug/l)	Field Blank 8/21/87 (ug/l)	Trip Blank 8/21/87 (ug/l)	Field Blank 5/31/88 (ug/l)	Trip Blank 5/31/88 (ug/l)	Field Blank 6/1/88 (ug/l)	Trip Blank 6/1/88 (ug/l)
Pesticides/PCBs:										
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1016	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1221	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1232	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1242	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1248	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1254	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
AROCLOR-1260	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Endrin Ketone	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Endosulfan Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA

U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - The analyte was found in the method blank as well as a sample.
[] - Indicates sample value is between IDL and CRDL.
* - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs.
+ - Holding time exceeded for volatiles.
NR - Not required as an analyte by NYSDEC
! Method blank noncompliance with NYSDEC clp
NA - Not analyzed
ND - Not detected
blank space - Data is invalid

Table No. 3 2 (continued)

PARAMETERS	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/3/89 (ug/l)	Trip Blank 3/3/89 (ug/l)
Volatiles:						
Acetone			13.0	ND	ND	ND
Benzene			ND	ND	ND	ND
Bromodichloromethane			ND	ND	ND	ND
Bromoform			ND	ND	ND	ND
Bromomethane			ND	ND	ND	ND
2-Butanone			ND	ND	ND	ND
Chlorobenzene			ND	ND	ND	ND
Carbon Disulfide			ND	ND	ND	ND
Carbon Tetrachloride			ND	ND	ND	ND
Chloroethane			ND	ND	ND	ND
Chloroform			ND	ND	ND	ND
Chloromethane			ND	ND	ND	ND
Dibromochloromethane			ND	ND	ND	ND
1,1-Dichloroethane			ND	ND	ND	ND
1,2-Dichloroethane			ND	ND	ND	ND
1,1-Dichloroethylene			ND	ND	ND	ND
1,2-Dichloroethylene			ND	ND	ND	ND
1,2-Dichloropropane			ND	ND	ND	ND
cis-1,3-Dichloropropene			ND	ND	ND	ND
trans-1,3-Dichloropropene			ND	ND	ND	ND
Ethyl Benzene			ND	ND	ND	ND
2-Hexanone			ND	ND	ND	ND
Methylene Chloride			ND	ND	ND	3.0 J
4-Methyl-2-Pentanone			ND	ND	ND	ND
Styrene			ND	ND	ND	ND
1,1,2,2-Tetrachloroethane			ND	ND	ND	ND
Tetrachloroethylene			ND	ND	ND	ND
Toluene			ND	ND	ND	ND
1,1,1-Trichloroethane			ND	ND	ND	ND
1,1,2-Trichloroethane			ND	ND	ND	ND
Trichloroethene			ND	2.0 J	ND	ND
Vinyl Acetate			ND	ND	ND	ND
Vinyl Chloride			ND	ND	ND	ND
Total Xylenes			ND	ND	ND	ND
Other:						
Unknown Alkane			ND	ND	ND	ND

Table No. 3-2 (continued)

PARAMETERS	Field Blank 6/2/88 (ug/l)	Trip Blank 6/2/88 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/3/89 (ug/l)	Trip Blank 3/3/89 (ug/l)
Semi-Volatiles:						
Acenaphthene	ND	NA	NA	NA	NA	NA
Acenaphthylene	ND	NA	NA	NA	NA	NA
Anthracene	ND	NA	NA	NA	NA	NA
Benzo(a)anthracene	ND	NA	NA	NA	NA	NA
Benzoic Acid	ND	NA	NA	NA	NA	NA
Benzyl Alcohol	ND	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	ND	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	ND	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	ND	NA	NA	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	ND	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	ND	NA	NA	NA	NA	NA
4-Chloroaniline	ND	NA	NA	NA	NA	NA
bis (2-Chloroethoxy) methane	ND	NA	NA	NA	NA	NA
bis (2-Chloroethyl) ether	ND	NA	NA	NA	NA	NA
bis (2-Chloroisopropyl) ether	ND	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol (p-chloro-m-cresol)	ND	NA	NA	NA	NA	NA
	ND	NA	NA	NA	NA	NA
2-Chloronaphthalene	ND	NA	NA	NA	NA	NA
2-Chlorophenol	ND	NA	NA	NA	NA	NA
4 Chlorophenyl Phenyl Ether	ND	NA	NA	NA	NA	NA
Chrysene	ND	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	ND	NA	NA	NA	NA	NA
Dibenzofuran	ND	NA	NA	NA	NA	NA
Di-n-butylphthalate	ND	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	ND	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	ND	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	ND	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	ND	NA	NA	NA	NA	NA
2,4-Dichlorophenol	ND	NA	NA	NA	NA	NA
Diethylphthalate	ND	NA	NA	NA	NA	NA
2,4-Dimethylphenol	ND	NA	NA	NA	NA	NA
Dimethyl Phthalate	ND	NA	NA	NA	NA	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	NA	NA	NA	NA
2,4-Dinitrophenol	ND	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	ND	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	ND	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	ND	NA	NA	NA	NA	NA
bis (2-ethylhexyl) Phthalate	ND	NA	NA	NA	NA	NA
Fluoranthene	ND	NA	NA	NA	NA	NA
Fluorene	ND	NA	NA	NA	NA	NA
Hexachlorobenzene	ND	NA	NA	NA	NA	NA
Hexachlorobutadiene	ND	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	ND	NA	NA	NA	NA	NA
Hexachloroethane	ND	NA	NA	NA	NA	NA

Table No. 5-2 (continued)

PARAMETERS	Field Blank 6/2/88 (ug/l)	Trip Blank 6/2/88 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)	Field Blank 3/3/89 (ug/l)	Trip Blank 3/3/89 (ug/l)
Indeno(1,2,3-cd)pyrene	ND	NA	NA	NA	NA	NA
Isophorone	ND	NA	NA	NA	NA	NA
2-Methylnaphthalene	ND	NA	NA	NA	NA	NA
2-Methyl Phenol	ND	NA	NA	NA	NA	NA
4-Methyl Phenol	ND	NA	NA	NA	NA	NA
Naphthalene	ND	NA	NA	NA	NA	NA
2-Nitroaniline	ND	NA	NA	NA	NA	NA
3-Nitroaniline	ND	NA	NA	NA	NA	NA
4-Nitroaniline	ND	NA	NA	NA	NA	NA
Nitrobenzene	ND	NA	NA	NA	NA	NA
2-Nitrophenol	ND	NA	NA	NA	NA	NA
4-Nitrophenol	ND	NA	NA	NA	NA	NA
N-Nitroso-Diphenylamine	ND	NA	NA	NA	NA	NA
N-Nitroso-Dipropylamine	ND	NA	NA	NA	NA	NA
Pentachlorophenol	ND	NA	NA	NA	NA	NA
Phenanthrene	ND	NA	NA	NA	NA	NA
Phenol	ND	NA	NA	NA	NA	NA
Phenol (total)	ND	NA	NA	NA	NA	NA
Pyrene	ND	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	ND	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	ND	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	ND	NA	NA	NA	NA	NA

Other:

Table No. 3-2 (continued)

PARAMETERS	Field Blank 6/2/88 (ug/l)	Trip Blank 6/2/88 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)	Field Blank 3/3/89 (ug/l)	Trip Blank 3/3/89 (ug/l)
Inorganics:						
Aluminum	40.0 U	NA	NA	NA	NA	NA
Antimony	60.0 U	NA	NA	NA	NA	NA
Arsenic	5.0 U	NA	NA	NA	NA	NA
Barium	25.0 U	NA	NA	NA	NA	NA
Beryllium	0.5 U	NA	NA	NA	NA	NA
Cadmium	5.0 U	NA	NA	NA	NA	NA
Calcium	600.0 U	NA	NA	NA	NA	NA
Chromium	27.0	NA	NA	NA	NA	NA
Cobalt	15.0 U	NA	NA	NA	NA	NA
Copper	10.0 U	NA	NA	NA	NA	NA
Cyanide	10.0 U	NA	NA	NA	NA	NA
Iron	50.0 U	NA	NA	NA	NA	NA
Lead	[1.4]	NA	NA	NA	NA	NA
Magnesium	900.0 U	NA	NA	NA	NA	NA
Manganese	2.0 U	NA	NA	NA	NA	NA
Mercury	0.2 U	NA	NA	NA	NA	NA
Nickel	15.0 U	NA	NA	NA	NA	NA
Potassium	1300.0 U	NA	NA	NA	NA	NA
Selenium	2.0 U	NA	NA	NA	NA	NA
Silver	10.0 U	NA	NA	NA	NA	NA
Sodium	70.0 U	NA	NA	NA	NA	NA
Thallium	2.0 U	NA	NA	NA	NA	NA
Vanadium	10.0 U	NA	NA	NA	NA	NA
Zinc	[17.0]	NA	NA	NA	NA	NA

Table No. 3-2 (continued)

PARAMETERS	Field Blank 6/2/88 (ug/l)	Trip Blank 6/2/88 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)	Field Blank 3/3/89 (ug/l)	Trip Blank 3/3/89 (ug/l)
Pesticides/PCBs:						
Aldrin	ND	NA	NA	NA	NA	ND
AROCLOR-1016	ND	NA	NA	NA	NA	ND
AROCLOR-1221	ND	NA	NA	NA	NA	ND
AROCLOR-1232	ND	NA	NA	NA	NA	ND
AROCLOR-1242	ND	NA	NA	NA	NA	ND
AROCLOR-1248	ND	NA	NA	NA	NA	ND
AROCLOR 1254	ND	NA	NA	NA	NA	ND
AROCLOR 1260	ND	NA	NA	NA	NA	ND
alpha-BHC	ND	NA	NA	NA	NA	ND
beta-BHC	ND	NA	NA	NA	NA	ND
delta-BHC	ND	NA	NA	NA	NA	ND
gamma-BHC (Lindane)	ND	NA	NA	NA	NA	ND
alpha-Chlordane	ND	NA	NA	NA	NA	ND
gamma-Chlordane	ND	NA	NA	NA	NA	ND
4,4'-DDD	ND	NA	NA	NA	NA	ND
4,4'-DDE	ND	NA	NA	NA	NA	ND
4,4'-DDT	ND	NA	NA	NA	NA	ND
Dieldrin	ND	NA	NA	NA	NA	ND
Endrin	ND	NA	NA	NA	NA	ND
Endrin Ketone	ND	NA	NA	NA	NA	ND
Endosulfan I	ND	NA	NA	NA	NA	ND
Endosulfan II	ND	NA	NA	NA	NA	ND
Endosulfan Sulfate	ND	NA	NA	NA	NA	ND
Heptachlor	ND	NA	NA	NA	NA	ND
Heptachlor Epoxide	ND	NA	NA	NA	NA	ND
Methoxychlor	ND	NA	NA	NA	NA	ND
Toxaphene	ND	NA	NA	NA	NA	ND

U - Indicates compound was analyzed for but not detected.
Reported with the instrument detection limits
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - The analyte was found in the method blank as well as a sample.
[] - Indicates sample value is between IDL and CRDL.
* - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs.
\+ - Holding time exceeded for volatiles.
NR - Not required as an analyte by NYSDEC
! - Method blank noncompliance with NYSDEC clip
NA - Not analyzed
ND - Not detected
blank space - Data is invalid

In addition, several sample results show the presence of unknown isomers and "other" compounds. These compounds are listed in the table and presented in the text; however, identification and determination of the exact levels of the compounds, as well as a discussion of their presence and extent of contamination, is not definable within the context of this program and is not included in the discussion.

3.2.1 Potential Source Investigation (Septic Tank)

As previously discussed, as a result of past disposal practices at a former dry cleaning establishment located in the Shopping Arcade, provision was made in the Phase IA sampling program to obtain up to six liquid matrix (septic tank effluent) samples from the leaching pools of the subsurface disposal system at the Arcade and two solid matrix (septic tank sludge) samples from the septic tank of the subsurface wastewater disposal system at the Arcade. Subsequent to the approval of the Bedford Village Wells RI/FS contract and during the preparation of the Remedial Investigation Work Plan, it was learned that a leaching/tile field system rather than leaching pools is utilized for the subsurface disposal of wastewater from the Arcade.

Since there were no leaching pools, it was not possible to obtain septic tank effluent samples from those units. However, in consultation with the NYSDEC Region-3 Field Supervisor, it was determined that it would be appropriate to obtain one liquid matrix sample from the effluent pump chamber of the septic tank. It is this liquid which is pumped to the leaching lines and would be representative of an effluent sample. An attempt was also made to obtain a sludge sample from the septic tank serving the Shopping Arcade; however, sludge was not found in the system.

3.2.1.1 Organic Sampling Results

The analytical results of sample IA(A)14W from the Shopping Arcade septic tank showed that the following organic compounds were detected: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and renalyzed and only these valid analytical results are presented.)

Analytes of Concern	Concentration (ug/l)
Tetrachloroethene	3.4 J
Trichloroethene	3.4 J
Trans-1,2-dichloroethene	2.3 J
1,1,1,-Trichloroethane	2.4 J

Other Compounds	Concentration (ug/l)
Acetone	4,500.0
Chloroform	4.5 J
Phenol (total)	46.8
Methylene chloride	100.0 B
Limonene	2,400.0 J
4-Methyl phenol	240.0
Caffeine	90.0 J
Unknown carboxylic acid (total)	3,800.0 J
Unknown (total)	3,200.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

It should be noted that the compounds bis(2-ethylhexyl)phthalate and methylene chloride, as well as acetone, chloroform, carbon disulfide, 1,1,2-trichloro-1,2,2-trifluoroethane (freon) di-n-butylphthalate and a number of polynuclear aromatic hydrocarbons, including phenanthrene, were often (if not always as in the case of methylene chloride) found in trip blanks and field blanks as well as method blanks and are most likely laboratory contaminants. As such, these compounds will not be specifically addressed (only listed) hereinafter in this section or in the discussion of the analytical results in Section 6.0.

3.2.1.2 Inorganic Sampling Results

Inorganic analyses conducted on the sample number IA(A)14W liquid matrix (effluent) colleted from the septic tank serving the Shopping Arcade showed that the following metals were detected:

Metals	Concentration (ug/l)
Antimony	139.0
Chromium	43.0
Copper	1,750.0
Mercury	1.1 N
Nickel	[30.0]
Silver	332.0 N
Zinc	3,003.0

"N" indicates spike sample recovery was not within control limits.
"[ ]" indicates the reported value is between the Contract Required Detection Limit (CRDL) and Instrument Detection Limit (IDL).

3.2.2 Stormwater Drainage System Sediment Investigation

The Phase IA drainage system sediment investigation was comprised of four sampling locations. The first location is on Route 22 directly in front of the Shopping Arcade building at the catch basin of the stormwater drainage system. The second location is the catch basin located at the intersection of Court Road and Route 22. The third location is at the point where the stormwater conduit discharges to the drainage ditch along and on the north side of Court Road, and the last location is at the point where the drainage ditch merges with outlet from the pond which flows under Court Road.

3.2.2.1 Organic Sampling Results

Sediment sample number IA(A)05S, collected from the primary catch basin of the drainage system in front of the Shopping Arcade contained the following organic compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Analytes of Concern	Concentration (ug/kg)
1,1,1-Trichloroethane	5.0

Other Compounds	Concentration (ug/kg)
Acetone	34.0 B
2-Butanone	4.0 J
Methylene chloride	20.0 B
3-Methyl phenol	9.0 J
Phenol	10.0 J
3-Hexene-2,5-dione	1,200.0 J
Unknown alkane	3,400.0 J
Unknown (total)	75,000.0 J

"J" indicates estimated value.
"B" indicates that the compound was found in the method blank.

Sediment sample number IA(A)07S collected from the stormwater drainage system catch basin at the intersection of Court Road and Route 22 contained:

Analytes of Concern	Concentration (ug/kg)
Trichloroethene	5.0
1,1-Dichloroethene	7.0
1,1,1-Trichloroethane	5.0
Benzene	6.0
Toluene	9.0

Other Compounds	Concentration (ug/kg)
Acetone	440.0 B
2-Butanone	21.0
Chlorobenzene	6.0
Methylene chloride	6.0 B
4-Methyl-2-pentanone	7.0
1,1,2-Trichloro-1,2,2-trifluoroethane	110.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Organic analyses of sample number IA(A)06S collected from the drainage ditch along Court Road revealed the detection of the following organic compounds, none of which were the analytes of concern:

Compound	Concentration (ug/kg)
Acetone	74.0 B
2-Butanone	9.0
Methylene chloride	25.0 B

"B" indicates compound found in method blank.

Organic analyses of sample number IA(A)04S collected at the point where the stormwater drainage ditch merges with the outlet from the pond on the north side of Court Road contained the following organic compounds, again none of which were analytes of concern: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/kg)
Acetone	156.0
2-Butanone	16.0
Pyrene	1,300.0
Benzo(k)fluoranthene	930.0
Benzo(a)anthracene	530.0 J
Fluoranthene	922.0
Chrysene	690.0
Benzo(b)fluoranthene	690.0
Di-n-butylphthalate	660.0 B
Butyl benzyl phthalate	660.0
Phenanthrene	280.0 B
Methylene chloride	38.0 B
Bis(2-ethylhexyl)phthalate	440.0 B
4-Hydroxy-4-methyl-2-pentanone	16,000.0 J
Hexane, 2-methyl	3,700.0 J
3-Hexane-2,5-dione	3,700.0 J
Isomer of dimethyl benzene	6,000.0 J

Unknown alkane (total)	16,000.0 J
Unknown (total)	76,000.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

As can be seen from the results above, sample IA(A)04S contained high levels of certain polynuclear aromatic hydrocarbons (PAHs) and a number of phthalate based compounds. The analytical laboratory noted that the phthalate compounds were detected in the method blanks utilized in the laboratory quality control program and is a laboratory derived contaminant. In addition, the PAH phenanthrene was also detected in the method blank. The remaining PAH compounds are coal tar based and most likely the result of runoff from tar or asphalt applied to the street surface.

3.2.2.2 Inorganic Sampling Results

Inorganic analyses were conducted on one sample collected from the drainage system in the Shopping Arcade Study Area. Sediment sample number IA(A)5S, collected from the primary catch basin located on Route 22 in front of the Shopping Arcade contained the following inorganic chemicals:

Constituent	Concentration (mg/kg)
Arsenic	0.9 N
Chromium	10.7
Copper	28.5
Lead	45.9 N
Nickel	13.7
Silver	16.3 N
Zinc	101.0 N

Sediment sample number IA(A)04S, collected at the point where the stormwater drainage ditch merges with the outlet from the pond on the north side of Court Road, contained the following inorganic chemicals:

Constituent	Concentration (mg/kg)
Chromium	11.4
Copper	8.9
Lead	51.1 SN#
Nickel	[8.3]
Zinc	33.1 N#

"S" indicates a value was determined by MSA.
"N" indicates spike sample recovery was not within control limits.
"#" indicates duplicate analysis was not within control limits.
"[ ]" indicates the reported value is between the CRDL and IDL.

3.2.3 Surface Water Investigation (Wetlands/Ponds)

For the purposes of this discussion, the Phase IA surface water investigation in the Shopping Arcade Study Area will begin with sample number IA(A)02W which is located at the inlet of the pond immediately south of Court Road. This pond is the first naturally occurring surface water body located downstream of the Shopping Arcade and receives a portion of the stormwater flow generated from within the study area of the Arcade. This surface water sampling location represents the first of four downstream surface water sampling locations. These include sample number IA(A)01W located at the inlet to Long Pond, sample number IA(A)08W located at the confluence of the Mianus River and the outlet from the wetland/pond system in the Shopping Arcade Study Area and sample number IA(A)09W located in the Mianus River at Middle Patent Road. One additional surface water sample number, IA(M)08W, was obtained from the Mianus River at a point approximately 400 feet east of the intersection of Greenwich Road and Millbrook Road in the Hunting Ridge Mall Study Area. This sample location was selected as a background location and will be discussed as part of Section 3.2.5 Background/Control Sampling Points along with the surface water sample [IA(A)03W] collected at the outlet from the pond north of Court Road.

3.2.3.1 Organic Sampling Results

None of the surface water samples collected as part of the Shopping Arcade Study Area immediately south of Court Road [IA(A)01W, IA(A)02W, IA(A)08W] and in the Mianus River near Middle Patent Road [IA(A)09W] contained the analytes of concern. Acetone and methylene chloride were found in field, trip and method blanks and considered laboratory contaminants, as well as di-n-butylphthalate and bis(2-ethylhexyl)phthalate which were found in method blanks.

Surface water sample IA(A)01W contained the following organic compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Acetone	6.0 B
Methylene chloride	1.2 JB
2-Cyclohexene-1-one	9.0 J
Unknown (total)	120.0 J

Surface water sample IA(A)02W contained the following organic compounds:

Compound	Concentration (ug/l)
Acetone	21.0 B
2-Butanone	2.9 J
Methylene chloride	8.4 B
Nonanal	7.0 J

Surface water sample IA(A)08W contained the following organic compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Acetone	20.0 B
Methylene chloride	19.0 B
Benzo(a)pyrene	9.3 J
Di-n-butylphthalate	3.0 J
Bis(2-ethylhexyl)phthalate	6.7 J
Unknown hydrocarbon	130.0 J
Unknown ketone	9.0 J

Surface water sample IA(A)09W obtained from the Mianus River at Middle Patent Road contained the following organic compounds:

Compound	Concentration (ug/l)
Acetone	22.0 B
2-Butanone	3.7 J
Methylene chloride	28.0 B

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.2.3.2 Inorganic Sampling Results

Of the surface water samples collected as part of the Shopping Arcade Study Area [IA(A)01W, IA(A)02W, IA(A)08W and IA(A)09W], only IA(A)01W and IA(A)08W were analyzed for inorganic analytes.

Surface water sample IA(A)01W contained the following inorganic constituents:

Constituent	Concentration (ug/l)
Cyanide	15.0
Silver	28.0 N

"N" indicates spike sample recovery was not within control limits.

Surface water sample IA(A)08W contained only the following metal:

Metal	Concentration (ug/l)
Silver	28.0 N

"N" indicates spike sample recovery was not within control limits.

3.2.4 Surface Water Sediment Investigation (Wetlands/Ponds)

The Phase IA sediment investigation (Wetlands/Ponds) in the Shopping Arcade Study Area consisted of sediment samples collected from naturally occurring wetlands and ponds located to the east of and draining the study area and from the Mianus River.

3.2.4.1 Organic Sampling Results

Organic analysis of sediment sample number IA(A)02S collected from the head of the pond immediately south of Court Road showed that the following organic compounds were detected, none of which were analytes of concern:

Compound	Concentration (ug/kg)
Acetone	220.0 B
2-Butanone	45.0
Methylene chloride	32.0 B

"B" indicates compound found in method blank.

Sediment sample number IA(A)01S was collected at the inlet to Long Pond and contained the following organic compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Analytes of Concern	Concentration (ug/kg)
Benzene	2.0 J

Other Compounds	Concentration (ug/kg)
Acetone	57.0 B
Methylene chloride	25.0 B
2,4-Dimethyl phenol	470.0 J
2-Methyl phenol	110.0 J
1,2-Benzenedicarboxylic acid dibutyl ester	1,500.0 J
Ethanone, 1-(2-furanyl)	34.0 J

2-Methoxy phenol	160.0 J
Unknown alcohol	36.0 J
Unknown alkane (total)	38,000.0 J
Unknown (total)	72,105.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Sample number IA(A)08S was collected at the confluence of the Mianus River and the outlet from Long Pond. It contained the following organic constituents, none of which were analytes of concern. (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/kg)
Acetone	27.0 B
2-Butanone	6.0
Methylene chloride	2.0 JB
Fluoranthene	780.0
Phenanthrene	520.0 J
Benzo(a)pyrene	560.0
Phenol (total)	500.0
Pyrene	580.0
Unknown alkane	17,000.0 J
Unknown (total)	13,000.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Sample number IA(A)09S collected from the Mianus River at Middle Patent Road contained the following organic compounds:

Analytes of Concern	Concentration (ug/kg)
Trans-1,2-dichloroethene	2.1 J
Toluene	11.0 B

Other Compounds	Concentration (ug/kg)
Acetone	213.0 B
Methylene chloride	19.0 B
Thiobis methane	26.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.2.4.2 Inorganic Sampling Results

Inorganic analysis was not conducted on the solid matrix (sediment) sample number IA(A)02S collected from the inlet to the Pond immediately south of Court Road. However, inorganic analysis was conducted on sample number IA(A)01S which was found to contain the following inorganic constituents:

Constituent	Concentration (mg/kg)
Arsenic	[1.4] N
Beryllium	[0.2] N
Chromium	12.9
Copper	8.5 N
Lead	25.9 N
Nickel	[8.2]
Zinc	25.3

"N" indicates spike sample recovery was not within control limits.
"[ ]" indicates the reported value is between the CRDL and IDL.

Sediment sample number IA(A)08S, collected at the confluence of the Mianus River and the outlet from Long Pond, contained the following inorganic constituents:

Constituent	Concentration (mg/kg)
Chromium	10.3
Copper	22.7 N
Lead	20.9 SN
Nickel	[8.1]
Zinc	46.2

"S" indicates a value was determined by MSA.
"N" indicates spike sample recovery was not within control limits.
"[ ]" indicates the reported value is between the CRDL and IDL.

3.2.5 Background/Control Sampling Points

3.2.5.1 Organic Sampling Results

As described above, the stormwater drainage system of the Shopping Arcade originates in the vicinity of the Arcade and discharges to the pond/wetland system east of the Arcade and subsequently to the Mianus River. A background/control sampling point was located upstream in the Mianus River at a point in the river approximately 400 feet east of the intersection of Greenwich Road and Millbrook Road. This sample location is identified as IA(M)08S and IA(M)08W and analytical results indicate non-detectable concentrations of the analytes of concern.

Although analytes of concern were not detected, the following organic compounds were found in sample number IA(M)08S.

Compound	Concentration (ug/kg)
Acetone	200.0 B
2-Butanone	39.0
Methylene chloride	5.0 B

"B" indicates compound found in method blank.

In addition, although analytes of concern were not found in sample number IA(M)08W, the following organic compounds were detected:

Compound	Concentration (ug/l)
Acetone	19.0 B
2-Butanone	4.3 J
Methylene chloride	28.0 B
Hexane	4.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

During the Phase IIB well drilling program, a background groundwater monitoring well was installed upgradient of the sanitary system behind the Shopping Arcade. The purpose of this well and the analytical results obtained from groundwater samples obtained from this location will help determine whether the Arcade is a potential source of surface water, sediment and/or ground water contamination found in the downgradient/downstream portions of the Shopping Arcade Study Area.

In addition to the background samples discussed above, a background sample was originally planned to be collected from the inlet to the Pond located north of Court Road (sample number IA[A]03W and IA[A]03S). However, upon field inspection of the proposed sampling point, it was observed that in a distinct inlet to the pond was not present. Discussions with a few local residents indicated that the pond was most probably "spring" fed. As a result, the background sampling point was relocated to the mouth of the outlet of the pond.

The sediment sample from this location, sample number IA(A)03S, contained the following compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Analytes of Concern	Concentration (ug/kg)
1,1,1-Trichloroethane	11.0
Benzene	3.0 J

Other Compounds	Concentration (ug/kg)
Acetone	1,500.0 B
Methylene chloride	140.0
2-Butanone	150.0
2-Methyl phenol	900.0 J
4-Methyl phenol	250.0 J
Phenol	540.0 J
2-Methoxy phenol	2,900.0 J
Phenol (total)	700.0
Unknown alcohol	570.0 J
1,2-Benzenedicarboxylic acid bis (methyl propyl) ester 278	6,000.0 J
Heptane,2,6-dimethyl	7,400.0 J
Pentane,2-methyl	5,800.0 J
Sulfur, mol.	4,200.0 J
Unknown alkane (total)	95,000.0 J
Unknown (total)	210,000.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Organic analysis of sample number IA(A)03W showed that the following compounds were detected, none of which were analytes of concern:

Compound	Concentration (ug/l)
Acetone	27.0 B
Methylene chloride	28.0 B
Unknown (total)	14.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.2.5.2 Inorganic Sampling Results

Inorganic analysis conducted on sample number IA(A)03S detected the metals listed below:

Metal	Concentration (mg/kg)
Chromium	22.7
Copper	[14.7] N
Lead	42.0 N
Nickel	[15.3]
Zinc	25.3

"N" indicates spiked sample recovery was not within control limits.
"[]" indicates sample value is between IDL and CRDL.

3.3 Description of the Phase IB Sampling Program

This section presents in detailed narrative and tabular format the specific components and associated activities of the Phase IB sampling program. The data collected from this phase of the sampling program assisted in determining the design of the IIB component of the Remedial Investigation.

The objective of the second phase (Phase IB) of the source/surficial sampling program was to provide additional data regarding the source and extent of contamination within the study area. Some of the locations sampled in the first phase of sampling (Phase IA) exhibited elevated concentrations of contaminants. It was the purpose of the Phase IA investigation to sample a broad range of locations to make an initial determination of contamination location, type and concentration. Based on that analytical data, Phase IB was designed to target these locations and additional locations to provide confirmatory data.

Environmental sampling was undertaken at the following general locations:

- o Septic tank (sludge)
- o Stormwater drainage system sediment
- o Surface water sediment (wetlands and ponds)
- o Soil (sanitary leaching field)

3.3.1 Sample Collection Methods

Methods for collection, preservation and handling of sediment and sludge, and surface water and supernatant in the Phase IB sampling program and decontamination of sampling equipment are the same as those described for the Phase IA program in Section 3.1.1.

3.3.2 Selection of Sampling Locations and Sample Points

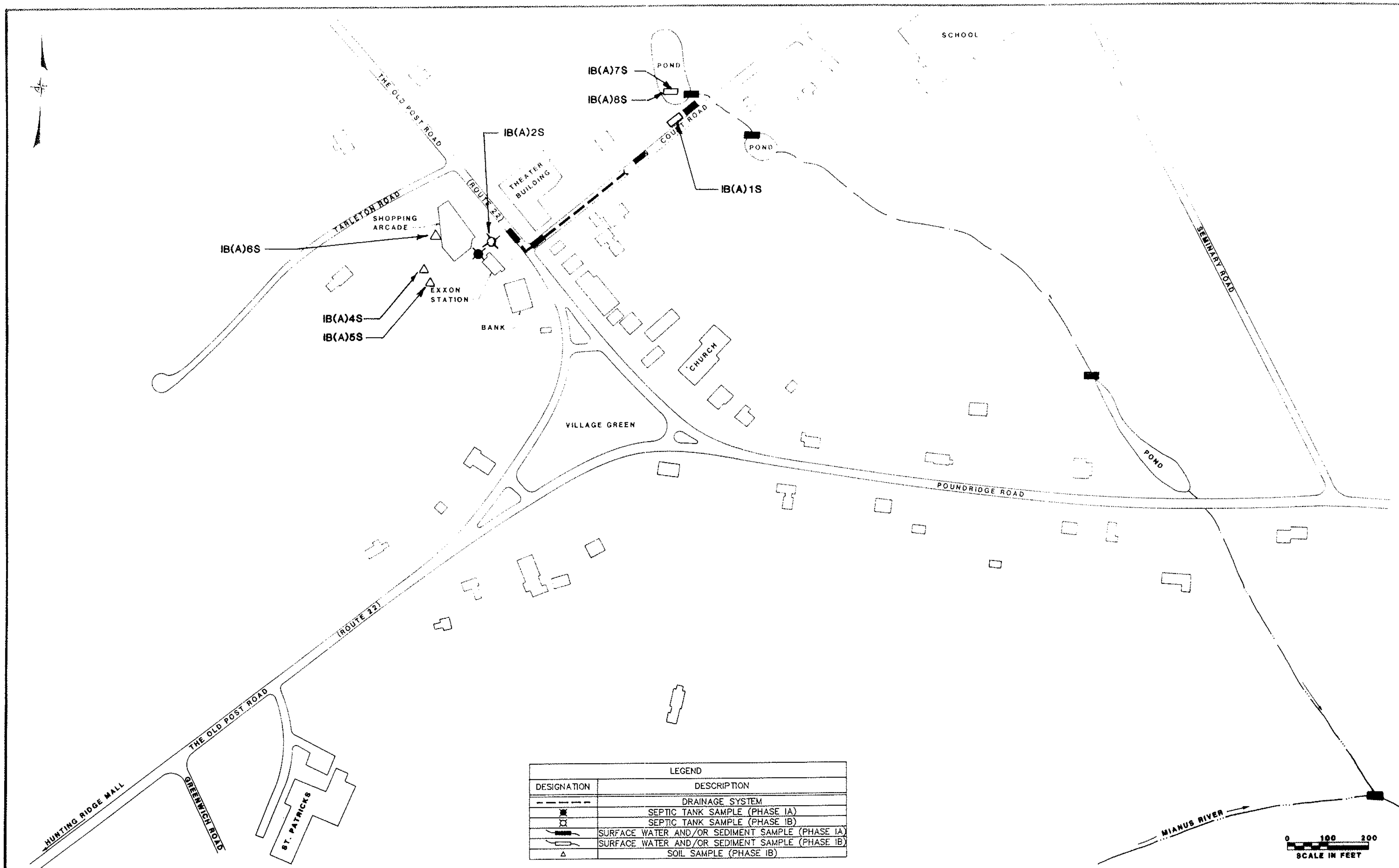
This section briefly reviews the rationale for the selection of various Phase IB sampling locations for the Shopping Arcade Study Area. These sampling locations are illustrated on Figure No. 3-4.

Septic Tank Sludge and Supernatant - The data validation procedure determined that there was a problem with the quality control exercised by the laboratory in the analysis of the Phase IA sample obtained from the Shopping Arcade septic tank. At the request of the NYSDEC, the Shopping Arcade septic tank was resampled.

It had originally been proposed that in view of the analytical data generated by the effluent sample collected and analyzed from the septic tank (IA(A)14W), an additional effluent sample would be collected from the septic tank servicing the Arcade and analyzed for Hazardous Substance List (HSL) compounds to confirm the estimated values of trichloroethene, 1,1,1-trichloroethane, trans-1,2-dichloroethene and phenol previously found in Phase IA.

During the Phase IA sampling program, an attempt was made to obtain a sludge sample from the Shopping Arcade septic tank. However, sludge was not encountered in the sanitary system.

The Phase IB sampling program also provided for sludge samples to be collected from the Exxon Gasoline Station septic tank and the Shopping Arcade leaching field distribution box; however, sludge was not found in the Shopping Arcade leaching field distribution box.



LEGEND	
DESIGNATION	DESCRIPTION
— — — —	DRAINAGE SYSTEM
	SEPTIC TANK SAMPLE (PHASE IA)
	SEPTIC TANK SAMPLE (PHASE IB)
	SURFACE WATER AND/OR SEDIMENT SAMPLE (PHASE IA)
	SURFACE WATER AND/OR SEDIMENT SAMPLE (PHASE IB)
△	SOIL SAMPLE (PHASE IB)

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REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE I B
SAMPLING LOCATIONS

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FIGURE NO. 3-4

Stormwater Drainage System Sediment – The data validation procedure determined that there was also a problem with the quality control exercised by the laboratory in the analysis of the Phase IA sediment samples obtained from the Route 22 storm drain in front of the Arcade and the drainage ditch along Court Road. At the request of NYSDEC, the abovementioned locations were resampled as part of the Phase IB field investigation.

Since the Phase IA sampling program documented limited low level concentrations of contaminants in samples taken from the drainage ditch along Court Road and in the pond north of Court Road, an additional sediment sample was collected from the drainage ditch along the north side of Court Road and analyzed for HSL compounds to confirm the presence of PAHs, phthalate compounds and the analytes of concern. This sample would also better determine the horizontal and vertical extent of organic contamination in the study area.

Surface Water Sediment (Wetlands and Ponds) – Data validation determined that there was a problem with the quality control exercised by the laboratory in the analysis of the Phase IA sediment and water samples obtained from the pond immediately north of Court Road, the pond to the south of Court Road (behind the school) and the Mianus River immediately downstream of the pond discharge. At the request of the NYSDEC, sediment and water at the abovementioned locations were resampled.

The Phase IB sampling program also provided for two sediment samples to be collected from the pond north of Court Road in order to better define the horizontal and vertical extent of organic chemical contamination detected in the pond.

Soil (Sanitary Leaching Field) – The Phase IB sampling program provided for three soil samples to be taken behind the Shopping Arcade building to determine if the soil is a continuing source of contamination. Two soil samples were collected immediately adjacent to the Arcade leaching field and one directly behind the location of the former dry cleaning operation at the Shopping Arcade. Each sample was obtained at a depth of 3 feet below the ground surface (at the bedrock interface) using a hand auger.

Table No. 3-3 summarizes the number and types of samples collected at each location as part of the Phase IB program.

Table No. 3-3

SUMMARY OF THE PHASE IB SAMPLING PROGRAM

Sampling Location	Number of Samples	Sample Identification Number	Rationale
Septic Tank (Sludge)	1	IB(A)2S	Determine if the Exxon Gas Station septic tank is a source of contamination as a result of present and past disposal practices.
Stormwater Drainage System Sediment	1	IB(A)1S	Determine if the drainage system is contributing to surface water in the study area.
Surface Water Sediment (Wetlands/Ponds)	2	IB(A)7S IB(A)8S	Determine the extent of contamination in the wetlands/ pond system that discharges to the Mianus River.
Soil (Sanitary Leaching Field)	3	IB(A)4S IB(A)5S IB(A)6S	Determine if soil is a continuing source of contamination to ground water.

3.3.3 Analytes of Concern

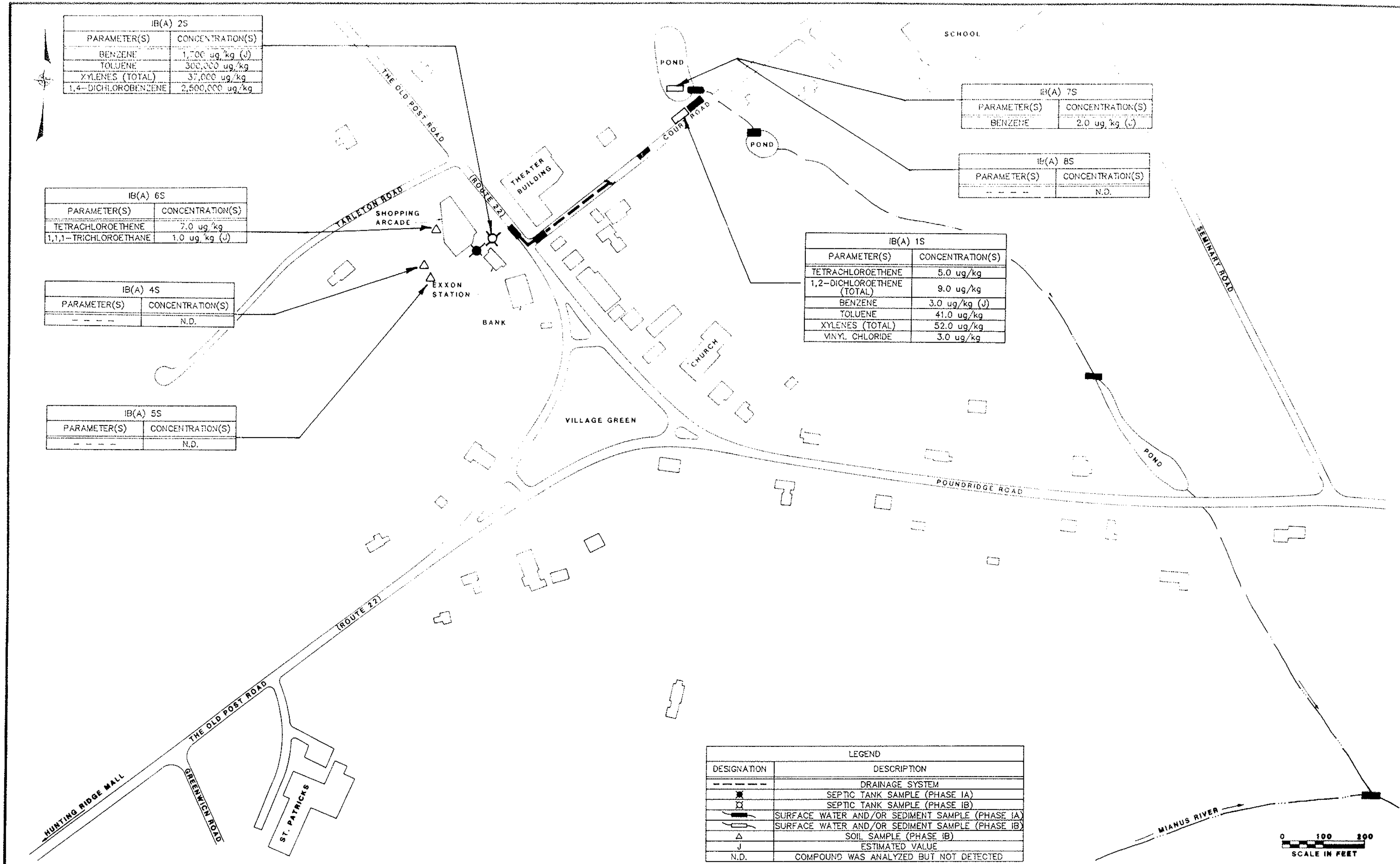
For all Phase IB samples obtained, laboratory analysis was conducted to determine the presence of volatile organic chemicals including tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, 1,1,1-trichloroethane and the BTX compounds. In addition, a select number of samples were analyzed for the HSL compounds.

3.4 Analytical Results of the Phase IB Sampling Program

The purpose of this section is to present the analytical results which were collected during the Phase IB component of the Remedial Investigation. As was presented in the previous section, provision was made to collect solid and liquid matrix samples at specific locations throughout the Shopping Arcade Study Area. The purpose of obtaining and analyzing these samples was threefold. First, the samples would confirm and expand upon previous analytical results obtained in Phase IA. Secondly, the results of the sampling effort would assist in the design of future phases of the sampling program (if required), and third, the evaluation of the data would assist in determining how the analytes of concern are moving through the environment of the study area and confirm possible sources of contamination.

Figure No. 3-5 presents a map of the study area which identifies the locations throughout the Shopping Arcade Site from which solid (sludge/sediment) matrix samples were collected during the Phase IB program, along with the analytical results of each sample. For purposes of presenting the sampling program results, each sampling point was identified by an identification number. For example, a sampling point labelled "IB(A)14W" would indicate the following. The "IB" portion of the identification number indicates that the sample was collected during the Phase IB portion of the sampling program. The remainder of the sample identification number is described in Section 3.2.

Similar to the results for Phase IA, in the following sections the sequence of data presentation for the Phase IB results will be by sampling media, beginning with potential sources such as septic tanks and continuing with drainage system sediment, wetlands and pond sediments, and soils. For each media there will be a presentation of organic and inorganic sampling results as appropriate.



IB(A) 2S	
PARAMETER(S)	CONCENTRATION(S)
BENZENE	1,700 ug/kg (J)
TOLUENE	300,000 ug/kg
XYLENES (TOTAL)	37,000 ug/kg
1,4-DICHLOROBENZENE	2,500,000 ug/kg

IB(A) 6S	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	7.0 ug/kg
1,1,1-TRICHLOROETHANE	1.0 ug/kg (J)

IB(A) 4S	
PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IB(A) 5S	
PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IB(A) 7S	
PARAMETER(S)	CONCENTRATION(S)
BENZENE	2.0 ug/kg (J)

IB(A) 8S	
PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IB(A) 1S	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	5.0 ug/kg
1,2-DICHLOROETHENE (TOTAL)	9.0 ug/kg
BENZENE	3.0 ug/kg (J)
TOLUENE	41.0 ug/kg
XYLENES (TOTAL)	52.0 ug/kg
VINYL CHLORIDE	3.0 ug/kg

LEGEND	
DESIGNATION	DESCRIPTION
– – – – –	DRAINAGE SYSTEM
[symbol]	SEPTIC TANK SAMPLE (PHASE IA)
[symbol]	SEPTIC TANK SAMPLE (PHASE IB)
[symbol]	SURFACE WATER AND/OR SEDIMENT SAMPLE (PHASE IA)
[symbol]	SURFACE WATER AND/OR SEDIMENT SAMPLE (PHASE IB)
△	SOIL SAMPLE (PHASE IB)
J	ESTIMATED VALUE
N.D.	COMPOUND WAS ANALYZED BUT NOT DETECTED

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REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE IB
ORGANIC CHEMICAL SAMPLING RESULTS

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FIGURE NO. 3-5

A summary of the Phase IB organic and inorganic analytical results of samples collected in the Shopping Arcade Study Area are presented in tabular format in Table No. 3-4. Samples reporting results for inorganic analyses were also analyzed for pesticides/PCBs, volatiles and semi-volatiles. All other samples were analyzed for volatiles only.

It is important to note that as shown in Table No. 3-4, multiple samples were obtained and analyzed at several locations during the Phase IB sampling program because some of the initial analyses did not meet NYSDEC QA/QC requirements for Hazardous Substance List (HSL) analysis and the results were deemed invalid. All resampling results were analyzed for Target Compound List (TCL) constituents (see Appendix B for a list of TCL constituents). Therefore, only those analytical results that met the NYSDEC QA/QC requirements for HSL and/or TCL analysis and resultant valid data is shown in both Table No. 3-4 and Figure No. 3-5, and presented in this report for discussion.

As listed in Table No. 3-4, where a result is not provided for a specific compound, the following qualifiers are used:

- o A blank space indicates that the analysis of the compound did not meet the NYSDEC CLP QA/QC requirements and was therefore deemed invalid and not shown.

- o The symbol "ND" indicates that the analysis of this compound met the NYSDEC CLP QA/QC requirements, but was not measured above the analytical instrument's detection limits (IDL).

- o The symbol "NA" indicates that the compound was not analyzed.

Qualifiers that accompany the concentrations reported in the table are NYSDEC CLP qualifiers.

In addition, several sample results show the presence of unknown isomers and "other" compounds. These compounds are listed in the table and presented in the text, however, identification and determination of the exact levels of the compounds, as well as a discussion of their presence and extent of contamination is not definable within the context of this program and is not included in the discussion.

Table No. 3-4
BEDFORD VILLAGE
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
SHOPPING ARCADE PHASE IB SAMPLING PROGRAM
ANALYTICAL RESULTS

PARAMETERS	IB(A)1S 6/1/88 ft (ug/kg)	IB(A)1SB 3/2/89 (ug/kg)	IB(A)2S 6/2/88 ft (ug/kg)	IB(A)4S 6/2/88 ft (ug/kg)	IB(A)5S 6/2/88 ft (ug/kg)	IB(A)6S 6/2/88 ft (ug/kg)	IB(A)7S 6/3/88 ft (ug/kg)	IB(A)8S 6/3/88 ft (ug/kg)
Volatiles:								
Acetone	65.0 B	NA	ND	30.0 B	ND	51.0 B	95.0 B	60.0 B
Benzene	3.0 J	NA	1700.0 J	ND	ND	ND	2.0 J	ND
Bromodichloromethane	ND	NA	ND	ND	ND	ND	ND	ND
Bromoform	ND	NA	ND	ND	ND	ND	ND	ND
Bromomethane	ND	NA	ND	ND	ND	ND	ND	ND
2-Butanone	ND	NA	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	NA	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	NA	ND	ND	ND	ND	5.0 J	ND
Carbon Tetrachloride	ND	NA	ND	ND	ND	ND	ND	ND
Chloroethane	ND	NA	ND	ND	ND	ND	ND	ND
Chloroform	ND	NA	ND	ND	ND	ND	ND	ND
Chloromethane	ND	NA	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	NA	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	NA	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	NA	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	NA	ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene	[illegible].0	NA	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	NA	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	NA	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	NA	ND	ND	ND	ND	ND	ND
Ethyl Benzene	ND	NA	15000.0	ND	ND	ND	ND	ND
2-Hexanone	ND	NA	ND	ND	ND	ND	ND	ND
Methylene chloride	9.0 B	NA	10300.0 B	8.2 B	800.0 B	10.0 B	49.0 B	26.0 B
4-Methyl-2-pentanone	ND	NA	ND	ND	ND	ND	ND	ND
Styrene	ND	NA	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	NA	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	5.0	NA	ND	ND	ND	7.0	ND	ND
Toluene	41.0	NA	300000	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	NA	ND	ND	ND	1.0 J	ND	ND
1,1,2-Trichloroethane	ND	NA	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	NA	ND	ND	ND	ND	ND	ND
Vinyl acetate	ND	NA	ND	ND	ND	ND	ND	ND
Vinyl chloride	3.0	NA	ND	ND	ND	ND	ND	ND
Total Xylenes	52.0	NA	37000.0	ND	ND	ND	ND	ND
Other:								
4-Methyl-1-(1-Methylethyl) Cyclohexene	54.0 J	NA	ND	ND	ND	ND	ND	ND
Alpha-Pinene	100.0 J	NA	ND	ND	ND	ND	ND	ND
2-Amino 4(1H)Pyrimdine	ND	NA	7600.0 J	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	NA	ND	ND	2000.0 JB	ND	ND	ND
Unknown Cyclic Compound	27.0 J	NA	9400.0 J	ND	ND	ND	ND	ND
Unknown Alkane (total)	250.0 J	NA	31000.0 J	ND	ND	23.0 J	12.0 J	ND
Unknown (total)	9.0 J	NA	40000.0 J	ND	1500.0 J	3.0 J	15.0 J	32.0 J

Table No. 3-4 (continued)

PARAMETERS	IB(A)1S 6/1/88 4ft (ug/kg)	IB(A)1SB 3/2/89 (ug/kg)	IB(A)2S 6/2/88 ft (ug/kg)	IB(A)4S 6/2/88 ft (ug/kg)	IB(A)5S 6/2/88 ft (ug/kg)	IB(A)6S 6/2/88 ft (ug/kg)	IB(A)7S 6/3/88 ft (ug/kg)	IB(A)8S 6/3/88 ft (ug/kg)
Semi-Volatiles:								
Acenaphthene	ND	NA	ND	ND	NA	NA	NA	NA
Acenaphthylene	ND	NA	ND	ND	NA	NA	NA	NA
Anthracene	280.0 J	NA	ND	ND	NA	NA	NA	NA
Benz(a)anthracene	ND	NA	ND	ND	NA	NA	NA	NA
Benzoic acid	ND	NA	ND	ND	NA	NA	NA	NA
Benzyl alcohol	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(b)fluoranthene	1400.0	NA	ND	ND	NA	NA	NA	NA
Benzo(k)fluoranthene	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(g,h,i)perylene	ND	NA	ND	ND	NA	NA	NA	NA
Benzo(a)pyrene	960.0	NA	ND	ND	NA	NA	NA	NA
4-Bromophenyl phenyl ether	ND	NA	ND	ND	NA	NA	NA	NA
Butyl benzyl phthalate	ND	NA	ND	ND	NA	NA	NA	NA
4-Chloroaniline	ND	NA	ND	ND	NA	NA	NA	NA
bis (2-Chloroethoxy) methane	ND	NA	ND	ND	NA	NA	NA	NA
bis (2-Chloroethyl) ether	ND	NA	ND	ND	NA	NA	NA	NA
bis (2-Chloroisopropyl) ether	ND	NA	ND	ND	NA	NA	NA	NA
4-Chloro-3-methylphenol	ND	NA	ND	ND	NA	NA	NA	NA
(p-chloro-m-cresol)	ND	NA	ND	ND	NA	NA	NA	NA
2-Chloronaphthalene	ND	NA	ND	ND	NA	NA	NA	NA
2-Chlorophenol	ND	NA	ND	ND	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	ND	NA	ND	ND	NA	NA	NA	NA
Chrysene	770.0	NA	ND	ND	NA	NA	NA	NA
Dibenz(a,h)anthracene	ND	NA	ND	ND	NA	NA	NA	NA
Dibenzofuran	ND	NA	ND	ND	NA	NA	NA	NA
Di-n-butylphthalate	ND	NA	ND	ND	NA	NA	NA	NA
1,2-Dichlorobenzene	ND	NA	ND	ND	NA	NA	NA	NA
1,3-Dichlorobenzene	ND	NA	ND	ND	NA	NA	NA	NA
1,4-Dichlorobenzene	ND	NA	2500000.0	ND	NA	NA	NA	NA
3,3'-Dichlorobenzidine	ND	NA	ND	ND	NA	NA	NA	NA
2,4-Dichlorophenol	ND	NA	ND	ND	NA	NA	NA	NA
Diethylphthalate	ND	NA	ND	ND	NA	NA	NA	NA
2,4-Dimethylphenol	ND	NA	ND	ND	NA	NA	NA	NA
Dimethyl phthalate	ND	NA	ND	ND	NA	NA	NA	NA
4,6-Dinitro-2-methyl phenol	ND	NA	ND	ND	NA	NA	NA	NA
2,4-Dinitrophenol	ND	NA	ND	ND	NA	NA	NA	NA
2,4-Dinitrotoluene	ND	NA	ND	ND	NA	NA	NA	NA
2,6-Dinitrotoluene	ND	NA	ND	ND	NA	NA	NA	NA
Di-n-octyl phthalate	ND	NA	ND	ND	NA	NA	NA	NA
bis (2-ethylhexyl) phthalate	450.0 J	NA	ND	ND	NA	NA	NA	NA
Fluoranthene	1700.0	NA	ND	ND	NA	NA	NA	NA
Fluorene	ND	NA	ND	ND	NA	NA	NA	NA
Hexachlorobenzene	ND	NA	ND	ND	NA	NA	NA	NA
Hexachlorobutadiene	ND	NA	ND	ND	NA	NA	NA	NA
Hexachlorocyclopentadiene	ND	NA	ND	ND	NA	NA	NA	NA
Hexachloroethane	ND	NA	ND	ND	NA	NA	NA	NA

Table No. 5-4 (continued)

PARAMETERS	IB(A)1S 6/1/88 ft (ug/kg)	IB(A)1SB 3/2/89 (ug/kg)	IB(A)2S 6/2/88 ft (ug/kg)	IB(A)4S 6/2/88 ft (ug/kg)	IB(A)5S 6/2/88 ft (ug/kg)	IB(A)6S 6/2/88 ft (ug/kg)	IB(A)7S 6/3/88 ft (ug/kg)	IB(A)8S 6/3/88 ft (ug/kg)
Indeno(1,2,3-cd)pyrene	480.0 J	NA	ND	ND	NA	NA	NA	NA
Isophorone	ND	NA	ND	ND	NA	NA	NA	NA
2-Methylnaphthalene	ND	NA	ND	ND	NA	NA	NA	NA
2-Methyl phenol	ND	NA	ND	ND	NA	NA	NA	NA
4-Methyl phenol	ND	NA	ND	ND	NA	NA	NA	NA
Naphthalene	ND	NA	ND	ND	NA	NA	NA	NA
2-Nitroaniline	ND	NA	ND	ND	NA	NA	NA	NA
3-Nitroaniline	ND	NA	ND	ND	NA	NA	NA	NA
4-Nitroaniline	ND	NA	ND	ND	NA	NA	NA	NA
Nitrobenzene	ND	NA	ND	ND	NA	NA	NA	NA
2-Nitrophenol	ND	NA	ND	ND	NA	NA	NA	NA
4-Nitrophenol	ND	NA	ND	ND	NA	NA	NA	NA
N-Nitroso-diphenylamine	ND	NA	ND	ND	NA	NA	NA	NA
N-Nitroso-dipropylamine	ND	NA	ND	ND	NA	NA	NA	NA
Pentachlorophenol	ND	NA	ND	ND	NA	NA	NA	NA
Phenanthrene	1300.0	NA	ND	ND	NA	NA	NA	NA
Phenol	ND	NA	ND	ND	NA	NA	NA	NA
Phenol (total)	200.0	NA	19800	ND	NA	NA	NA	NA
Pyrene	1400.0	NA	ND	ND	NA	NA	NA	NA
1,2,4-Trichlorobenzene	ND	NA	ND	ND	NA	NA	NA	NA
2,4,5-Trichlorophenol	ND	NA	ND	ND	NA	NA	NA	NA
2,4,6-Trichlorophenol	ND	NA	ND	ND	NA	NA	NA	NA
Other:								
Hexadecanoic Acid	14.0 J	NA	ND	ND	NA	NA	NA	NA
Sulfur	41.0 J	NA	ND	ND	NA	NA	NA	NA
Decane	ND	NA	290.0 J	ND	NA	NA	NA	NA
Dodcecane	ND	NA	200.0 J	ND	NA	NA	NA	NA
2,7,10-Trimethyldodecane	ND	NA	280.0 J	ND	NA	NA	NA	NA
Undecane	ND	NA	1300.0 J	ND	NA	NA	NA	NA
Heptadecane	ND	NA	540.0 J	ND	NA	NA	NA	NA
4-Methyl-3-Penten-2-one	ND	NA	ND	22.0 J	NA	NA	NA	NA
2,3 Dimethylheptane	ND	NA	ND	17.0 J	NA	NA	NA	NA
Unknown Carboxylic Acid (total)	380.0 J	NA	3700.0 J	350.0 J	NA	NA	NA	NA
Unknown Alkane (total)	130.0 J	NA	1400.0 J	100.0 J	NA	NA	NA	NA
Unknown (total)	1300.0 J	NA	9000.0 J	1900.0 J	NA	NA	NA	NA

Table No. 3-4 (continued)

PARAMETERS	IB(A)1S 6/1/88 ft (mg/kg)	IB(A)1SB 5/2/88 (mg/kg)	IB(A)2S 6/2/88 ft (mg/kg)	IB(A)4S 6/2/88 ft (mg/kg)	IB(A)5S 6/2/88 ft (mg/kg)	IB(A)6S 6/2/88 ft (mg/kg)	IB(A)7S 6/3/88 ft (mg/kg)	IB(A)8S 6/3/88 ft (mg/kg)
Inorganics:								
Aluminum	68500.0 P	NA	6700.0 P	30700.0 P	NA	NA	NA	NA
Antimony	18.2 UP	NA	150.0 UPN	50.0 PN	NA	NA	NA	NA
Arsenic	[1.9] F	NA	7.5 UF	1.0 UF	NA	NA	NA	NA
Barium	[56.0] P	NA	[360.0] P	300.0 P	NA	NA	NA	NA
Beryllium	[0.6] P	NA	1.3 UP	2.2 P	NA	NA	NA	NA
Cadmium	1.5 UP	NA	12.5 UP	1.7 UP	NA	NA	NA	NA
Calcium	47900.0 P	NA	32000.0 P	3500.0 P	NA	NA	NA	NA
Chromium	17.0 P	NA	48.0 P*	31.0 P#	NA	NA	NA	NA
Cobalt	[7.6] P	NA	37.5 UP	32.0 P	NA	NA	NA	NA
Copper	25.0 P	NA	1200.0 P	22.0 P	NA	NA	NA	NA
Cyanide	1.0 U	NA	15.6 U	2.1 U	NA	NA	NA	NA
Iron	14300.0 P	NA	18400.0 P	54300.0 P	NA	NA	NA	NA
Lead	55.0 P	NA	1000.0 F1:10	23.0 F1:10	NA	NA	NA	NA
Magnesium	4900.0 P	NA	[4400.0]P	18200.0 P	NA	NA	NA	NA
Manganese	150.0 PN	NA	150.0 P	660.0 P	NA	NA	NA	NA
Mercury	0.2 UCVN	NA	2.1 CV	0.2 UCV	NA	NA	NA	NA
Nickel	15.0 P	NA	[40.0] P	32.0 P	NA	NA	NA	NA
Potassium	[1500.0]P	NA	3250.0 UP	11300.0 P	NA	NA	NA	NA
Selenium	0.6 UF	NA	5.0 UF	0.7 UF	NA	NA	NA	NA
Silver	6.4 P	NA	25.0 UP	3.3 UP	NA	NA	NA	NA
Sodium	212.1 UP	NA	[3800.0]P	233.3 UP	NA	NA	NA	NA
Thallium	0.6 UF	NA	5.0 UF	0.7 UF	NA	NA	NA	NA
Vanadium	13.0 P	NA	25.0 UP	100.0 P	NA	NA	NA	NA
Zinc	110.0 P	NA	1900.0 P	120.0 P	NA	NA	NA	NA

Table No. 5-4 (continued)

PARAMETERS	IB(A)1S 6/1/88 #ft (ug/kg)	IB(A)1SB 6/2/88 (ug/kg)	IB(A)2S 6/2/88 ft (ug/kg)	IB(A)4S 6/2/88 ft (ug/kg)	IB(A)5S 6/2/88 ft (ug/kg)	IB(A)6S 6/2/88 ft (ug/kg)	IB(A)7S 6/3/88 ft (ug/kg)	IB(A)8S 6/3/88 ft (ug/kg)
Pesticides/PCBs:								
Aldrin		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1016		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1221		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1232		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1242		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1248		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1254		ND	ND	ND	NA	NA	NA	NA
AROCLOR-1260		ND	ND	ND	NA	NA	NA	NA
alpha-BHC		ND	ND	ND	NA	NA	NA	NA
beta-BHC		ND	ND	ND	NA	NA	NA	NA
delta-BHC		ND	ND	ND	NA	NA	NA	NA
gamma-BHC (Lindane)		ND	24.0 J	ND	NA	NA	NA	NA
alpha-Chlordane		ND	ND	ND	NA	NA	NA	NA
gamma-Chlordane		ND	ND	ND	NA	NA	NA	NA
4,4'-DDD		ND	ND	ND	NA	NA	NA	NA
4,4'-DDE		ND	ND	ND	NA	NA	NA	NA
4,4'-DDT		ND	ND	ND	NA	NA	NA	NA
Dieldrin		ND	ND	ND	NA	NA	NA	NA
Endrin		ND	ND	ND	NA	NA	NA	NA
Endrin ketone		ND	ND	ND	NA	NA	NA	NA
Endosulfan I		ND	ND	ND	NA	NA	NA	NA
Endosulfan II		ND	ND	ND	NA	NA	NA	NA
Endosulfan sulfate		ND	ND	ND	NA	NA	NA	NA
Heptachlor		ND	ND	ND	NA	NA	NA	NA
Heptachlor epoxide		ND	ND	ND	NA	NA	NA	NA
Methoxychlor		ND	ND	ND	NA	NA	NA	NA
Toxaphene		ND	ND	ND	NA	NA	NA	NA

U - Indicates compound was analyzed for but not detected.
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the method blank as well as the sample.
+ - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs.
‡ - Holding time exceeded for volatiles.
ND - Not detected.
NA - Not analyzed.
Blank space - Data is invalid

[] - Indicates sample value is between IDL and CRDL.
ft - Holding time for field/trip blank exceeded.
- Duplicate analysis is not within control limits.
e - Indicates a value estimated or not reported due to the presence of interference.
P - Indicates ICP analysis.
F - Indicates furnace analysis.
CV - Cold vapor analysis.
(#:#) - Metal to water ratio in sample analysis.

Table No. 3-4 (continued)

PARAMETERS	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 6/3/88 ++ (ug/l)	Trip Blank 6/3/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)
Volatiles:								
Acetone							13.0	ND
Benzene							ND	ND
Bromodichloromethane							ND	ND
Bromoform							ND	ND
Bromomethane							ND	ND
2-Butanone							ND	ND
Chlorobenzene							ND	ND
Carbon Disulfide							ND	ND
Carbon Tetrachloride							ND	ND
Chloroethane							ND	ND
Chloroform							ND	ND
Chloromethane							ND	ND
Dibromochloromethane							ND	ND
1,1-Dichloroethane							ND	ND
1,2-Dichloroethane							ND	ND
1,1-Dichloroethylene							ND	ND
1,2-Dichloroethylene							ND	ND
1,2-Dichloropropane							ND	ND
cis 1,3-Dichloropropene							ND	ND
trans-1,3-Dichloropropene							ND	ND
Ethyl Benzene							ND	ND
2-Hexanone							ND	ND
Methylene Chloride							ND	ND
4-Methyl-2-Pentanone							ND	ND
Styrene							ND	ND
1,1,2,2-Tetrachloroethane							ND	ND
Tetrachloroethylene							ND	ND
Toluene							ND	ND
1,1,1-Trichloroethane							ND	ND
1,1,2-Trichloroethane							ND	ND
Trichloroethene							ND	2.0 J
Vinyl Acetate							ND	ND
Vinyl Chloride							ND	ND
Total Xylenes							ND	ND
Other:								

Table No. 3-4 (continued)

PARAMETERS	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 6/3/88 ++ (ug/l)	Trip Blank 6/3/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)
Semi Volatiles:								
Acenaphthene	ND	NA	ND	NA	ND	NA	NA	NA
Acenaphthylene	ND	NA	ND	NA	ND	NA	NA	NA
Anthracene	ND	NA	ND	NA	ND	NA	NA	NA
Benzo(a)anthracene	ND	NA	ND	NA	ND	NA	NA	NA
Benzoic Acid	ND	NA	ND	NA	ND	NA	NA	NA
Benzyl Alcohol	ND	NA	ND	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	ND	NA	ND	NA	ND	NA	NA	NA
Benzo(k)fluoranthene	ND	NA	ND	NA	ND	NA	NA	NA
Benzo(g,h,i)perylene	ND	NA	ND	NA	ND	NA	NA	NA
Benzo(a)pyrene	ND	NA	ND	NA	ND	NA	NA	NA
4-Bromophenyl Phenyl Ether	ND	NA	ND	NA	ND	NA	NA	NA
Butyl Benzyl Phthalate	ND	NA	ND	NA	ND	NA	NA	NA
4-Chloroaniline	ND	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroethoxy) methane	ND	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroethyl) ether	ND	NA	ND	NA	ND	NA	NA	NA
bis (2-Chloroisopropyl) ether	ND	NA	ND	NA	ND	NA	NA	NA
4-Chloro-3-Methylphenol	ND	NA	ND	NA	ND	NA	NA	NA
(p-chloro-m-cresol)	ND	NA	ND	NA	ND	NA	NA	NA
2-Chloronaphthalene	ND	NA	ND	NA	ND	NA	NA	NA
2-Chlorophenol	ND	NA	ND	NA	ND	NA	NA	NA
4-Chlorophenyl Phenyl Ether	ND	NA	ND	NA	ND	NA	NA	NA
Chrysene	ND	NA	ND	NA	ND	NA	NA	NA
Dibenz(a,h)anthracene	ND	NA	ND	NA	ND	NA	NA	NA
Dibenzofuran	ND	NA	ND	NA	ND	NA	NA	NA
Di-n-butylphthalate	15.0	NA	ND	NA	ND	NA	NA	NA
1,2-Dichlorobenzene	ND	NA	ND	NA	ND	NA	NA	NA
1,3-Dichlorobenzene	ND	NA	ND	NA	ND	NA	NA	NA
1,4-Dichlorobenzene	ND	NA	ND	NA	ND	NA	NA	NA
3,3'-Dichlorobenzidine	ND	NA	ND	NA	ND	NA	NA	NA
2,4-Dichlorophenol	ND	NA	ND	NA	ND	NA	NA	NA
Diethylphthalate	ND	NA	ND	NA	ND	NA	NA	NA
2,4-Dimethylphenol	ND	NA	ND	NA	ND	NA	NA	NA
Dimethyl Phthalate	ND	NA	ND	NA	ND	NA	NA	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	ND	NA	ND	NA	NA	NA
2,4-Dinitrophenol	ND	NA	ND	NA	ND	NA	NA	NA
2,4-Dinitrotoluene	ND	NA	ND	NA	ND	NA	NA	NA
2,6-Dinitrotoluene	ND	NA	ND	NA	ND	NA	NA	NA
Di-n-Octyl Phthalate	ND	NA	ND	NA	ND	NA	NA	NA
bis (2-ethylhexyl) Phthalate	ND	NA	ND	NA	120.0 B	NA	NA	NA
Fluoranthene	ND	NA	ND	NA	ND	NA	NA	NA
Fluorene	ND	NA	ND	NA	ND	NA	NA	NA
Hexachlorobenzene	ND	NA	ND	NA	ND	NA	NA	NA
Hexachlorobutadiene	ND	NA	ND	NA	ND	NA	NA	NA
Hexachlorocyclopentadiene	ND	NA	ND	NA	ND	NA	NA	NA
Hexachloroethane	ND	NA	ND	NA	ND	NA	NA	NA

Table No. 3-4 (continued)

PARAMETERS	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 6/3/88 ++ (ug/l)	Trip Blank 6/3/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)
Indeno(1,2,3-cd)pyrene	ND	NA	ND	NA	ND	NA	NA	NA
Isophorone	ND	NA	ND	NA	ND	NA	NA	NA
2-Methylnaphthalene	ND	NA	ND	NA	ND	NA	NA	NA
2-Methyl Phenol	ND	NA	ND	NA	ND	NA	NA	NA
4-Methyl Phenol	ND	NA	ND	NA	ND	NA	NA	NA
Naphthalene	ND	NA	ND	NA	ND	NA	NA	NA
2-Nitroaniline	ND	NA	ND	NA	ND	NA	NA	NA
3-Nitroaniline	ND	NA	ND	NA	ND	NA	NA	NA
4-Nitroaniline	ND	NA	ND	NA	ND	NA	NA	NA
Nitrobenzene	ND	NA	ND	NA	ND	NA	NA	NA
2-Nitrophenol	ND	NA	ND	NA	ND	NA	NA	NA
4-Nitrophenol	ND	NA	ND	NA	ND	NA	NA	NA
N-Nitroso-Diphenylamine	ND	NA	ND	NA	ND	NA	NA	NA
N-Nitroso-Dipropylamine	ND	NA	ND	NA	ND	NA	NA	NA
Pentachlorophenol	ND	NA	ND	NA	ND	NA	NA	NA
Phenanthrene	ND	NA	ND	NA	ND	NA	NA	NA
Phenol	ND	NA	ND	NA	ND	NA	NA	NA
Phenol (total)	ND	NA	ND	NA	55.0	NA	NA	NA
Pyrene	ND	NA	ND	NA	ND	NA	NA	NA
1,2,4 Trichlorobenzene	ND	NA	ND	NA	ND	NA	NA	NA
2,4,5-Trichlorophenol	ND	NA	ND	NA	ND	NA	NA	NA
2,4,6-Trichlorophenol	ND	NA	ND	NA	ND	NA	NA	NA
Other:								
Hexadecanoic Acid	ND	NA	ND	NA	240.0 J	NA	NA	NA
Unknown Hydrocarbon	ND	NA	ND	NA	150.0 J	NA	NA	NA
Unknown (total)	ND	NA	ND	NA	110.0 J	NA	NA	NA

Table No. 5-4 (continued)

PARAMETERS	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 6/3/88 ++ (ug/l)	Trip Blank 6/3/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)
Inorganics:								
Aluminum	60.0 UP		60.0 UP	NA	60.0 UP	NA	NA	NA
Antimony	60.0 UP		60.0 UP	NA	60.0 UP	NA	NA	NA
Arsenic	3.0 UP		3.0 UP	NA	3.0 UP	NA	NA	NA
Barium	25.0 UP		25.0 UP	NA	25.0 UP	NA	NA	NA
Beryllium	0.5 UP		0.5 UP	NA	0.5 UP	NA	NA	NA
Cadmium	5.0 UP		5.0 UP	NA	5.0 UP	NA	NA	NA
Calcium	600.0 UP		600.0 UP	NA	600.0 UP	NA	NA	NA
Chromium	10.0 UP		[illegible] P	NA	10.0 UP	NA	NA	NA
Cobalt	15.0 UP		15.0 UP	NA	15.0 UP	NA	NA	NA
Copper	10.0 UP		10.0 UP	NA	10.0 UP	NA	NA	NA
Cyanide	10.0 U		10.0 U	NA	10.0 U	NA	NA	NA
Iron	[75.0] P		50.0 UP	NA	50.0 UP	NA	NA	NA
Lead	[1.9] F		[1.4] F	NA	1.0 UFN*	NA	NA	NA
Magnesium	900.0 UP		900.0 UP	NA	900.0 UP	NA	NA	NA
Manganese	2.0 UP		2.0 UP	NA	2.0 UP	NA	NA	NA
Mercury	0.2 UCVN		0.2 UCVN	NA	0.2 UCVN	NA	NA	NA
Nickel	15.0 UP		15.0 UP	NA	15.0 UP	NA	NA	NA
Potassium	1300.0 UP		1300.0 UP	NA	1300.0 UP	NA	NA	NA
Selenium	2.0 UF		2.0 UF	NA	2.0 UF	NA	NA	NA
Silver	10.0 UP		10.0 UP	NA	10.0 UP	NA	NA	NA
Sodium	700.0 UP		700.0 UP	NA	700.0 UP	NA	NA	NA
Thallium	2.0 UF		2.0 UF	NA	2.0 UF	NA	NA	NA
Vanadium	10.0 UP		10.0 UP	NA	10.0 UP	NA	NA	NA
Zinc	47.0 P		[17.0] P	NA	35.0 P	NA	NA	NA

Table No. 3-4 (continued)

PARAMETERS	Field Blank 6/1/88 + (ug/l)	Trip Blank 6/1/88 + (ug/l)	Field Blank 6/2/88 + (ug/l)	Trip Blank 6/2/88 + (ug/l)	Field Blank 6/3/88 ++ (ug/l)	Trip Blank 6/3/88 + (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/2/89 (ug/l)
Pesticides/PCBs:								
Aldrin	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1016	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1221	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1232	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1242	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1248	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1254	ND	NA	ND	NA		NA	NA	NA
AROCLOR-1260	ND	NA	ND	NA		NA	NA	NA
alpha-BHC	ND	NA	ND	NA		NA	NA	NA
beta-BHC	ND	NA	ND	NA		NA	NA	NA
delta-BHC	ND	NA	ND	NA		NA	NA	NA
gamma-BHC (Lindane)	ND	NA	ND	NA		NA	NA	NA
alpha-Chlordane	ND	NA	ND	NA		NA	NA	NA
gamma-Chlordane	ND	NA	ND	NA		NA	NA	NA
4,4'-DDD	ND	NA	ND	NA		NA	NA	NA
4,4'-DDE	ND	NA	ND	NA		NA	NA	NA
4,4'-DDT	ND	NA	ND	NA		NA	NA	NA
Dieldrin	ND	NA	ND	NA		NA	NA	NA
Endrin	ND	NA	ND	NA		NA	NA	NA
Endrin ketone	ND	NA	ND	NA		NA	NA	NA
Endosulfan I	ND	NA	ND	NA		NA	NA	NA
Endosulfan II	ND	NA	ND	NA		NA	NA	NA
Endosulfan Sulfate	ND	NA	ND	NA		NA	NA	NA
Heptachlor	ND	NA	ND	NA		NA	NA	NA
Heptachlor Epoxide	ND	NA	ND	NA		NA	NA	NA
Methoxychlor	ND	NA	ND	NA		NA	NA	NA
Toxaphene	ND	NA	ND	NA		NA	NA	NA

U - Indicates compound was analyzed for but not detected.
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the method blank as well as the sample.
* - Pesticide, PCB's - The retention time window for Endrin was outsiue the allowable range on two of the evaluation standard runs.
+ - Holding time exceeded for volatiles.
ND - Not detected.
NA - Not analyzed.
blank space - Data is invalid.
blank space - Data is invalid

[] - Indicates sample value is between IDL and CRDL.
++ - Holding time for field/trip blank exceeded.
* - Duplicate analysis is not within control limits.
e - Indicates a value estimated or not reported due to the presence of interference.
P - Indicates ICP analysis.
F - Indicates furnace analysis.
CV - Cold vapor analysis.
(#:#) - Metal to water ratio in sample analysis.

Also similar to the presentation of the results for Phase IA, a number of the environmental samples have letter subscripts following the numerical concentration values. A letter 'B' indicates the analyte was found in the laboratory method blank samples as well as the environmental sample. The letter 'J' indicates that the concentration is an estimated value.

3.4.1 Potential Source Investigation (Septic Tanks)

As a result of possible past disposal practices at a dry cleaning establishment formerly located in the Shopping Arcade, provision was made in the Phase IA sampling program to obtain a supernatant sample from the Arcade septic tank. However, as mentioned in Section 3.2.1, the data validation procedure that reviews the analytical results for quality assurance noted that a problem existed with the quality control exercised by the laboratory when analyzing the Phase IA sample obtained from the Shopping Arcade septic tank and the results were deemed invalid. Therefore, at the request of the NYSDEC, provision was made to resample the septic tank supernatant during Phase IB. As discussed earlier in this report, the analytical results of the resampling at this location were presented in Section 3.2.1.

In addition to resampling the Shopping Arcade septic tank during Phase IB, as a result of discovery during the Phase IA field investigation that a leaching field existed directly behind the Shopping Arcade, provision was made in Phase IB to sample the leaching field distribution box for sludge. However, no sludge was encountered in the distribution box at the time of sampling. As part of the Phase IB program, provision was also made to sample the Exxon Gasoline Station septic tank to determine whether or not it was a source of contamination.

3.4.1.1 Organic Sampling Results

Sediment/sludge sample IB(A)02S was collected from the Exxon Station septic tank and contained the following organic compounds:

Analytes of Concern	Concentration (ug/kg)
Benzene	1,700.0 J
Toluene	300,000.0
Total xylenes	37,000.0

Other Compounds	Concentration (ug/kg)
Phenol (total)	19,800.0
Lindane (gamma-BHC)	24.0 J
Ethyl benzene	15,000.0
1,4-Dichlorobenzene	2,500,000.0
Methylene chloride	10,300.0 B
2-Amino-4(IH)pyrimdine	7,600.0 J
Unknown cyclic compound	9,400.0 J
Decane	790.0 J
Dodecane	200.0 J
2,7,10-Trimethyldodecane	280.0 J
Heptadecane	540.0 J
Undecane	1,300.0 J
Unknown carboxylic acid (total)	3,700.0 J
Unknown alkane (total)	32,000.0 J
Unknown (total)	49,000.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.4.1.2 Inorganic Sampling Results

Sludge sample IB(A)02S contained the following inorganic constituents:

Constituent	Concentration (mg/kg)
Aluminum	6,700.0
Barium	[360.0]
Calcium	32,000.0
Chromium	48.0 #
Copper	1,200.0
Iron	18,400.0
Lead	1,000.0
Magnesium	[4,400.0]
Manganese	150.0
Mercury	2.1
Nickel	[40.0]
Sodium	[3,800.0]
Zinc	1,900.0

"[]" indicates sample value is between IDL and CRDL
"#" indicates duplicate analysis was not within control limits.

3.4.2 Stormwater Drainage System Sediment Investigation

The data validation procedure determined that there was a problem with the quality control exercised by the laboratory in the analyses of the Phase IA sediment samples obtained from the drainage ditch along the north side of Court Road (IA[A]04S) and the Route 22 storm drain in front of the Shopping Arcade (IA[A]05S). At the request of the

NYSDEC, sediment at the aforementioned locations was resampled during of the Phase IB sampling program. As discussed earlier in this report, the analytical results of the resampling at these locations were presented in Section 3.2.2.

Since the Phase IA sampling program documented limited low level concentrations of contaminants in samples taken from the drainage ditch along the north side of Court Road and in the pond north of Court Road, provision was made in Phase IB for an additional sediment sample from this drainage ditch to be analyzed for HSL compounds to confirm the presence of PAHs, phthalate compounds and analytes of concern. This sample would also better determine the extent of organic chemical contamination found during the Phase IA program at this location.

3.4.2.1 Organic Sampling Results

Sediment sample IB(A)01S obtained from the Court Road drainage ditch was found to contain the following organic compounds: (Please note that the initial sample failed QA/QC requirements for pesticides/PCBs. Therefore, this location was resampled and reanalyzed and only these valid results are presented)

Analytes of Concern	Concentration (ug/kg)
Tetrachloroethene	5.0
Trans-1,2-dichloroethene	9.0
Vinyl chloride	3.0
Benzene	3.0 J
Toluene	41.0
Total xylenes	52.0

Other Compounds	Concentration (ug/kg)
Phenol (total)	200.0
Acetone	65.0 B
Methylene chloride	9.0 B
4-Methyl-1-(1-methylethyl) cyclohexene	54.0 J
Alpha-pinene	100.0 J
Anthracene	280.0 J
Benzo(b)fluoranthene	1,400.0
Benzo(a)pyrene	960.0
Chrysene	770.0
Bis(2-ethylhexyl)phthalate	450.0 J
Fluoranthene	1,700.0
Indeno(1,2,3-cd)pyrene	480.0 J
Phenanthrene	1,300.0
Pyrene	1,400.0
Hexadecanoic acid	14.0 J

Sulfur	41.0 J
Unknown cyclic compound	27.0 J
Unknown alkane (total)	1,080.0 J
Unknown carboxylic acid (total)	380.0 J
Unknown (total)	1,309.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.4.2.2 Inorganic Sampling Results

The following inorganic constituents were found in sediment sample IB(A)01S:

Constituent	Concentration (mg/kg)
Aluminum	68,800.0
Arsenic	[1.9]
Barium	[56.0]
Beryllium	[0.6]
Calcium	47,900.0
Chromium	17.0
Cobalt	[7.6]
Copper	25.0
Iron	14,300.0
Lead	55.0
Magnesium	4,900.0
Manganese	150.0 N
Nickel	13.0
Potassium	[1,300.0]
Silver	6.4
Vanadium	19.0
Zinc	110.0

"N" indicates spike sample recovery was not within control limits.
"[ ]" indicates the reported value is between the CRDL and IDL.

3.4.3 Surface Water Sediment Investigation (Wetlands/Ponds)

The data validation procedure determined that there was a problem with the quality control exercised by the laboratory in the analyses of the Phase IA sediment and water samples obtained from the inlet of the pond immediately south of Court Road (IA[A]01S and IA[A]01W), the pond north of Court Road (IA[A]03S and IA[A]03W) and the Mianus River immediately downstream of the pond (Long Pond) discharge (IA[A]08S and IA[A]08W). These locations were resampled during the Phase IB sampling program. As discussed earlier in this report, the analytical results of the aforementioned samples were presented in Section 3.2.

3.4.3.1 Organic Sampling Results

Sediment sample IB(A)07S collected at a depth of one foot below the sediment surface at the pond outlet north of Court Road was found to contain the following organic compounds:

Analytes of Concern	Concentration (ug/kg)
Benzene	2.0 J
Other Compounds	Concentration (ug/kg)
Acetone	95.0 B
Carbon disulfide	5.0 J
Methylene chloride	49.0 B
Unknown alkane (total)	12.0 J
Unknown (total)	15.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Sediment sample IB(A)08S collected at a depth of two feet below the sediment surface from the pond outlet north of Court Road was found to contain the following organic compounds, none of which were the analytes of concern in the study area:

Compound	Concentration (ug/kg)
Acetone	60.0 B
Methylene chloride	26.0 B
Unknown (total)	32.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.4.4 Soil Sampling Investigation

In the Phase IA sampling program, provision was made to collect six supernatant samples from the leaching pools associated with the Shopping Arcade septic system. However, since there were no leaching pools, it was impossible to obtain septic tank effluent samples from those units. As an alternative, soil samples were obtained in Phase IB by hand augering at two locations immediately adjacent to the sanitary leaching field and one directly behind the location of the former dry cleaner in the Shopping Arcade. The samples were obtained at depths of approximately two to four feet below ground surface (at the bedrock interface). These samples would determine if the soil is a continuing source of contamination at the Shopping Arcade.

3.4.4.1 Organic Sampling Results

Soil sample number IB(A)04S, obtained immediately adjacent to the Shopping Arcade leaching field, was found to contain the following organic compounds, none of which were analytes of concern:

Compound	Concentration (ug/kg)
Acetone	30.0 B
Methylene chloride	8.9 B
4-Methyl-3-penten-2-one	22.0 J
2,3-Dimethylheptane	17.0 J
Unknown carboxylic acid (total)	350.0 J
Unknown alkane (total)	100.0 J
Unknown (total)	1,900.0 J

"B" indicates compound found in method blank.
"J" indicates estimated value.

Soil sample number IB(A)05S, also obtained immediately adjacent to the Shopping Arcade leaching field, was found to contain the following organic compounds, and again none of which were analytes of concern:

Compound	Concentration (ug/kg)
Methylene chloride	800.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	2,000.0 JB
Unknown (total)	1,500.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

Soil sample number IB(A)06S, obtained directly behind the location of the former dry cleaner, was found to contain the following organic compounds:

Compound	Concentration (ug/kg)
Tetrachloroethene	7.0
1,1,1-Trichloroethane	1.0 J

Other Compounds	Concentration (ug/kg)
Acetone	51.0 B
Methylene chloride	10.0 B
Unknown alkane (total)	23.0 J
Unknown (total)	8.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

3.4.4.2 Inorganic Sampling Results

Soil sample number IB(A)04S was found to contain the following inorganic constituents:

Constituent	Concentration (mg/kg)
Aluminum	38,700.0
Antimony	50.0 N
Barium	300.0
Beryllium	2.7
Calcium	3,500.0
Chromium	31.0 #
Cobalt	32.0
Copper	22.0
Iron	54,300.0
Lead	23.0
Magnesium	18,200.0
Manganese	660.0
Nickel	32.0
Potassium	11,900.0
Vanadium	100.0
Zinc	120.0

"N" indicates spike sample recovery was not within control limits.
"#" indicates duplicate analysis was not within control limits.

Section 4

4.0 HYDROGEOLOGIC INVESTIGATION

4.1 Field Investigation Methods and Results

4.1.1 Surface Geophysical Studies

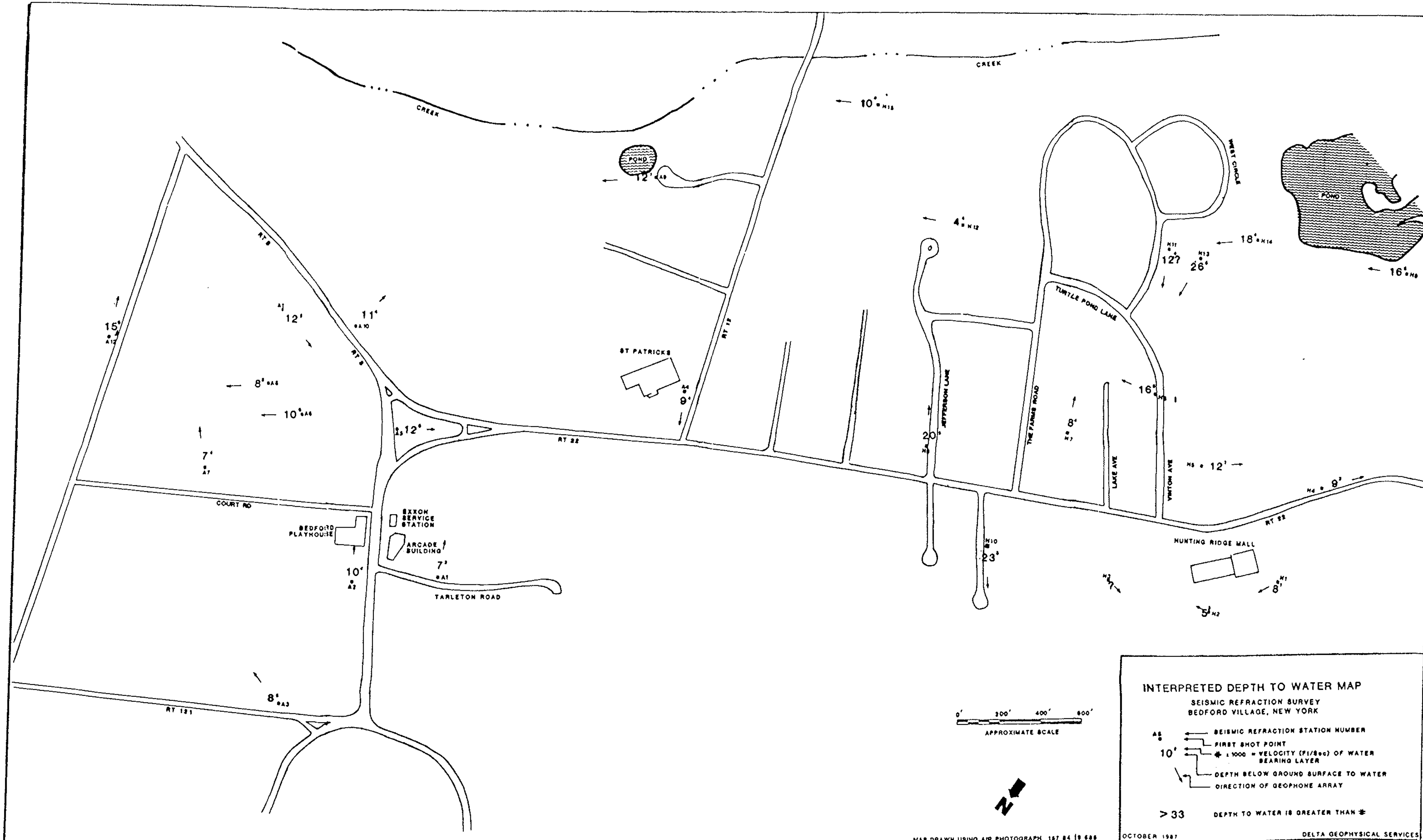
4.1.1.1 Seismic Refraction

A comprehensive seismic geophysical survey was performed as part of the Shopping Arcade Site Remedial Investigation. The purpose of this geophysical survey was to obtain non-destructive subsurface data which defined on a preliminary basis the depth to ground water and bedrock throughout the study area. Geophysical surveys are a cost-effective reconnaissance tool that allows the profiling of large areas of the subsurface so that hydro- geologic maps can be constructed while minimizing the need for soil borings.

The seismic refraction method was utilized to generate the data. This method records a shock wave that is propagated by striking a sledge hammer against a plate laid on the ground surface. As the shock wave travels through the subsurface, it is affected by the densities of the material through which it passes. The resultant reflected wave is recorded along a line of geophones (sensing devices) which are placed on the ground surface at pre-selected distances from the wave source.

The refraction method utilizes the amount of time it takes the resultant wave to travel to each geophone. Analysis of the data (travel time and distance) provides velocities of the seismic wave in the subsurface. Depths to interfaces of differing seismic wave velocities can be computed from the data. Data was collected at 12 locations throughout the Shopping Arcade Study Area.

The interpretation of the seismic data is presented on two maps, Figure Nos. 4-1 and 4-2, and in a table of results, Table No. 4-1. Figure No. 4-1 graphically depicts the seismic station location and number, depth to ground water (below ground surface) and the velocity of the water bearing layer. The velocity of the seismic wave is indicated by a number (smaller size) above the depth value. By multiplying this number by 1,000, the actual velocity can be determined.



INTERPRETED DEPTH TO WATER MAP
SEISMIC REFRACTION SURVEY
BEDFORD VILLAGE, NEW YORK
SEISMIC REFRACTION STATION NUMBER
FIRST SHOT POINT
✱ x 1000 = VELOCITY (Ft/Sec) OF WATER BEARING LAYER
DEPTH BELOW GROUND SURFACE TO WATER
DIRECTION OF GEOPHONE ARRAY
> 33
DEPTH TO WATER IS GREATER THAN ✱
OCTOBER 1987
DELTA GEOPHYSICAL SERVICES
MAP DRAWN USING AIR PHOTOGRAPH
APPROXIMATE SCALE
0'
200'
400'
600'
N
CREEK
CREEK
POND
POND
RT 8
RT 22
RT 22
RT 22
RT 121
COURT RD
TARLETON ROAD
ST PATRICKS
BEDFORD PLAYHOUSE
EXXON SERVICE STATION
ARCADE BUILDING
JEFFERSON LANE
THE FARMS ROAD
LAKE AVE
VINTON AVE
TURTLE POND LANE
WEST CIRCLE
HUNTING RIDGE MALL

FIGURE NO. 4-1

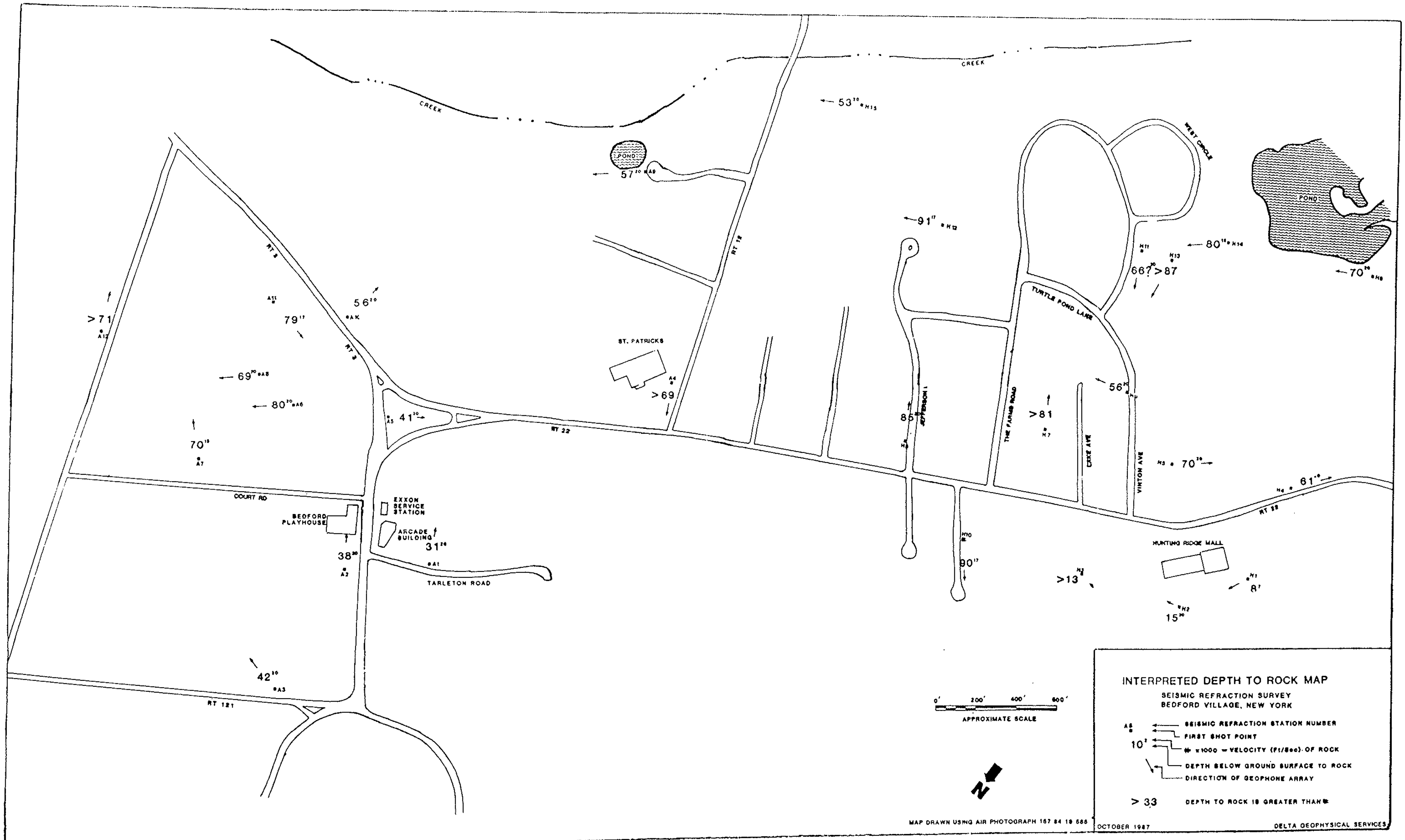

INTERPRETED DEPTH TO ROCK MAP
SEISMIC REFRACTION SURVEY
BEDFORD VILLAGE, NEW YORK
SEISMIC REFRACTION STATION NUMBER
FIRST SHOT POINT
x1000 = VELOCITY (Ft/Sec) OF ROCK
DEPTH BELOW GROUND SURFACE TO ROCK
DIRECTION OF GEOPHONE ARRAY
> 33
DEPTH TO ROCK IS GREATER THAN
OCTOBER 1987
DELTA GEOPHYSICAL SERVICES
APPROXIMATE SCALE
MAP DRAWN USING AIR PHOTOGRAPH
CREEK
POND
ST. PATRICKS
RT 22
RT 121
COURT RD
BEDFORD PLAYHOUSE
EXXON SERVICE STATION
ARCADE BUILDING
TARLETON ROAD
TURTLE POND LANE
WEST CIRCLE
THE FARMS ROAD
VINTON AVE
HUNTING RIDGE MALL

FIGURE NO. 4-2

Table No. 4–1

SEISMIC REFRACTION INTERPRETATION
SHOPPING ARCADE STUDY AREA

Station Number	Depth (Ft)	Velocity (Ft/Sec)	Interpreted Material
A1	0 to 7	1,100	TILL
	7 to 31	3,250	MOIST TILL
	Below 31	20,000	ROCK
A2	0 to 10	1,100	TILL
	10 to 38	3,500	MOIST TILL
	Below 38	20,000	ROCK
A3	0 to 8	1,100	TILL
	8 to 42	5,000	MOIST TILL
	Below 42	20,000	ROCK
A4	0 to 9	1,100	TILL
	9 to ?	4,500	MOIST TILL
	Depth to rock is greater than 69 feet		
A5	0 to 12	1,200	TILL
	12 to 41	6,000	MOIST TILL
	Below 41	20,000	ROCK
A6	0 to 10	1,200	TILL
	10 to 80	5,500	MOIST TILL
	Below 80	20,000	ROCK
A7	0 to 7	1,350	TILL
	7 to 70	4,500	MOIST TILL
	Below 70	15,000	ROCK
A8	0 to 8	1,100	TILL
	8 to 69	4,750	MOIST TILL
	Below 69	20,000	ROCK
A9	0 to 12	1,100	TILL
	12 to 57	7,000	MOIST TILL
	Below 57	20,000	ROCK
A10	0 to 11	1,000	TILL
	11 to 56	4,000	MOIST TILL
	Below 56	20,000	ROCK
A11	0 to 12	1,100	TILL
	12 to 79	4,600	MOIST TILL
	Below 79	17,000	ROCK
A12	0 to 15	1,250	TILL
	15 to ?	8,000	MOIST TILL
	Depth of rock is greater than 71 feet		

Figure No. 4-2 illustrates the seismic location and number, depth below ground surface to rock and the velocity of the rock. Again, the displayed velocity value can be multiplied by 1,000 to determine the actual velocity. For a complete review of the geophysical survey report for the Shopping Arcade Site, see Appendix C.

A comparison of depths to bedrock obtained using seismic refraction and actual depths to bedrock obtained from monitoring well borings revealed that the seismic data was relatively accurate in cases where boring locations coincided with seismic refraction data points with differences between estimated and actual depths to bedrock of less than five feet.

Depths to ground water obtained using seismic refraction were also compared to actual ground water levels obtained from monitoring wells. Again, the data correlated very well with differences between estimated and actual depths to ground water of less than five feet.

4.1.1.2 Terrain Conductivity

A limited terrain conductivity survey was undertaken on the Shopping Arcade property and at various locations in the project study area to determine the presence of buried underground tank(s) and other metal objects in order to assist in the placement of monitoring wells.

Profiling was undertaken using a Geonics EM 31-DC conductivity meter which provides measurement of both the quadrature-phase and in-phase components of terrain conductivity without ground electrodes or contact. The nominal depth of subsurface sampled by this equipment is about 18 feet. The survey was conducted with continuous operation of the instrument.

Individual conductivity surveys were performed on the Exxon gasoline station property, in front of the Shopping Arcade Building, in the parking lot behind the Bedford Playhouse, and behind the Fire Department Building. As a result of using this geophysical technique, monitoring wells MW-1, MW-2, MW-3, MW-4 and MW-5 were successfully installed.

4.1.2 Soil Boring and Monitoring Well Installation

4.1.2.1 General Description

Section 1.5 of this document includes a description of the hydrogeologic investigation portion of the Bedford Village Wells-Shopping Arcade Site as a multi-phased program comprised of Phases IIA and IIB. This program had been developed to supplement existing data and to provide a comprehensive site investigation which would characterize the hydrogeologic regime underlying the site. A further objective was to identify the source(s) of ground water contamination and to define the lateral and vertical extent of contaminated ground water to facilitate the evaluation and selection of a viable, long-term remedial action plan.

Initially, pertinent and available literature, technical reports and analytical data from the existing monitoring and water supply wells in the study area was reviewed. This provided a baseline characterization of the geology, ambient ground water quality and flow direction.

This previous information was incorporated into the design of the Phase IIA well drilling program. The main objective of the Phase IIA program was to evaluate the ground water quality, determine ground water flow direction and map the subsurface geology underlying the site on a preliminary basis. The two specific aquifers that were defined for investigation in the Shopping Arcade Study Area included the overburden/water table aquifer and the bedrock aquifer. Ground water monitoring was conducted in the two aquifers within four specific zones: water table, overburden/bedrock interface, shallow bedrock and deep bedrock.

During the Phase IIA sampling program, seven monitoring wells were installed at five well locations within the study area. Two of the Phase IIA boring locations (MW-4 and MW-5) consisted of two wells screened at different depths in separate boreholes in close proximity. The purpose of these well clusters in the hydrogeologic investigation was to determine:

- o Whether independent hydraulic regimes exist in the overburden zone and the competent bedrock zone;

- o The vertical hydraulic relationship and contaminant behavior/migration between the units; and

- o The vertical distribution of contaminants.

The Phase IIA well drilling program commenced in August 1987 and was completed in December 1987. Upon completion of monitoring well installation, all wells were sampled for chemical analysis. Wells were sampled a minimum of two weeks after completion.

Data obtained from the monitoring well boring logs (see Appendix D for boring logs) were organized and incorporated into hydrogeologic maps to illustrate the subsurface hydrogeologic conditions underlying the study area. Potentiometric (ground water flow direction) maps were assembled for the overburden/water table and bedrock aquifers. In addition, a bedrock surface contour map was constructed for the study area, and finally, hydrogeologic cross sections of the Shopping Arcade Study Area were prepared. These maps and cross sections are provided later in this section.

The chemical analytical data and the physical hydrogeologic data, based on the information generated by the Phase IIA sampling program, as well as the data from previous investigations, was reviewed. Trends in the data were noted and data gaps identified. This knowledge was utilized in designing the Phase IIB well drilling program. The objective of the Phase IIB program was to provide confirmatory data for defining the nature, extent and source(s) of the ground water contamination.

The Phase IIB drilling program, which commenced in April 1988 and was completed in September 1988, involved the installation of an additional six monitoring wells at four monitoring well locations. In addition, one exploratory contaminant source boring was advanced behind the Shopping Arcade building and soil samples were collected.

The following monitoring wells were constructed during the Phase IIA and Phase IIB well drilling program in the Shopping Arcade Study Area.

Phase IIA	Depth (ft)*
MW-1B	43.5
MW-2M	22.5
MW-3M	20.5
MW-4S	22
MW-4B	73
MW-5S	22
MW-5B	116

Phase IIB	Depth (ft)*
MW-6M	37
MW-6B	87.3
MW-7B	105
MW-8M	25
MW-8B	60
MW-10M	85.5
B-11**	32

* Depth below ground surface.
** Exploratory contaminant source borings.

Note: MW-#S refers to a shallow (overburden/water table) well
MW-#M refers to a mid-depth (overburden/bedrock interface) well
MW-#B refers to a bedrock well.

For a complete discussion regarding the rationale for the placement of the monitoring wells, refer to Sections 4.2.1 and 4.4.1. The locations of the wells in the study area are also provided in these sections in Figure Nos. 4-7 and 4-9.

4.1.2.2 Soil Boring and Rock Core Sampling

As mentioned in the previous section, soil borings were advanced in each of the well drilling phases (IIA and IIB). At the completion of each boring, a monitoring well was constructed within the borehole (with the exception of the exploratory contaminant source boring). During drilling, split spoon samples were collected in the deepest borehole in each well cluster generally at five foot intervals in the unconsolidated deposits except for the exploratory contaminant source boring where continuous split spoon samples were collected. Split spoon samples were obtained to classify the stratigraphic sequences underlying the study area. The recovered soil samples were inspected and logged characterizing the soil type, color, grain size and moisture content. Selected grain size analyses were performed and the results are presented in Section 4.1.6. In addition, the samples were screened for the presence of organic chemical vapors, and if the samples were suspected of containing significant concentrations of contaminants, they were submitted to a field laboratory for chemical analysis/screening. A representative sample from each split spoon was preserved in a glass sample jar for future reference.

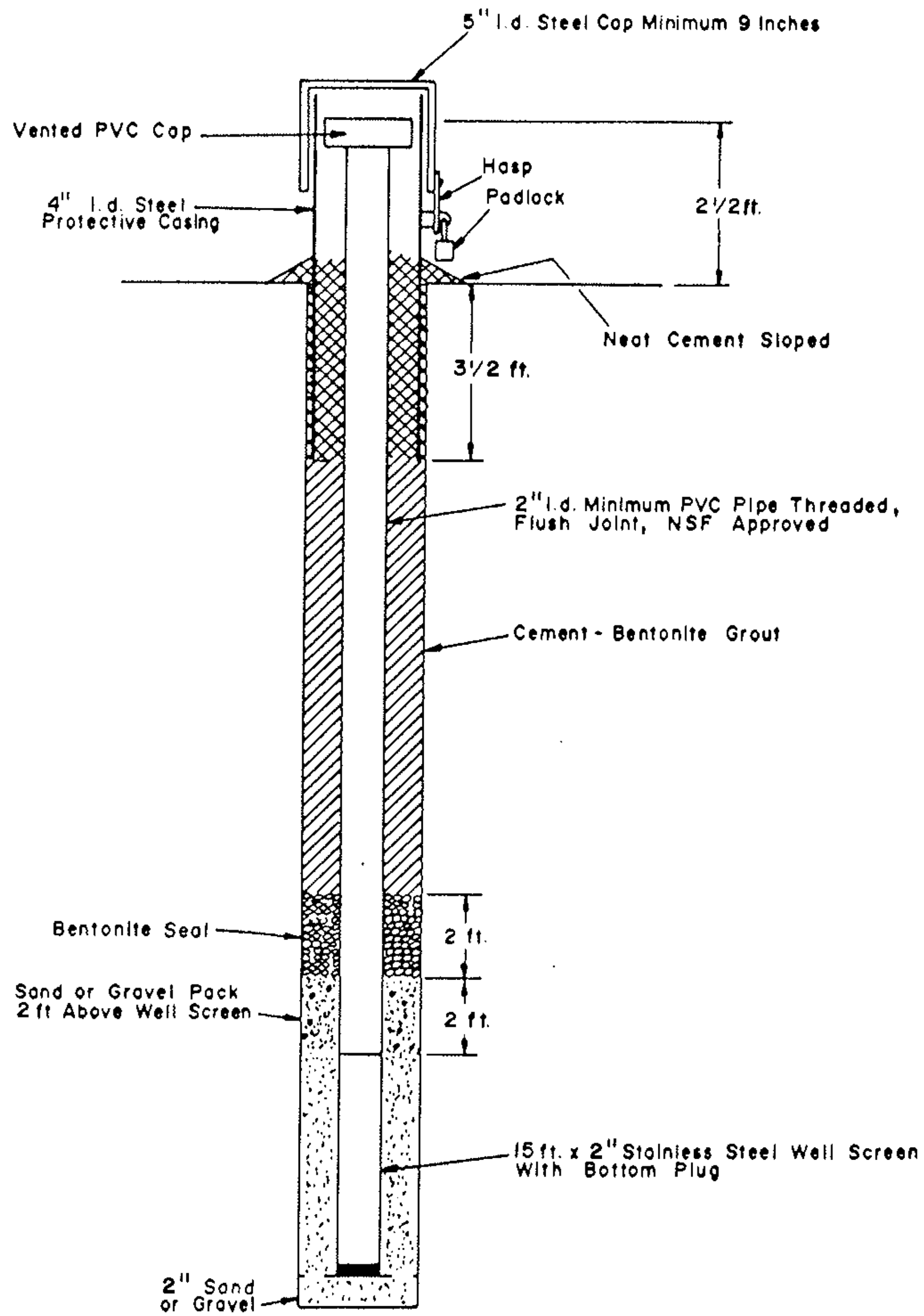
Continuous rock core samples were collected within the bedrock borings. The rock cores were examined and a permanent log was recorded to establish the lithology and physical characteristics of the bedrock unit. A complete visual description of the core was recorded, including the rock type, color, hardness, size and shape of grains (if discernable), sorting, cementation and fractures. The samples of bedrock were stored in labeled core boxes for future reference. These samples were given to the SUNY-New Paltz Geology Department and the New York State Geological Survey in Albany.

4.1.2.3 Well Construction

Shallow Overburden Monitoring Wells

The shallow overburden monitoring wells were designed to intercept and effectively monitor the shallow water table system which exists in the unconsolidated deposits. The two shallow wells installed (MW-4S and MW-5S) were constructed at a depth of 22 feet below ground surface. Borings were advanced through the overburden zone using hollow stem augers. The augers were of sufficient diameter (four inch inner diameter) to allow for the installation of a two inch diameter stainless steel screen and flush joint, threaded Schedule 40 PVC casing. (Fifteen feet of 0.006 screen [machine cut slots] was installed with 10 feet of stainless steel screen situated in the saturated portion of the borehole. Situating the screen in this manner will monitor and detect any light fractions of organic compounds which may be "floating" on the ground water surface (such as benzene, toulene and xylene) as well as compensate for seasonal variation in ground water levels. A two inch diameter PVC riser extends from the top of the screen to an elevation of two feet above ground surface except where vaults were required.

In constructing the well, the annulus of the borehole was sand-packed to a height of two feet above the screened interval with clean silica sand, and a two foot seal of bentonite pellets was placed immediately above the filter material. The remaining annulus was grouted with a cement/bentonite slurry using a tremie pipe to prevent bridging and to ensure the filling of all voids. Finally, a four inch diameter protective outer steel surface casing with locking cap was installed except where vaults were used. (See Figure No. 4-3 for an illustration of the construction of a water table well.)



Dvirka and Bartilucci CONSULTING ENGINEERS

SHALLOW/WATER TABLE WELL

FIGURE NO. 4-3

Overburden/Bedrock Interface Monitoring Wells

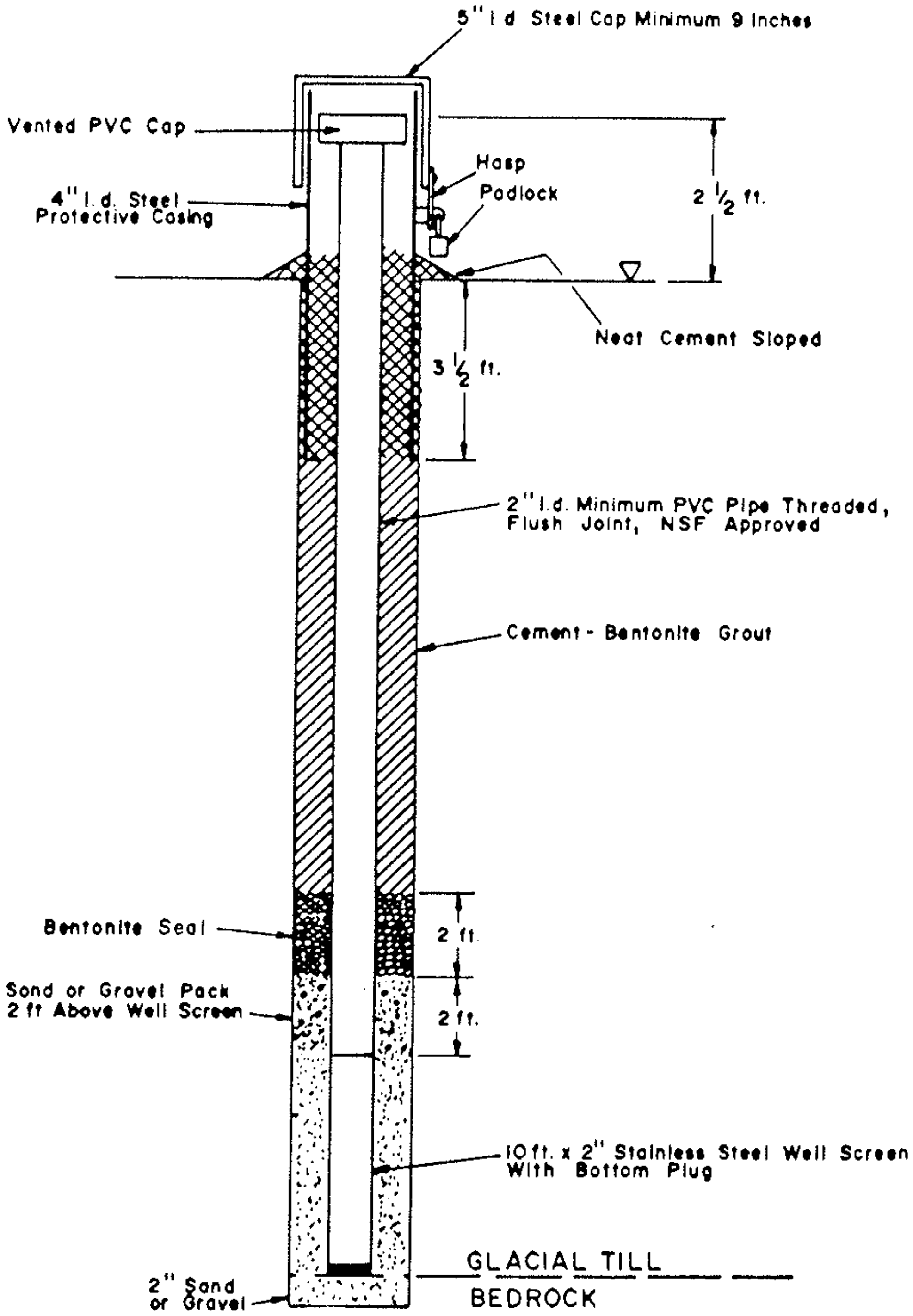
The construction depth of the overburden/bedrock interface monitoring wells varied from 20.5 feet to 85.5 feet depending on their location within the river valley and the thickness of the overburden deposits. When constructing the interface monitoring wells, the well screens were situated at the top of the overburden/bedrock interface. Monitoring this zone will detect heavy volatile organic compounds (such as, tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, etc.) that may be found migrating along the bedrock surface. Construction techniques for the interface monitoring wells are the same as those for the shallow overburden wells described above with the exception that 10 feet of screen was installed rather than the 15 feet installed in the shallow overburden wells. (See Figure No. 4-4 for an illustration of the construction of the overburden/bedrock interface well.)

Bedrock Monitoring Wells

Each bedrock well was designed to intercept and monitor the quality of ground water in the upper fractured zone of the bedrock strata. These wells were installed by augering to the bedrock with six inch inner diameter hollow stem augers. When bedrock was encountered, a five foot hole/socket was drilled (roller bit reamed) into rock and a four inch PVC casing was grouted in place with a tremie pipe. The casing was allowed to set for a minimum of 24 hours. Once a secure impermeable seal was established in the rock, an open hole (three inch diameter) was cored into bedrock. Coring (a minimum of 30 feet) was continued until a water bearing fracture zone was encountered. A six inch diameter protective steel surface casing with locking cover was installed over the monitoring well riser pipe, except where vaults were required. (See Figure No. 4-5 for an illustration of the construction of the bedrock well.)

4.1.2.4 Well Development

Well development helps restore the natural hydraulic conductivity of the formation between the well and aquifer. In addition, it removes extraneous drilling fluids that may have been introduced during borehole construction and fine grained sediments in the formation immediately in the vicinity of the well screen to ensure to the maximum extent possible, that turbid-free ground water samples can be obtained. Monitoring wells in the Shopping Arcade Study Area were either developed using an air compressor with an in-line filter, hand bailed with a PVC bailer or evacuated with a PVC hand pump. Water was removed from the wells until it was "clear" as determined by the on-site geologist in consultation with the NYSDEC field representative.



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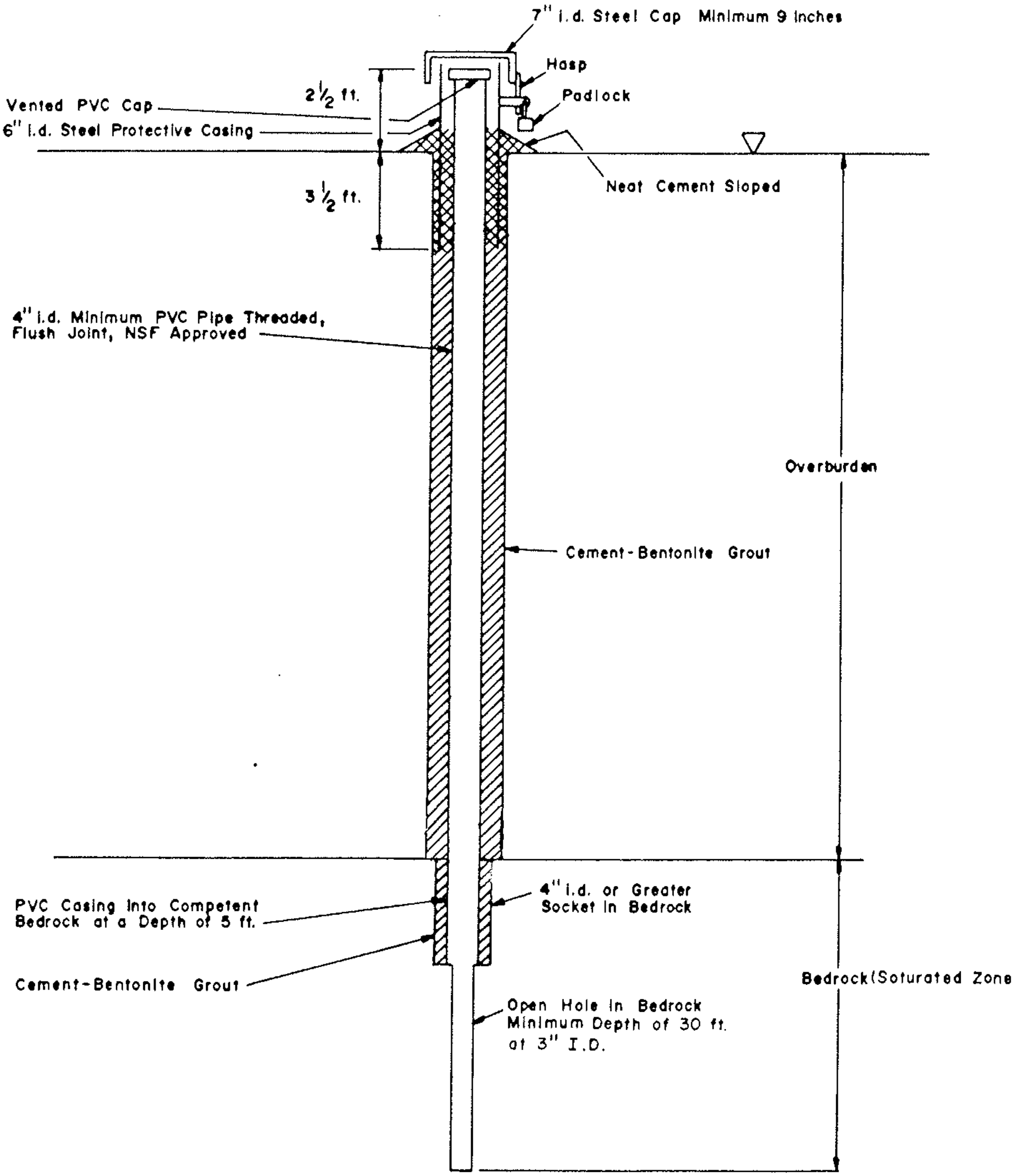
MID-DEPTH/INTERFACE WELL

FIGURE NO. 4-4



Dvirka and Bartilucci CONSULTING ENGINEERS

DEEP/BEDROCK WELL

FIGURE NO. 4-5

4.1.2.5 Decontamination Procedures

Decontamination of drilling equipment was performed at the designated equipment staging area which was located at the Town of Bedford Highway Department Garage at the end of Crusher Road in Bedford Village. A temporary decontamination pad was constructed at the staging area. The decontamination pad was lined with plastic, bermed and graded so that residual soils and water would drain into the deep portion (sump) of the pad for collection. The contents of the sump were pumped out following each decontamination event and temporarily stored in 55 gallon drums prior to being treated by an activated carbon system and discharged.

Prior to drilling the first well and following the completion of drilling at each borehole, all down-hole equipment (augers, rods, plugs, etc., including the drilling rig) was brought to the decontamination pad and steam cleaned.

The procedures followed for decontamination of the split spoon samplers involved removing gross contamination and soil residue using a potable water rinse. This was followed by washing the split spoons with a solution of potable water and Alconox soap. The split spoon samplers were then rinsed with distilled water.

4.1.3 Organic Vapor Screening of Soil Samples

As described above, as part of the construction of each monitoring well, soil samples were obtained using a split spoon sampler at five foot intervals. These soil samples were used to classify the stratigraphic units underlying the study area. In addition, immediately upon retrieval of the split spoon sampler, a representative soil sample was collected in a six ounce drilling jar which was tightly capped. Approximately a one inch head space was allowed between the soil sample and cap so that soil gases could equilibriate in the void/head space.

The soil sample was allowed to warm up for a period of approximately 10 minutes. Using a Century Organic Vapor Analyzer (OVA), Model 128 (flame ionization detector), a probe was quickly introduced into the head space and a reading of the total volatile organic compounds was recorded in relation to depth on the Well Log Forms.

The values recorded were used in interpreting and differentiating zones of contamination in the unconsolidated deposits underlying the study area. Soil samples which recorded significant volatile organic head space values were collected and sent to a field laboratory for chemical screening analysis. The results of the soil screening with the OVA are provided on the boring logs in Appendix D, and the results of screening by the field laboratory are presented in Table 4-2.

4.1.4 Soil Gas Survey

There exist three distinct hydrogeologic zones within the unconsolidated sediments underlying the site. One is the zone of saturation (or phreatic zone) in which all the voids between the soil grains are filled with fluid. This zone is monitored at the site utilizing wells which provide representative ground water samples from the formation.

Located above the zone of saturation is the capillary fringe. The capillary fringe is a zone in which the voids between soil particles are only partially filled with fluid as a result of capillary forces.

Above the capillary fringe is the vadose zone or more commonly referred to as the unsaturated zone. Within this zone, the voids between the soil particles are filled with vapor/gas. Under ideal conditions the gas trapped in the soil can exhibit similar volatile organic chemical qualities as the ground water beneath.

Soil gas sampling and analysis can be utilized as a reconnaissance tool to monitor the vadose zone and which at times can reduce the time and costs associated with locating and delineating plumes of ground water contamination (as well as areas of contaminated soil). Once the data from the soil gas survey is examined, it is necessary to confirm the results with analysis of soil and ground water samples. The mapping of soil gas contaminant concentrations can assist in designing the placement of the soil borings and the ground water monitoring network.

The New York State Department of Environmental Conservation (NYSDEC) retained the services of the United States Environmental Protection Agency (USEPA) to conduct a soil gas survey in the Shopping Arcade Study Area as part of the Remedial Investigation. Samples were obtained at 69 locations in the study area as shown in Figure No. 4-6.

Table No. 4–2

SOIL SAMPLE SCREENING

PHASE IIA

Sample Number	Sample Location	Date Collected	Matrix	Tetra–chloro–ethene (ppb)	Tri–chloro–ethene (ppb)	1,2–Di–chloro–ethene (ppb)	Benzene (ppb)	Toluene (ppb)	Xylene (ppb)
B38731305	MW–1B (5–7')	11/3/87	soil	ND	ND	ND	ND	5	ND
B38731306	MW–2M (5–7')	11/5/87	soil	ND	ND	ND	ND	ND	ND
B38731307	MW–2M (10–12')	11/5/87	soil	ND	ND	ND	ND	ND	ND
B38731308	MW–2M (15–17')	11/5/87	soil	ND	ND	ND	ND	ND	ND
B38731309	MW–2M (20–22')	11/5/89	soil	ND	ND	ND	ND	ND	ND
B38731701	MW–3M (5–7')	11/9/89	soil	ND	ND	ND	ND	6	ND
B38731702	MW–3M (10–12')	11/9/87	soil	ND	ND	ND	ND	ND	ND
B38731703	MW–3M (15–17')	11/9/87	soil	ND	22	ND	ND	32	ND
B38731704	MW–3M (20–22')	11/9/87	soil	ND	34	ND	ND	50	ND
B38731705	MW–4M (5–7')	11/11/87	soil	ND	ND	ND	ND	ND	ND
B38731706	MW–4M (10–12')	11/11/87	soil	ND	ND	ND	ND	ND	ND
B38731707	MW–4M (15–17')	11/12/87	soil	ND	ND	ND	ND	ND	ND
B38731708	MW–4M (20–22')	11/12/87	soil	ND	ND	ND	ND	ND	ND
B38731709	MW–4M (25–27')	11/12/87	soil	ND	ND	ND	ND	ND	ND
B38731710	MW–4M (30–32')	11/12/87	soil	ND	ND	ND	ND	ND	ND
B38731301	MW–5S (5–7')	10/28/87	soil	ND	ND	ND	ND	6	ND
B38731302	MW–5S (10–12')	10/28/87	soil	ND	ND	ND	ND	ND	ND
B38731303	MW–5S (15–17')	10/28/87	soil	ND	ND	ND	ND	ND	ND
B38731304	MW–5S (20–22')	10/28/87	soil	ND	ND	ND	ND	ND	ND

Table No. 4–2 (continued)

SOIL SAMPLE SCREENING

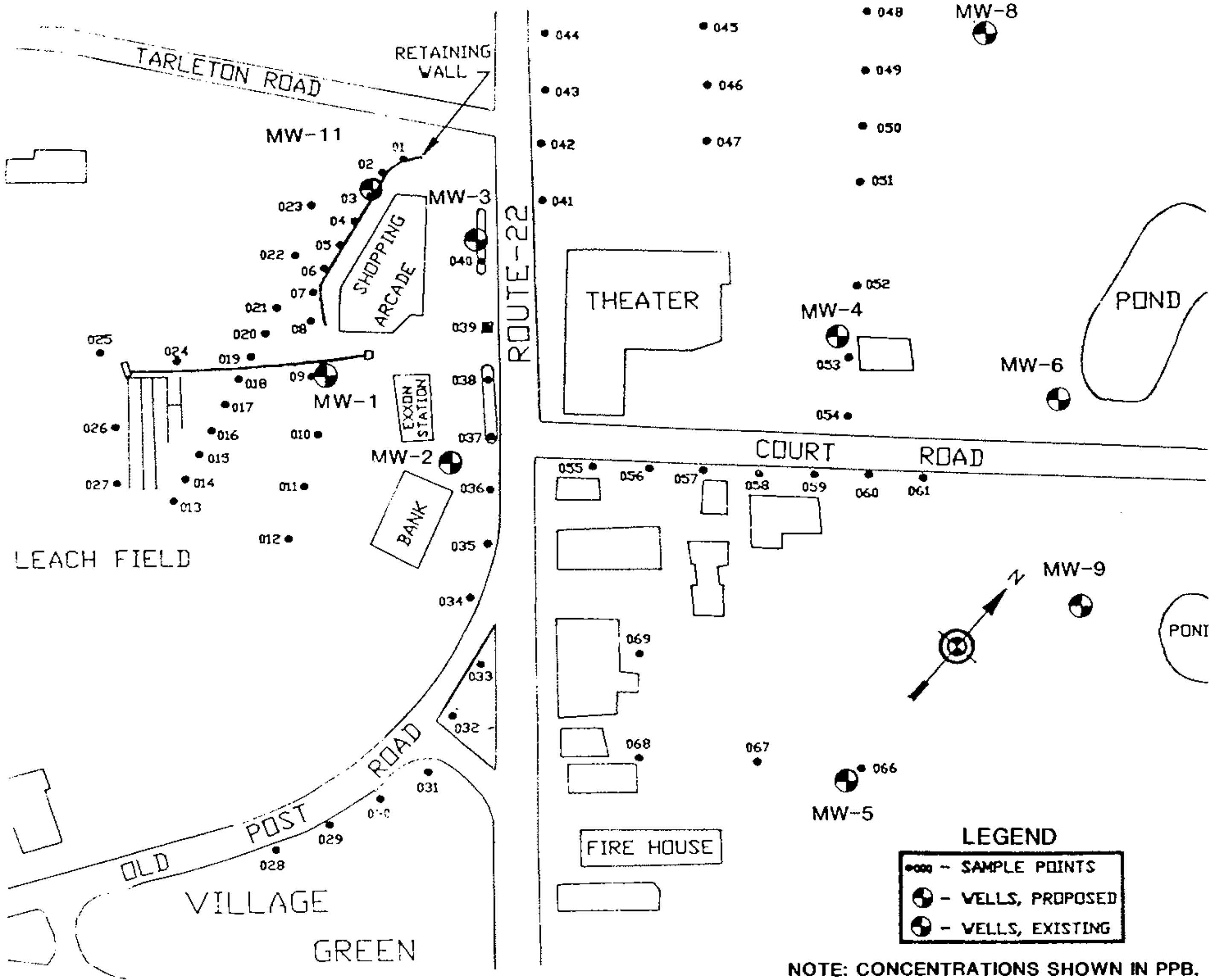
Phase IIA

Sample Number	Sample Location	Date Collected	Matrix	Tetra–chloro–ethene (ppb)	Tri–chloro–ethene (ppb)	1,2–Di–chloro–ethene (ppb)	Benzene (ppb)	Toluene (ppb)	Xylene (ppb)
B38734101	MW–5B (33–35')	12/03/87	soil	ND	ND	ND	ND	ND	ND
B38734102	MW–5B (40–42')	12/03/87	soil	ND	15	ND	ND	ND	ND
B38734103	MW–5B (45–47')	12/03/87	soil	ND	14	ND	ND	ND	ND
B38734104	MW–5B (50–52')	12/04/87	soil	ND	ND	ND	ND	ND	ND
B38734105	MW–5B (55–57')	12/04/87	soil	ND	ND	ND	ND	ND	ND
B38734106	MW–5B (65–67')	12/05/87	soil	ND	ND	ND	ND	ND	ND
B38734107	MW–5B (75–77')	12/05/87	rocks			sample not analyzed			

Phase IIB

Sample Number	Sampling Point	Tetra–chloro–ethene (ppb)	Tri–chloro–ethene (ppb)	Trans–1,2–Dichloro–ethene (ppb)	1,1–Di–chloro–ethene (ppb)	1,1,1–Tri–chloro–ethane (ppb)	Vinyl Chloride (ppb)	Benzene (ppb)	Toluene (ppb)
388–194–07	MW–11SA (0–2')	10.4	ND	ND	ND	ND	ND	ND	ND
388–194–08	MW–11SA (4–6')	ND	7.4	ND	ND	ND	ND	ND	ND
388–194–09	MW–11SA (22–24')	ND	6.1	ND	ND	ND	ND	ND	ND
388–195–01	MW–11SA (30–32')	ND	5.7	ND	ND	ND	ND	ND	ND
388–195–02	MW–11SA (water)	ND	6.9	ND	ND	ND	ND	ND	ND

Note: ND – Not Detected



SOURCE: U.S.E.P.A.

NOTE: CONCENTRATIONS SHOWN IN PPB.

SHOPPING ARCADE STUDY AREA

SOIL GAS SURVEY
SAMPLE STATION LOCATIONS

Dvirka and Bartilucci CONSULTING ENGINEERS

FIGURE NO. 4-6

The analytical data generated from the soil gas sampling indicated the presence of tetrachlorethene and trichloroethene as well as benzene, toluene and other hydrocarbons in the subsurface. The results showed that significant tetrachloroethene contamination was detected in only one sample located directly behind the former dry cleaning establishment at the Shopping Arcade, and only in trace amounts at two other locations (one sample near MW-5). Trichloroethene was found at four locations, but only confirmed by GC/MS analyses in two samples downgradient of the Shopping Arcade along Route 22 in front of the Exxon gasoline station. In addition, benzene, toluene and other hydrocarbons were detected in most samples, however, it is not uncommon to find such high levels of hydrocarbons in soil gas near gasoline stations.

The results of the soil gas investigation were used in the planning and design of the Phase IIB well drilling program. For a review of the soil gas report prepared by USEPA, refer to Appendix E.

4.1.5 Borehole Logging Tests

Downhole borehole logging was performed at three bedrock borehole locations within the Shopping Arcade Study Area. The three bedrock borehole locations included the abandoned Bedford Resource Center School production well on Court Road, the abandoned Exxon production well located behind the Exxon Station and monitoring well MW-5M located behind the Bedford Firehouse. The downhole borehole logging tests included caliper, resistivity, gamma-ray and specific potential logging. The following provides a brief review of the type and rationale for each of the logging tests performed.

Caliper - The caliper log provided a continuous record of borehole diameter. These logs are useful in determining the location and extent of openings in the sides of the borehole caused by caving, fracturing and solutioning.

Electrical Resistivity - The electrical resistivity logs form a continuous record of the resistance to flow of an electrical current from points within the borehole to an electrical ground at land surface. Sandstone units containing fresh water have a high resistance, while shales have a low resistance. This log is useful for determining lithology and stratigraphic correlation as well as the presence of water producing fractures in bedrock of low porosity.

<u>Spontaneous Potential</u> – The spontaneous potential logs record small differences in voltage that develop at the contact of the borehole fluid, the surrounding rock and the water in the aquifer. The logs are used for determining lithology, predominantly with regard to shale and clay content.

<u>Gamma Ray</u> – Natural gamma logs indicate the amount of natural gamma radiation emitted by the rock surrounding the borehole. In general, shales give off more radiation than sandstones or carbonate rocks, typically because of their potassium content. Consequently, the logs are useful in determining lithology and in making stratigraphic correlations.

The predominant rationale for performing downhole logging at the three well locations within the Shopping Arcade Study Area was to obtain a better understanding of the degree of fracturing within the metamorphic bedrock and the pathway by which contaminants are migrating through the bedrock zone. These wells were the deepest drilled as part of the Remedial Investigation.

The abandoned Exxon production well was chosen for downhole logging because of its depth (310 feet) and its close proximity to the Arcade's sanitary disposal system which is suspected to be an origin of contaminant release. This well also contained some of the highest concentrations of the analytes of concern detected in ground water within the study area.

The monitoring well MW-5B was chosen for downhole logging because it was the deepest well available in the southeast quadrant of the study area. This location is between the suspected source and the Mianus River discharge.

The Bedford Resource Center School abandoned well was chosen for its easterly position in relation to the suspected source as well as the fact that it was the deepest well available (650 feet) for performing downhole logging in the study area. This well is also representative of the geology in the central portion of the valley just east of Bedford Village.

A review of the downhole logging tests performed on the three wells indicates that the gneiss bedrock underlying the study area is relatively massive and very competent in structure. Overall, the caliper log did not detect significant zones of fracturing within the gneiss. However, in the abandoned Exxon well at 300 feet and in monitoring well

MW-5B at 86 feet, a lithologic change occurred and limestone was encountered underlying the gneiss. The caliper log noted solution cavities within this limestone lithology and at the time when the drilling activities were being observed, it was noted that this limestone strata was capable of producing significant quantities of ground water as compared to the gneiss.

The resistivity, spontaneous potential and gamma data obtained from the tests yielded small amounts of information and little can be determined regarding the preferred ground water flow pathways at specific depths. The anomalies noted in the gamma logs within the gneiss are probably influenced by locally high concentrations of potassium feldspar crystals within the gneiss bedrock.

4.1.6 Permeability

For the purpose of this investigation, permeabilities were estimated by applying the Hazen Equation to grain size analysis curves. The grain size analysis curves were generated from soil samples that were collected at the screened intervals of monitoring wells MW-3M, MW-4M and deep in the overburden at MW-5B which are located downgradient of the Shopping Arcade and are representative of the geology in the study area. The grain size analyses are contained in Appendix F.

The Hazen Equation is $K = Ad_{10}^2$, where the parameter K represents permeability. The parameter d_{10} represents effective grain size and is taken directly from the grain size gradation curve as determined by sieve and hydrometer analysis. It is the grain size diameter at which 10% by weight of the soil particles are finer and 90% are coarser. For K in cm/s and d_{10} in mm, the coefficient A is equal to 1.0.

The following are permeability calculations for unconsolidated sediments collected from the screen depths of MW-3M, MW-4M and in the deep overburden at MW-5B.

MW-3M (15 to 22 feet)

$d_{10} = 0.015$

$K = 1.0\ (0.015)^2$

$= 2.25 \times 10^{-4}$ cm/sec

Fine to coarse sand, some silt, trace gravel.

MW-4M (25 to 32 feet)

$d_{10} = 0.06$
$K = 1.0\ (0.06)^2$
$= 3.6 \times 10^{-3}$
Fine to medium sand, little silt.

MW-5B (50 to 57 feet)

$d_{10} = 0.07$
$K = 1.0\ (0.07)^2$
$= 4.9 \times 10^{-3}$
Fine to medium sand, little silt.

The above calculations display relatively uniform high permeability values which are characteristic of the generally clean, well sorted sands found in the study area. By comparing the grain size descriptions noted in the boring logs with the corresponding permeability values, it appears that the glacial stratified drift deposits overlying the bedrock in the study area are relatively isotropic (a medium whose properties are the same in all directions).

4.1.7 Water Level Measurements

After the monitoring wells were installed in the study area, a permanent reference point was established on the top of the PVC riser pipe casing by scribing. This reference point was surveyed to an accuracy of 0.01 feet in relation to mean sea level. Water levels were periodically measured to an accuracy of 0.01 feet in all wells, and the data recorded on a log. Ground water elevations were obtained utilizing an electronic water level indicator (Slope Indicator Model 51453). Water level measurements provided the necessary base line data in the study area for:

- o Calculating the direction and magnitude of lateral and vertical hydraulic gradients within the unconsolidated and bedrock units.
- o Determination of fluctuation/seasonal variation in water levels.
- o Determination of hydraulic interconnection between the shallow and deep water table zones.

The results of the ground water levels obtained during the Remedial Investigation are presented later in Section 4.7.2.

4.1.8 Ground Water Sampling

4.1.8.1 Well Evacuation

Ground water in the well column can be effected by pressure, degassing and prolonged contact with the well construction materials. Standing water within the well may not be representative of in-situ ground water quality. Therefore, it is essential to evacuate the standing water in the well and filter pack so that it can be replaced with representative formation ground water.

Fluorocarbon resin/Teflon bailers were utilized in evacuating three well volumes from each monitoring well prior to sampling. Pre-cleaned (decontaminated) bailers were incorporated in the evacuation procedure to minimize the potential of introducing contamination into the monitoring wells. In addition, precautionary measures, such as using clean gloves, dedicated braided nylon cord, and plastic sheeting placed around the well head during the purging and sampling procedures, were exercised.

4.1.8.2 Sample Withdrawal, Preservation and Handling

Once three well volumes of ground water were removed, sample containers provided by the analytical laboratory were taken from the coolers and filled with ground water samples obtained from the same bailer which was utilized in purging the monitoring well. Samples were transferred directly from the bailer into the laboratory containers.

Since many of the chemical constituents and physiochemical parameters that were measured in the ground water monitoring program are not chemically stable, sample preservation was required. Sample preservation is generally intended to retard biological action, retard hydrolysis and reduce absorption effects. Preservation methods which were required by the NYSDEC 1986 Contract Laboratory Protocol (CLP) and utilized included pH control by chemical addition, refrigeration and protection from light.

Upon completion of daily sampling, Chain-of-Custody Forms were completed and the sample coolers were delivered to the laboratory within 48 hours as specified by NYSDEC.

4.2 Description of the Phase IIA Sampling Program

This section reviews the specific components and associated activities of the Phase IIA sampling program.

The objective of the Phase IIA sampling program was to collect and analyze subsurface (soil and ground water) data from the Shopping Arcade Site and the surrounding area. As described in Section 4.1.2, as a means of developing this information, soil borings and monitoring wells were installed. Soil samples were obtained from the borehole and screened in the field with utilizing an Organic Vapor Analyzer (OVA). After screening by the OVA, a number of soil samples were selected for chemical analysis at the NYSDEC laboratory in Saratoga, or with an infield Gas Chromatograph (GC) provided through NYSDEC and located in Spring Valley. Once the monitoring wells were constructed, representative ground water samples were collected and sent to a NYSDEC certified laboratory for analysis. The analytical data generated as part of the Phase IIA sampling program, complimented by the data produced in the Phase IA sampling program, made it possible to identify on an initial basis, the location of the sources of contamination, to assess the surficial transport and subsurface migration pathway, and extent of contaminants in the study area, as well as to assist in making decisions on specific sampling locations for the Phase IB and IIB components of the remedial investigation.

The following activities were undertaken during the Phase IIA Sampling Program:

- o Pertinent, available literature, and technical reports and data were reviewed. These included:
  - Dvirka and Bartilucci Consulting Engineers "Remedial Investigation – Interim Report Phase IA Sampling Program (Shopping Arcade), December, 1987."
  - Leggette, Brashers and Graham, Inc. "Ground Water Assessment, Town of Bedford, New York, December, 1985."
- o Oversight was provided for a limited tap water sampling program conducted at commercial establishments along Route 22 by the Westchester County Department of Health (WCDH) in September, 1987. The program was conducted by personnel from the WCDH with review provided by a

representative of Dvirka and Bartilucci Consulting Engineers. Some private well depth measurements and analytical data obtained from WCDH were confirmed and expanded upon as a result of discussions with the local proprietors.

- o Aerial photographs of the study area were obtained to provide the most recent information on land use patterns, potential sources of contamination, local topography and drainage patterns. In addition, aerial topographic contour maps (five foot contour intervals) were produced to further enhance the understanding of surficial and subsurface drainage patterns in the study area.

- o Data generated from the seismic survey conducted during Phase IA of this investigation was reviewed and incorporated in to the design and analysis of the results of the Phase IIA Sampling Program. This seismic survey was undertaken to obtain data on depth to, and slope of bedrock, and depth to ground water in the Mianus River Valley/study area.

- o Seven monitoring wells were constructed at five locations.

- o All monitoring wells constructed as part of the Phase IIA sampling program were sampled and surveyed, and ground water level readings were obtained and recorded. These measurements supplied the necessary data for determining ground water flow direction underlying and in the immediate vicinity of the site.

4.2.1 Selection of Ground Water Monitoring Well Locations

This section reviews the rationale for selecting the various Phase IIA monitoring well locations.

In part, as discussed previously, the rationale for the overall selection of monitoring well locations was based on the analytical data generated by prior ground water investigations, the analytical data obtained from the Phase IA Sampling Program, the location of the suspected source(s) of contamination, and the pre-supposition that ground water is flowing toward and discharging to the pond system adjacent to Court Road and ultimately to the Mianus River.

The following table summarizes the well depths for each monitoring well which was constructed in Phase IIA in the Shopping Arcade Site. The locations of the wells are illustrated in Figure No. 4-7.

Phase IIA Wells	Location	Depth (ft)*
MW-1D	Adjacent to the Shopping Arcade septic system	43.5
MW-2M	In the Exxon Gasoline Station parking lot (behind the building)	22.5
MW-3M	In front of the Arcade Building	20.5
MW-4S	In back of the Theatre Building	22
MW-4B		73
MW-5S	In back of the Fire Department	22
MW-5B		116

* Depth below ground surface

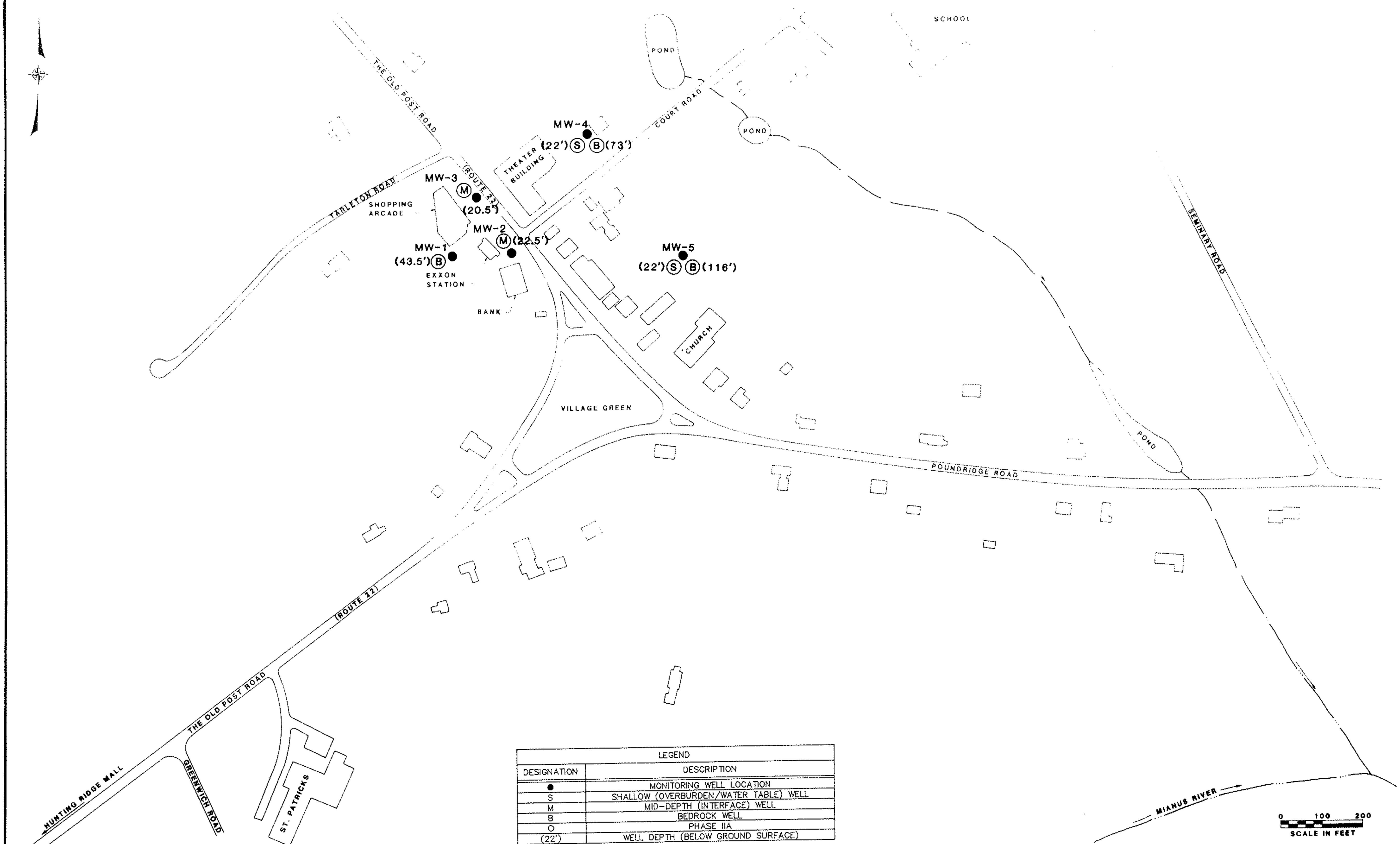
Note: MW-#S refers to a shallow (overburden/water table) well
MW-#M refers to a mid-depth (overburden/bedrock interface) well
MW-#B refers to a (shallow) bedrock well

The following outlines the rationale for the placement of the seven ground water monitoring wells in the study area.

- The bedrock well installed at the MW-1 location provides ground water quality data in the upper fractured zone of the bedrock in the area immediately adjacent to a suspected source of ground water contamination.

- Monitoring wells at MW-2 and MW-3 were installed at these locations to document the ground water quality in areas east and immediately downgradient of the Shopping Arcade Site.

- The well clusters installed at the MW-4 and MW-5 provide data on the ground water quality that has migrated from the Shopping Arcade Site towards the pond/wetland system that discharges to the Mianus River.



LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
S	SHALLOW (OVERBURDEN/WATER TABLE) WELL
M	MID-DEPTH (INTERFACE) WELL
B	BEDROCK WELL
O	PHASE IIA
(22')	WELL DEPTH (BELOW GROUND SURFACE)

NO.	DATE	REVISION	INT.

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CONSULTING ENGINEERS
Syosset, New York

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE II A
MONITORING WELL LOCATIONS

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 4-7

4.2.2 Analytical Parameters

For all Phase IIA samples collected, laboratory analysis was conducted to determine the presence of volatile organic chemicals (VOCs) including, but not limited to, tetrachloroethene, trichloroethene, cis/trans-1,2-dichloroethene, vinyl chloride, 1,1,1-trichloroethane, benzene, toulene and xylene (the analytes of concern in the study area). In addition, approximately 50 percent of the samples obtained were analyzed for the Hazardous Substance List (HSL) compounds.

4.2.3 Location of Background Ground Water Monitoring Well

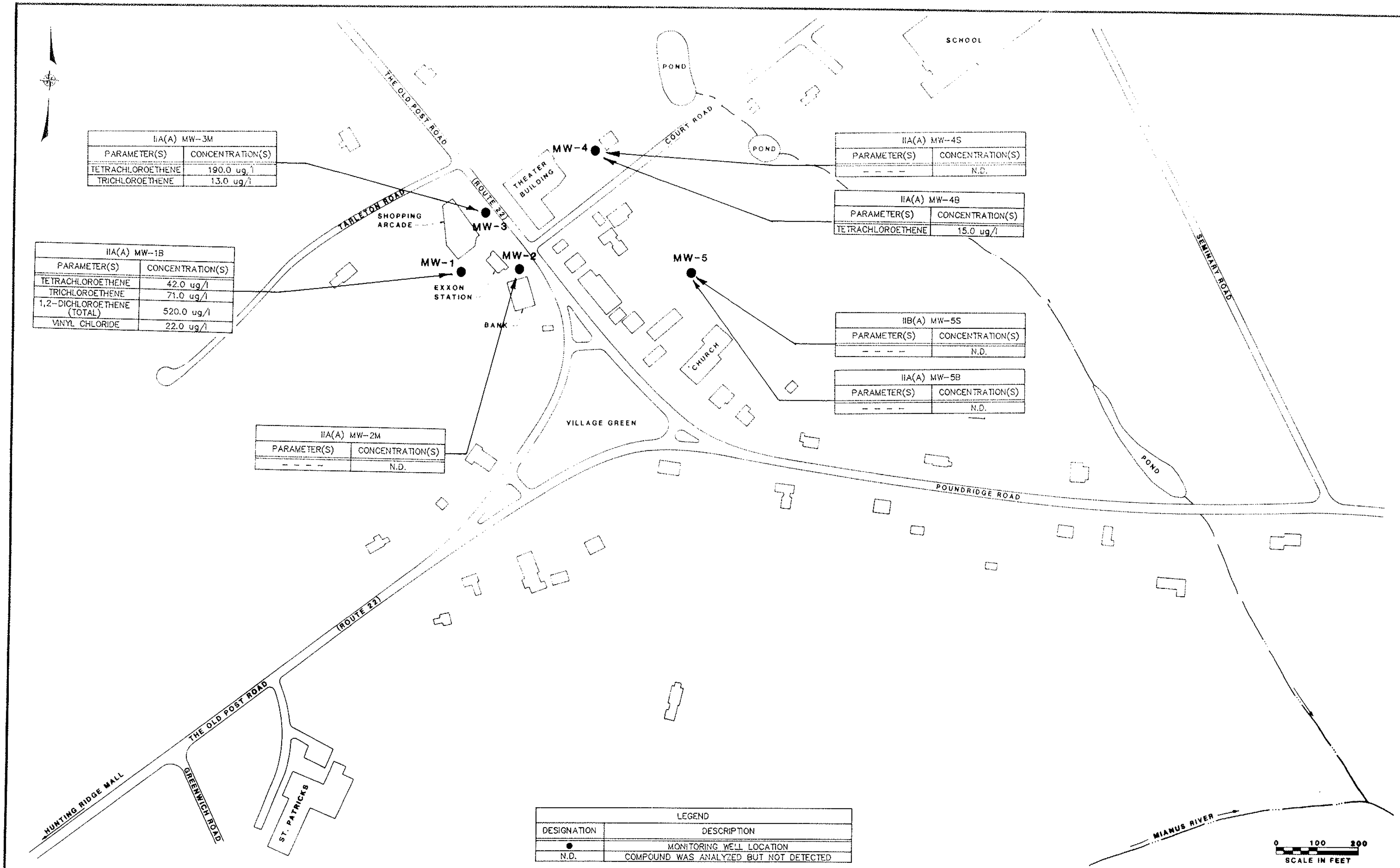
The Phase II well drilling program was designed to confirm data obtained in the past, and to better define the suspected source(s) and extent of contamination in the study area in order to develop an appropriate remedial action, if required. At the completion of the Phase IIA program, ground water flow patterns were determined in the water table zone as well as at the overburden/bedrock interface.

As part of the Phase IIB well drilling sampling program, an upgradient monitoring well was constructed east of the Shopping Arcade Site along Tarleton Road. Representative ground water samples were collected at this site as a control in the program to document the ambient quality of ground water. This provides better definition of the suspected source and degree of contamination in the study area.

4.3 Analytical Results of the Phase IIA Sampling Program

The purpose of this section is to present the analytical results of samples which were collected during the baseline component of the ground water sampling program. The purpose of obtaining and analyzing these samples is twofold. First, the evaluation of the data would assist in determining where and how the analytes of concern are moving through the ground water system in the study area and to determine/confirm possible sources of contamination, and second, the results of the sampling effort would assist in the design of future phases of the sampling program.

Figure No. 4-8 presents a map of the study area which identifies the locations in the Shopping Arcade Study Area from which ground water samples were collected, along with the analytical results of each sample for the analytes of concern and other organic and inorganic contaminants detected. For purposes of presenting the sampling program



IIA(A) MW-3M

PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	190.0 ug/l
TRICHLOROETHENE	13.0 ug/l

IIA(A) MW-1B

PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	42.0 ug/l
TRICHLOROETHENE	71.0 ug/l
1,2-DICHLOROETHENE (TOTAL)	520.0 ug/l
VINYL CHLORIDE	22.0 ug/l

IIA(A) MW-2M

PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IIA(A) MW-4S

PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IIA(A) MW-4B

PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	15.0 ug/l

IIB(A) MW-5S

PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

IIA(A) MW-5B

PARAMETER(S)	CONCENTRATION(S)
- - - -	N.D.

LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
N.D.	COMPOUND WAS ANALYZED BUT NOT DETECTED

NO.	DATE	REVISION	INT

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BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE II A
ORGANIC CHEMICAL SAMPLING RESULTS

PROJECT NO 842
DATE
SCALE AS NOTED
FIGURE NO 4-8

results, each sampling point is identified by an identification number. For example, for a sampling point labeled "IIA(A)MW-1S," The "IIA" portion of the identification number indicates that the sample was collected during the Phase IIA portion of the sampling program. The "(A)" of the sample identification number designates that the sample was collected from within the Shopping Arcade Study Area. The next portion of the sample identification is the prefix MW- followed by a number such as "1," "2," "3," etc., through "5." This identifies the sample as being taken from a monitoring well and the specific location/identification of that well. The last element of the sample identification number is either a "S," "M" or "B", which indicates whether the monitoring well is shallow (water table), mid-depth (interface) or a bedrock well, respectively.

This sample identification number is also used on the Chain-of-Custody Forms and Field Log Forms. As such, background information regarding each sampling location including Location Sketches, field personnel involved, date and time of sample collection, meteorological conditions, etc., can be obtained from the forms which are contained in the Field Report (separate document) by cross referencing the forms to the appropriate sample identification number from Figure No. 4-8.

In the following sections, the sequence of data presentation will be by proximity to the suspected source in the study site. For each location, there is a presentation of organic and inorganic sampling results for the compounds detected. Cases where analytes of concern were reported are specifically discussed.

A summary of the organic and inorganic analytical results of samples collected in the Shopping Arcade Study Area as part of the Phase IIA program are presented in tabular format in Table No. 4-3. Samples reporting results for inorganic analyses were also analyzed for pesticides/PCBs, volatiles and semi-volatiles. All other samples were analyzed for volatiles only.

It is important to note that as shown in Table No. 4-3, multiple samples were obtained and analyzed at several locations during the Phase IIA sampling program because some of the initial analyses did not meet NYSDEC QA/QC requirements for Hazardous Substance List (HSL) analysis and the results were deemed invalid. All resampling results were analyzed for Target Compound List (TCL) constituents. Therefore, only those analytical results that met the NYSDEC QA/QC requirements for HSL and/or TCL analysis and resultant valid data is shown in both Table No. 4-3 and Figure No. 4-8, and presented in this report for discussion.

Table No. 4-3
BEDFORD VILLAGE
REMEDIAL INVESTIGATION / FEASIBILTY STUDY
SHOPPING ARCADE PHASE IIA SAMPLING PROGRAM
ANALYTICAL RESULTS

PARAMETERS	IIA(A)MW1B 1/20/89 + (ug/l)	IIA(A)MW1BA 3/2/89 (ug/l)	IIA(A)MW2M 1/20/88 + (ug/l)	IIA(A)MW2MA 3/2/89 (ug/l)	IIA(A)MW3M 1/20/88 + (ug/l)	IIA(A)MW3MA 2/28/89 (ug/l)
Volatiles:						
Acetone		ND		ND		ND
Benzene		ND		ND		ND
Bromodichloromethane		ND		ND		ND
Bromoform		ND		ND		ND
Bromomethane		ND		ND		ND
2-Butanone		ND		ND		ND
Chlorobenzene		ND		ND		ND
Carbon Disulfide		ND		ND		ND
Carbon Tetrachloride		ND		ND		ND
Chloroethane		ND		ND		ND
Chloroform		ND		ND		ND
Chloromethane		ND		ND		ND
Dibromochloromethane		ND		ND		ND
1,1-Dichloroethane		ND		ND		ND
1,2-Dichloroethane		ND		ND		ND
1,1-Dichloroethylene		ND		ND		ND
1,2-Dichloroethylene		520.0 D		ND		ND
1,2-Dichloropropane		ND		ND		ND
cis-1,3-Dichloropropene		ND		ND		ND
trans-1,3-Dichloropropene		ND		ND		ND
Ethyl Benzene		ND		ND		ND
2-Hexanone		ND		ND		ND
Methylene Chloride		ND		ND		ND
4-Methyl-2-Pentanone		ND		ND		ND
Styrene		ND		ND		ND
1,1,2,2-Tetrachloroethane		ND		ND		ND
Tetrachloroethylene		42.0		ND		190.0
Toluene		ND		ND		ND
1,1,1-Trichloroethane		ND		ND		ND
1,1,2-Trichloroethane		ND		ND		ND
Trichloroethene		71.0		ND		13.0
Vinyl Acetate		ND		ND		ND
Vinyl Chloride		22.0		ND		ND
Total Xylenes		ND		ND		ND
Other:						

Table No. 4-5 (continued)

PARAMETERS	IIA(A)MW1B 1/20/88 + (ug/l)	IIA(A)MW1BA 3/2/89 (ug/l)	IIA(A)MW2M 1/20/88 + (ug/l)	IIA(A)MW2MA 3/2/89 (ug/l)	IIA(A)MW3M 1/20/88 + (ug/l)	IIA(A)MW3MA 2/28/89 (ug/l)
Semi-Volatiles:						
Acenaphthene	ND	NA	ND	NA	ND	NA
Acenaphthylene	ND	NA	ND	NA	ND	NA
Anthracene	ND	NA	ND	NA	ND	NA
Benz(a)anthracene	ND	NA	ND	NA	ND	NA
Benzoic Acid	ND	NA	ND	NA	ND	NA
Benzyl Alcohol	ND	NA	ND	NA	ND	NA
Benzo(b)fluoranthene	ND	NA	ND	NA	ND	NA
Benzo(k)fluoranthene	ND	NA	ND	NA	ND	NA
Benzo(g,h,i)perylene	ND	NA	ND	NA	ND	NA
Benzo(a)pyrene	ND	NA	ND	NA	ND	NA
4-Bromophenyl Phenyl Ether	ND	NA	ND	NA	ND	NA
Butyl Benzyl Phthalate	ND	NA	ND	NA	ND	NA
4-Chloroaniline	ND	NA	ND	NA	ND	NA
bis (2-Chloroethoxy) methane	ND	NA	ND	NA	ND	NA
bis (2-Chloroethyl) ether	ND	NA	ND	NA	ND	NA
bis (2-Chloroisopropyl) ether	ND	NA	ND	NA	ND	NA
4-Chloro-3-Methylphenol (p-chloro-m-cresol)	ND	NA	ND	NA	ND	NA
2 Chloronaphthalene	ND	NA	ND	NA	ND	NA
2-Chlorophenol	ND	NA	ND	NA	ND	NA
4-Chlorophenyl Phenyl Ether	ND	NA	ND	NA	ND	NA
Chrysene	ND	NA	ND	NA	ND	NA
Dibenz(a,h)anthracene	ND	NA	ND	NA	ND	NA
Dibenzofuran	ND	NA	ND	NA	ND	NA
Di-n-Butylphthalate	ND	NA	ND	NA	ND	NA
1,2-Dichlorobenzene	ND	NA	ND	NA	ND	NA
1,3 Dichlorobenzene	ND	NA	ND	NA	ND	NA
1,4-Dichlorobenzene	ND	NA	ND	NA	ND	NA
3,3'-Dichlorobenzidine	ND	NA	ND	NA	ND	NA
2,4-Dichlorophenol	ND	NA	ND	NA	ND	NA
Diethylphthalate	ND	NA	ND	NA	ND	NA
2,4-Dimethylphenol	ND	NA	ND	NA	ND	NA
Dimethyl Phthalate	ND	NA	ND	NA	ND	NA
4,6-Dinitro-2-Methyl Phenol	ND	NA	ND	NA	ND	NA
2,4-Dinitrophenol	ND	NA	ND	NA	ND	NA
2,4-Dinitrotoluene	ND	NA	ND	NA	ND	NA
2,6-Dinitrotoluene	ND	NA	ND	NA	ND	NA
Di n Octyl Phthalate	ND	NA	ND	NA	ND	NA
bis (2-ethylhexyl) phthalate	320.0	NA	ND	NA	56.0	NA
Fluoranthene	ND	NA	ND	NA	ND	NA
Fluorene	ND	NA	ND	NA	ND	NA
Hexachlorobenzene	ND	NA	ND	NA	ND	NA
Hexachlorobutadiene	ND	NA	ND	NA	ND	NA
Hexachlorocyclopentadiene	ND	NA	ND	NA	ND	NA
Hexachloroethane	ND	NA	ND	NA	ND	NA

Table No. 4-3 (continued)

PARAMETERS	IIA(A)MW18 1/20/88 + (ug/l)	IIA(A)MW18A 3/2/89 (ug/l)	IIA(A)MW2M 1/20/88 + (ug/l)	IIA(A)MW2MA 3/2/89 (ug/l)	IIA(A)MW3M 1/20/88 + (ug/l)	IIA(A)MW3MA 2/28/89 (ug/l)
Indeno(1,2,3-cd)pyrene	ND	NA	ND	NA	ND	NA
Isophorone	ND	NA	ND	NA	ND	NA
2-Methylnaphthalene	ND	NA	ND	NA	ND	NA
2-Methyl Phenol	ND	NA	ND	NA	ND	NA
4-Methyl Phenol	ND	NA	ND	NA	ND	NA
Naphthalene	ND	NA	ND	NA	ND	NA
2-Nitroaniline	ND	NA	ND	NA	ND	NA
3-Nitroaniline	ND	NA	ND	NA	ND	NA
Nitrobenzene	ND	NA	ND	NA	ND	NA
2-Nitrophenol	ND	NA	ND	NA	ND	NA
4-Nitrophenol	ND	NA	ND	NA	ND	NA
N-Nitroso-Diphenylamine	ND	NA	ND	NA	ND	NA
N-Nitroso-dipropylamine	ND	NA	ND	NA	ND	NA
Pentachlorophenol	ND	NA	ND	NA	ND	NA
Phenanthrene	ND	NA	ND	NA	ND	NA
Phenol	ND	NA	ND	NA	ND	NA
Phenol (total)	ND	NA	ND	NA	ND	NA
Pyrene	ND	NA	ND	NA	ND	NA
1,2,4-Trichlorobenzene	ND	NA	ND	NA	ND	NA
2,4,5-Trichlorophenol	ND	NA	ND	NA	ND	NA
2,4,6-Trichlorophenol	ND	NA	ND	NA	ND	NA
Other:						
Unknown (total)	1500.0 J	NA	540.0 J	NA	92.0 J	NA

Table No. 4.3 (continued)

PARAMETERS	IIA(A)MW1B 1/20/88 * (ug/l)	IIA(A)MW1BA 3/2/89 (ug/l)	IIA(A)MW2M 1/20/88 * (ug/l)	IIA(A)MW2MA 3/2/89 (ug/l)	IIA(A)MW3M 1/20/88 * (ug/l)	IIA(A)MW3MA 2/28/89 (ug/l)
Inorganics:						
Aluminum	24500.0 PN	NA	72600.0 PN	NA	133700 PN	NA
Antimony	50.0 UP	NA	50.0 UP	NA	50.0 UP	NA
Arsenic	3.0 UFN	NA	3.0 UFN	NA	15.0 UFN1:5	NA
Barium	460.0 P	NA	1200.0 P	NA	2400.0 P	NA
Beryllium	[1.2] P	NA	[2.5] P	NA	[3.6] P	NA
Cadmium	4.0 UP	NA	4.0 UP	NA	4.0 UP	NA
Calcium	91700.0 P	NA	40200.0 P	NA	108400 P	NA
Chromium	10.0 UPN#	NA	54.0 PN#	NA	1000.0 PN#	NA
Cobalt	[16.0] P	NA	170.0 P	NA	210.0 P	NA
Copper	82.0 P	NA	190.0 P	NA	290.0 P	NA
Cyanide	10.0 U	NA	10.0 '	NA	10.0 U	NA
Iron	31200.0 P	NA	132100 P	NA	249900 P	NA
Lead	11.0 FN#	NA	65.0 FN#	NA	33.0 FN#1:10	NA
Magnesium	21200.0 P	NA	43300.0 P	NA	128100 P	NA
Manganese	1700.0 Pe	NA	2500.0 Pe	NA	4600.0 Pe	NA
Mercury	0.2 UCV	NA	0.3 CV	NA	0.2 UCV	NA
Nickel	22.0 UP	NA	280.0 P	NA	800.0 P	NA
Potassium	41100.0 P	NA	49500.0 P	NA	87700.0 P	NA
Selenium	15.0 UFN1:5	NA	15.0 UFN1:5	NA	15.0 UFeN1:5	NA
Silver	10.0 UPN	NA	10.0 UPN	NA	10.0 UPN	NA
Sodium	23900.0 P	NA	60700.0 P	NA	44600.0 P	NA
Thallium	2.0 UFN	NA	2.0 UFN	NA	2.0 UFN	NA
Vanadium	[43.0] P	NA	250.0 P	NA	530.0 P	NA
Zinc	92.0 P	NA	260.0 P	NA	540.0 P	NA

Table No. 4.5 (continued)

Pesticides/PCBs:	IIA(A)MW1R 1/20/88 + (ug/l)	IIA(A)MW1RA 3/2/89 (ug/l)	IIA(A)MW2M 1/20/88 + (ug/l)	IIA(A)MW2MA 3/2/89 (ug/l)	IIA(A)MW3M 1/20/88 + (ug/l)	IIA(A)MW3MA 2/28/89 (ug/l)
Aldrin	ND	NA	ND	NA	ND	NA
AROCLOR-1016	ND	NA	ND	NA	ND	NA
AROCLOR-1221	ND	NA	ND	NA	ND	NA
AROCLOR-1232	ND	NA	ND	NA	ND	NA
AROCLOR-1242	ND	NA	ND	NA	ND	NA
AROCLOR-1248	ND	NA	ND	NA	ND	NA
AROCLOR-1254	ND	NA	ND	NA	ND	NA
AROCLOR-1260	ND	NA	ND	NA	ND	NA
alpha-BHC	ND	NA	ND	NA	ND	NA
beta-BHC	ND	NA	ND	NA	ND	NA
delta-BHC	ND	NA	ND	NA	ND	NA
gamma-BHC (Lindane)	ND	NA	ND	NA	ND	NA
alpha-Chlordane	ND	NA	ND	NA	ND	NA
gamma-Chlordane	ND	NA	ND	NA	ND	NA
4,4'-DDD	ND	NA	ND	NA	ND	NA
4,4'-DDE	ND	NA	ND	NA	ND	NA
4,4'-DDT	ND	NA	ND	NA	ND	NA
Dieldrin	ND	NA	ND	NA	ND	NA
Endrin	ND	NA	ND	NA	ND	NA
Endrin ketone	ND	NA	ND	NA	ND	NA
Endosulfan I	ND	NA	ND	NA	ND	NA
Endosulfan II	ND	NA	ND	NA	ND	NA
Endosulfan Sulfate	ND	NA	ND	NA	ND	NA
Heptachlor	ND	NA	ND	NA	ND	NA
Heptachlor Epoxide	ND	NA	ND	NA	ND	NA
Methoxychlor	ND	NA	ND	NA	ND	NA
Toxaphene	ND	NA	ND	NA	ND	NA

U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits.
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
D - Sample was diluted (1:5) because this compound's initial concentration was above the calibration range.
+ - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation st
+ - Holding time exceeded for volatiles
NR - Not required as an analyte by NYSDEC
ND - Not detected.
NA - Not analyzed.
blank space - Data is invalid.
E - Valve exceeds initial calibration range.
CV- Cold Vaper Technique
[] - Indicates sample value is between IDL and CRDL.
e - Indicates a value estimated or not reported due to the presence
of interference.
s - Indicates a value determined by method of standard addition.
- Indicates duplicate analysis is not within control limits.
M - Indicates duplicate injection results exceeded control limits.
P - Indicates ICP analysis.
F - Indicates furnace analysis.
(#:#)- Ratio of metal to water in sample analysis

Table No. 4-3
BEDFORD VILLAGE
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
SHOPPING ARCADE PHASE IIA SAMPLING PROGRAM
ANALYTICAL RESULTS

PARAMETERS	IIA(A)MW4S 1/21/88 + (ug/l)	IIA(A)MW4SA 3/2/89 (ug/l)	IIA(A)MW4B 1/21/88 + (ug/l)	IIA(A)MW4BA 3/7/89 (ug/l)	IIA(A)MW5S 1/21/88 + (ug/l)	IIA(A)MW5SA 3/2/89 (ug/l)	IIA(A)MW5B 1/21/88+ (ug/l)	IIA(A)MW5BA 3/7/89 (ug/l)
Volatiles:								
Acetone		ND		ND		ND		ND
Benzene		ND		ND		ND		ND
Bromodichloromethane		ND		ND		ND		ND
Bromoform		ND		ND		ND		ND
Bromomethane		ND		ND		ND		ND
2-Butanone		ND		ND		ND		ND
Chlorobenzene		ND		ND		ND		ND
Carbon Disulfide		ND		ND		ND		ND
Carbon Tetrachloride		ND		ND		ND		ND
Chloroethane		ND		ND		ND		ND
Chloroform		ND		ND		ND		ND
Chloromethane		ND		ND		ND		ND
Dibromochloromethane		ND		ND		ND		ND
1,1-Dichloroethane		ND		ND		ND		ND
1,2-Dichloroethane		ND		ND		ND		ND
1,1-Dichloroethylene		ND		ND		ND		ND
1,2-Dichloroethylene		ND		ND		ND		ND
1,2-Dichloropropane		ND		ND		ND		ND
cis-1,3-Dichloropropene		ND		ND		ND		ND
trans-1,3-Dichloropropene		ND		ND		ND		ND
Ethyl Benzene		ND		ND		ND		ND
2-Hexanone		ND		ND		ND		ND
Methylene Chloride		ND		ND		ND		ND
4-Methyl-2-Pentanone		ND		ND		ND		ND
Styrene		ND		ND		ND		ND
1,1,2,2-Tetrachloroethane		ND		ND		ND		ND
Tetrachloroethylene		ND		15.0		ND		ND
Toluene		ND		ND		ND		ND
1,1,1-Trichloroethane		ND		ND		ND		ND
1,1,2-Trichloroethane		ND		ND		ND		ND
Trichloroethene		ND		ND		ND		ND
Vinyl Acetate		ND		ND		ND		ND
Vinyl Chloride		ND		ND		ND		ND
Total Xylenes		ND		ND		ND		ND
Other:								

Table No. 4-3 (continued)

PARAMETERS	IIA(A)MW4S 1/21/88 + (ug/l)	IIA(A)MW4SA 3/2/89 (ug/l)	IIA(A)MW4B 1/21/88 + (ug/l)	IIA(A)MW4BA 3/7/89 (ug/l)	IIA(A)MW5S 1/21/88 + (ug/l)	IIA(A)MW5SA 3/2/89 (ug/l)	IIA(A)MW5B 1/21/88+ (ug/l)	IIA(A)MW5BA 3/7/89 (ug/l)
Semi-Volatiles:								
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
(p-chloro-m-cresol)	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA

Table No. 4-3 (continued)

PARAMETERS	IIA(A)MW4S 1/21/88 + (ug/l)	IIA(A)MW4SA 3/2/89 (ug/l)	IIA(A)MW4B 1/21/88 + (ug/l)	IIA(A)MW4BA 3/7/89 (ug/l)	IIA(A)MW5S 1/21/88 + (ug/l)	IIA(A)MW5SA 3/2/89 (ug/l)	IIA(A)MW5B 1/21/88+ (ug/l)	IIA(A)MW5BA 3/7/89 (ug/l)
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-dipropylamine	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenol (total)	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Other:								
Unknown (total)	NA	NA	NA	NA	NA	NA	NA	NA

Table No. 4-3 (continued)

PARAMETERS	IIA(A)MW4S 1/21/88+ (ug/l)	IIA(A)MW4SA 3/2/89 (ug/l)	IIA(A)MW4B 1/21/88+ (ug/l)	IIA(A)MW4BA 3/7/89 (ug/l)	IIA(A)MW5S 1/21/88+ (ug/l)	IIA(A)MW5SA 3/2/89 (ug/l)	IIA(A)MW5B 1/21/88+ (ug/l)	IIA(A)MW5BA 3/7/89 (ug/l)
Inorganics:								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA

Table No. 4-7 (continued)

Pesticides/PCBs:	IIA(A)MW4S 1/21/88 + (ug/l)	IIA(A)MW4SA 3/2/89 (ug/l)	IIA(A)MW4B 1/21/88 + (ug/l)	IIA(A)MW4BA 3/7/89 (ug/l)	IIA(A)MW5S 1/21/88 + (ug/l)	IIA(A)MW5SA 3/2/89 (ug/l)	IIA(A)MW5B 1/21/88+ (ug/l)	IIA(A)MW5BA 3/7/89 (ug/l)
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1016	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1221	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1232	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1242	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1248	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1254	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1260	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA

U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits.
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
D - Sample was diluted (1:5) because this compound's initial concentration was above the calibration range.
† - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs.
‡ - Holding time exceeded for volatiles
NR - Not required as an analyte by NYSDEC
ND - Not detected.
NA - Not analyzed.
blank space - Data is invalid.
E - Valve exceeds initial calibration range.
CV- Cold Vapor Technique
[] - Indicates sample value is between IDL and CRDL.
e - Indicates a value estimated or not reported due to the presence of interference.
s - Indicates a value determined by method of standard addition.
* - Indicates duplicate analysis is not within control limits.
M - Indicates duplicate injection results exceeded control limits.
P - Indicates ICP analysis.
F - Indicates furnace analysis.
(#:#) - Ratio of metal to water in sample analysis

Table No. 4-3 (continued)

PARAMETERS	Field Blank 1/20/88 + (ug/l)	Field Blank 1/21/88 + (ug/l)	Trip Blank 1/21/88 + (ug/l)	Field Blank 2/28/89 (ug/l)	Trip Blank 2/27/89 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/7/89 (ug/l)	Trip Blank 3/7/89 (ug/l)
Volatiles:									
Acetone				43.0	ND	13.0	ND	ND	ND
Benzene				ND	ND	ND	ND	ND	ND
Bromodichloromethane				ND	ND	ND	ND	ND	ND
Bromoform				ND	ND	ND	ND	ND	ND
Bromomethane				ND	ND	ND	ND	ND	ND
2-Butanone				ND	ND	ND	ND	ND	ND
Chlorobenzene				ND	ND	ND	ND	ND	ND
Carbon Disulfide				ND	ND	ND	ND	ND	ND
Carbon Tetrachloride				ND	ND	ND	ND	ND	ND
Chloroethane				ND	ND	ND	ND	ND	ND
Chloroform				ND	ND	ND	ND	ND	ND
Chloromethane				ND	ND	ND	ND	ND	ND
Dibromochloromethane				ND	ND	ND	ND	ND	ND
1,1-Dichloroethane				ND	ND	ND	ND	ND	ND
1,2-Dichloroethane				ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene				ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene				ND	ND	ND	ND	ND	ND
1,2-Dichloropropane				ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene				ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene				ND	ND	ND	ND	ND	ND
Ethyl Benzene				ND	ND	ND	ND	ND	ND
2-Hexanone				ND	ND	ND	ND	ND	ND
Methylene Chloride				ND	2.0 J	ND	ND	ND	3.0 BJ
4-Methyl-2-Pentanone				ND	ND	ND	ND	ND	ND
Styrene				ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane				ND	ND	ND	ND	ND	ND
Tetrachloroethylene				ND	ND	ND	ND	ND	ND
Toluene				ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane				ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane				ND	ND	ND	ND	ND	ND
Trichloroethene				ND	ND	ND	2.0 J	ND	ND
Vinyl Acetate				ND	ND	ND	ND	ND	ND
Vinyl Chloride				ND	ND	ND	ND	ND	ND
Total Xylenes				ND	ND	ND	ND	ND	ND
Other:									

Table No. 4-3 (continued)

PARAMETERS	Field Blank 1/19/88 (ug/l)	Field Blank 1/21/88 * (ug/l)	Trip Blank 1/21/88 * (ug/l)	Field Blank 2/28/89 (ug/l)	Trip Blank 2/27/89 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/7/89 (ug/l)	Trip Blank 3/7/89 (ug/l)
Semi-Volatiles:									
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
4 Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroethoxy) methane	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
(p-chloro-m-cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-Butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4 Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di n-Octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis (2-ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table No. 4-3 (continued)

PARAMETERS	Field Blank 1/19/88 (ug/l)	Field Blank 1/21/88 + (ug/l)	Trip Blank 1/21/88 + (ug/l)	Field Blank 2/28/89 (ug/l)	Trip Blank 2/27/89 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/7/89 (ug/l)	Trip Blank 3/7/89 (ug/l)
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-dipropylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA

Other:

Table No. 4.3 (continued)

PARAMETERS	Field Blank 1/17/88 (ug/l)	Field Blank 1/21/88 + (ug/l)	Trip Blank 1/21/88 + (ug/l)	Field Blank 2/28/89 (ug/l)	Trip Blank 2/27/89 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/7/89 (ug/l)	Trip Blank 3/7/89 (ug/l)
Inorganics:									
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table No. 4 5 (continued)

PARAMETERS	Field Blank 1/19/88 (ug/l)	Field Blank 1/21/88 + (ug/l)	Trip Blank 1/21/88 + (ug/l)	Field Blank 2/28/89 (ug/l)	Trip Blank 2/27/89 (ug/l)	Field Blank 3/2/89 (ug/l)	Trip Blank 3/1/89 (ug/l)	Field Blank 3/7/89 (ug/l)	Trip Blank 3/7/89 (ug/l)
Pesticides/PCBs:									
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA
AROCLOR-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA

U - Indicates compound was analyzed for but not detected. Reported with the instrument detection limits.
N - Indicates spike sample recovery is not within control limits.
J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
D - Sample was diluted (1:5) because this compound's initial concentration was above the calibration range.
+ - Pesticide, PCB's - The retention time window for Endrin was outside the allowable range on two of the evaluation standard runs.
+ - Holding time exceeded for volatiles
NR - Not required as an analyte by NYSDEC
ND - Not detected.
NA - Not analyzed.
blank space - Data is invalid.
E - Valve exceeds initial calibration range.
CV- Cold Vapor Technique
[] - Indicates sample value is between IDL and CRDL.
e - Indicates a value estimated or not reported due to the presence of interference.
s - Indicates a value determined by method of standard addition.
\# - Indicates duplicate analysis is not within control limits.
M - Indicates duplicate injection results exceeded control limits.
P - Indicates ICP analysis.
F - Indicates furnace analysis.
(M W) Ratio of metal to water in sample analysis

As listed in Table No. 4-3, where a result is not provided for a specific compound, the following qualifiers are used:

- o A blank space indicates that the analysis of the compound did not meet the NYSDEC CLP QA/QC requirements and was therefore deemed invalid and not shown.

- o The symbol "ND" indicates that the analysis of this compound met the NYSDEC CLP QA/QC requirements, but was not measured above the analytical instrument's detection limits (IDL).

- o The symbol "NA" indicates that the compound was not analyzed.

Qualifiers that accompany the concentrations reported in the table are NYSDEC CLP qualifiers.

In addition, several sample results show the presence of unknown isomers and "other" compounds. These compounds are listed in the table and presented in the text, however, identification and determination of the exact levels of the compounds, as well as a discussion of their presence and extent of contamination is not definable within the context of this program and is not included in the discussion.

4.3.1 Monitoring Well MW-1 (MW-1B [43.5'])

The location for monitoring well MW-1B was chosen to provide soil and ground water quality information immediately adjacent to a suspected source of contamination. Bedrock at this location was encountered at a depth of eight and a half (8.5) feet below grade. Since evidence of saturation did not exist in the overburden soils at this location, a well was not constructed in this strata. Alternately, a PVC casing was grouted in the bedrock and 30 feet of rock core was removed from the boring.

4.3.1.1 Organic Sampling Results

The organic analytical results for sample IIA(A)MW-1B contained the following compounds, of which tetrachloroethene, trichloroethene, 1,2-dichloroethene and vinyl chloride are analytes of concern. (Please note that the initial sample failed QA/QC requirements for volatiles. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Tetrachloroethene	42.0
Trichloroethene	71.0
1,2-Dichloroethene (total)	520.0 D
Vinyl chloride	22.0
Bis(2-ethylhexyl)phthalate	320.0
Unknown (total)	1,500.0 J

"J" indicates estimated value.
"D" indicates sample was diluted (1:5) because this compounds's initial concentration was above the calibration range.

During the Phase IIA sampling program, methylene chloride and acetone were commonly found in method blanks, trip blanks and field blanks, and are laboratory contaminants.

4.3.1.2 Inorganic Sampling Results

The following inorganic constituents were found in sample IIA(A)MW-1B:

Constituent	Concentration (ug/l)
Aluminum	24,500.0 N
Barium	460.0
Beryllium	[1.2]
Calcium	91,700.0
Cobalt	[46.0]
Copper	82.0
Iron	31,200.0
Lead	11.0 N#
Magnesium	21,200.0
Manganese	1,700.0 E
Potassium	41,000.0
Sodium	23,900.0
Vanadium	[48.0]
Zinc	92.0

"N" indicates spike sample recovery was not within control limits.
"#" indicates duplicate analysis was not within control limits.
"E" indicates this sample value was estimated due to interference.
"[ ]" indicates the reported value is between the CRDL and IDL.

4.3.2 Monitoring Well MW-2 (MW-2M [26.5'])

The monitoring well MW-2 location was chosen to determine subsurface flow conditions as well as ground water quality in the stratified drift just east (downgradient) of a suspected source of contamination. A borehole was advanced 27 feet at which depth bedrock was encountered. A five foot zone of saturation existed at the stratified drift/bedrock interface. A 10 foot screen was installed to effectively monitor this interface zone as well as lateral migration of ground water (and contamination) to areas downgradient of the Shopping Arcade property boundary.

4.3.2.1 Organic Sampling Results

The analytical results for sample IIA(A)MW-2M showed that the sample contained only one unknown organic compound. (Please note that the initial sample failed QA/QC requirements for volatiles. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Unknown (total)	540.0 J

"J" indicates estimated value.

4.3.2.2 Inorganic Sampling Results

As previously mentioned, elevated concentrations of four metals of concern, namely, barium, chromium, lead and nickel were detected in sample IIA(A)MW-2M. In addition, other inorganic constituents found in the sample are listed below:

Constituent	Concentration (ug/l)
Aluminum	72,600.0 N
Barium	1,200.0
Beryllium	[2.5]
Calcium	40,200.0
Chromium	54.0 N#
Cobalt	170.0
Copper	190.0
Iron	132,000.0
Lead	65.0 N#
Magnesium	43,300.0
Manganese	2,500.0 E
Mercury	0.3

Nickel	280.0
Potassium	40,500.0
Sodium	60,700.0
Vanadium	250.0
Zinc	260.0

"N" indicates spike sample recovery was not within control limits.
"#" indicates duplicate analysis was not within control limits.
"E" indicates this sample value was estimated due to interference.
"[ ]" indicates the reported value is between the CRDL and IDL.

4.3.3 Monitoring Well MW-3 (MW-3M [20.5'])

The monitoring well MW-3 location was chosen to define the subsurface stratified drift flow conditions, establish the hydraulic gradient in the study area as well as determine ground water quality migrating from the Shopping Arcade. A boring was advanced to 21 feet at which depth bedrock was encountered. Similar to the MW-2 location, a five foot zone of saturation existed at the stratified drift/bedrock interface. A 10 foot screen was installed in the boring so that representative ground water samples could be collected from this interface zone.

4.3.3.1 Organic Sampling Results

The results for sample IIA(A)MW-3M contained the following organic compounds, of which tetrachloroethene and trichloroethene were analytes of concern. (Please note that the initial sample failed QA/QC requirements for volatiles. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Tetrachloroethene	190.0
Trichloroethene	13.0
Bis(2-ethylhexyl)phthalate	56.0
Unknown (total)	92.0 J

"J" indicates estimated value.

It is important to note that based upon prior laboratory results, there is a strong possibility that resamples IIA(A)MW-3MA and IIB(M)MW-8MB (Hunting Ridge Mall Site) were inadvertently switched at the laboratory prior to analysis during the resampling program. Past laboratory results showed that high concentrations of contaminants were found in sample IIA(A)MW-3M and not in sample IIB(M)MW-8M. However, the latest resampling results showed high concentrations of the same contaminants in resample IIB(M)MW-8MB, not in resample IIA(A)MW-3MA as found previously at this location. In addition, these two samples were analyzed with one immediately following the other.

The laboratory which analyzed these samples was notified and asked to investigate this situation. The laboratory could not determine if and when this error occurred; however, it was acknowledged that there exists the possibility of an error to occur when the sample is transferred from the sample vial to the analysis vial prior to analysis, as documented in their letter dated May 3, 1989 which is enclosed in Appendix G.

4.3.3.2 Inorganic Sampling Results

As previously mentioned, elevated concentrations of four metals of concern, namely, barium, chromium, lead and nickel were detected in sample IIA(A)MW-3M. In addition, other inorganic constituents found in this sample are listed below:

Constituent	Concentration (ug/l)
Aluminum	133,700.0
Barium	2,400.0
Beryllium	[3.6]
Calcium	108,400.0
Chromium	1,000.0 N#
Cobalt	210.0
Copper	290.0
Iron	249,900.0
Lead	33.0 N#
Magnesium	128,100.0
Manganese	4,600.0 E
Nickel	800.0
Potassium	87,700.0
Sodium	44,600.0
Vanadium	530.0
Zinc	540.0

"N" indicates spike sample recovery was not within control limits.
"#" indicates duplicate analysis was not within control limits.
"E" indicates this sample value was estimated due to interference.
"[ ]" indicates the reported value is between the CRDL and IDL.

4.3.4 Monitoring Well Cluster MW-4 (MW-4S [22'] and MW-4B [73'])

Monitoring well cluster MW-4 was constructed behind the Theatre Building and downgradient of the Shopping Arcade. A stratified drift shallow water table and a bedrock monitoring well were completed as part of this cluster. This monitoring well location provides data on ground water quality migrating towards the low lying ponds and wetlands which cross under Court Road and ultimately drain to the Mianus River. Monitoring of these two strata begins to determine the vertical extent of contamination, as well as provides essential ground water elevation data which contributes to preparing a potentiometric contour map of the study area.

4.3.4.1 Organic Sampling Results

Please note that the initial sample at MW-4S failed QA/QC requirements for volatiles. Therefore, this location was resampled and reanalyzed and only these valid results are presented. The analytical results for sample IIA(A)MW-4S showed that no organic compounds were detected in the sample.

The analytical results for sample IIA(A)MW-4B showed that the sample contained only tetrachloroethene, which is an analyte of concern. (Please note that the initial sample failed QA/QC requirements for volatiles. Therefore, this location was resampled and reanalyzed and only these valid analytical results are presented.)

Compound	Concentration (ug/l)
Tetrachloroethene	15.0

4.3.5 Monitoring Well Cluster MW-5 (MW-5S [22'] and MW-5B [116'])

Monitoring well cluster MW-5 is located behind the Fire Department adjacent to wetlands which drain to the Mianus River. The MW-5 cluster is the farthest removed ground water monitoring point from the Shopping Arcade Site and is located downgradient in the drainage valley. It is a monitoring point which may be representative of the ground water quality which is migrating from the Bedford Village commercial district and ultimately discharging into the Mianus River Valley. This was the one location in the study area where the Inwood Marble was encountered, and 30 feet of this rock core was removed from MW-5B.

4.3.5.1 Organic Sampling Results

Please note that the initial samples at both MW-5S and MW-5B failed QA/QC requirements for volatiles. Therefore, these locations were resampled and reanalyzed and only these valid results are presented. No organic compounds were detected in either sample IIA(A)MW-5S or in sample IIA(A)MW-5B.

4.4 Description of the Phase IIB Sampling Program

This section reviews the specific components and associated activities of the Phase IIB sampling program. The data collected from the Phase IA and Phase IB (source/

surficial) sampling program, as well as the initial Phase IIA (subsurface) sampling program, assisted in determining the design of the Phase IIB sampling program.

Similar to Phase IIA, the objective of the Phase IIB well drilling program was to collect and analyze subsurface data from the Shopping Arcade Site and the surrounding area. As a means of developing this information, soil borings and monitoring wells were installed. Also similar to the Phase IIA sampling program, soil samples were obtained from the borehole and screened in the field by utilizing an OVA. After screening with the analyzer, a number of soil samples were selected for chemical analysis at either the NYSDEC laboratory in Saratoga, or an infield GC provided through NYSDEC and located in Spring Valley. Once the monitoring wells were constructed, ground water samples were collected and forwarded to a NYSDEC certified laboratory for analysis. The analytical data generated as part of the Phase IIA sampling program, complimented by the data resulting from the Phase IA and Phase IB sampling programs made it possible to identify on an initial basis, the location of the sources of contamination, and to assess the surficial transport and subsurface migration pathway of contaminants through the study area. This data assisted in making decisions on the specific sampling locations for the Phase IIB component of the Remedial Investigation which were to confirm the extent and travel of ground water contamination.

The following activities were undertaken prior to and during the Phase IIB program:

- o In addition to the pertinent, available literature, and technical reports and data reviewed in preparation for the Phase IIA program (described in Section 4.2), the following report was reviewed:

  - Dvirka and Bartilucci Consulting Engineers, "Remedial Investigation Interim Report Phase IIA Sampling Program (Hunting Ridge Mall), March 1988."

- o Aerial photographs of the study area were again reviewed for information on land use patterns, potential sources of contamination, local topography and drainage patterns, as well as aerial topographic contour maps to better understand the surficial and subsurface drainage patterns in the area.

- o Data generated from the seismic survey conducted during Phase IA of this investigation was also again reviewed and incorporated in to the design of the Phase IIB sampling program.

- o Six monitoring wells were constructed at four locations.

- o All monitoring wells constructed as part of the Phase IIB sampling program, as well as the seven wells installed in Phase IIA were sampled. The Phase IIB wells were also surveyed. Ground water level readings were obtained from all wells and recorded. These measurements supplied the necessary data for determining ground water flow direction underlying and in the immediate vicinity of the site.

4.4.1 Selection of Ground Water Monitoring Well Locations

The rationale for the overall selection of monitoring well locations for the Phase IIB drilling program was based on the analytical data generated by prior ground water investigations, the analytical data obtained from the Phase IA, IB and IIA sampling programs, the location of the suspected source(s) of contamination, and the determination that ground water is flowing toward and discharging to the Mianus River.

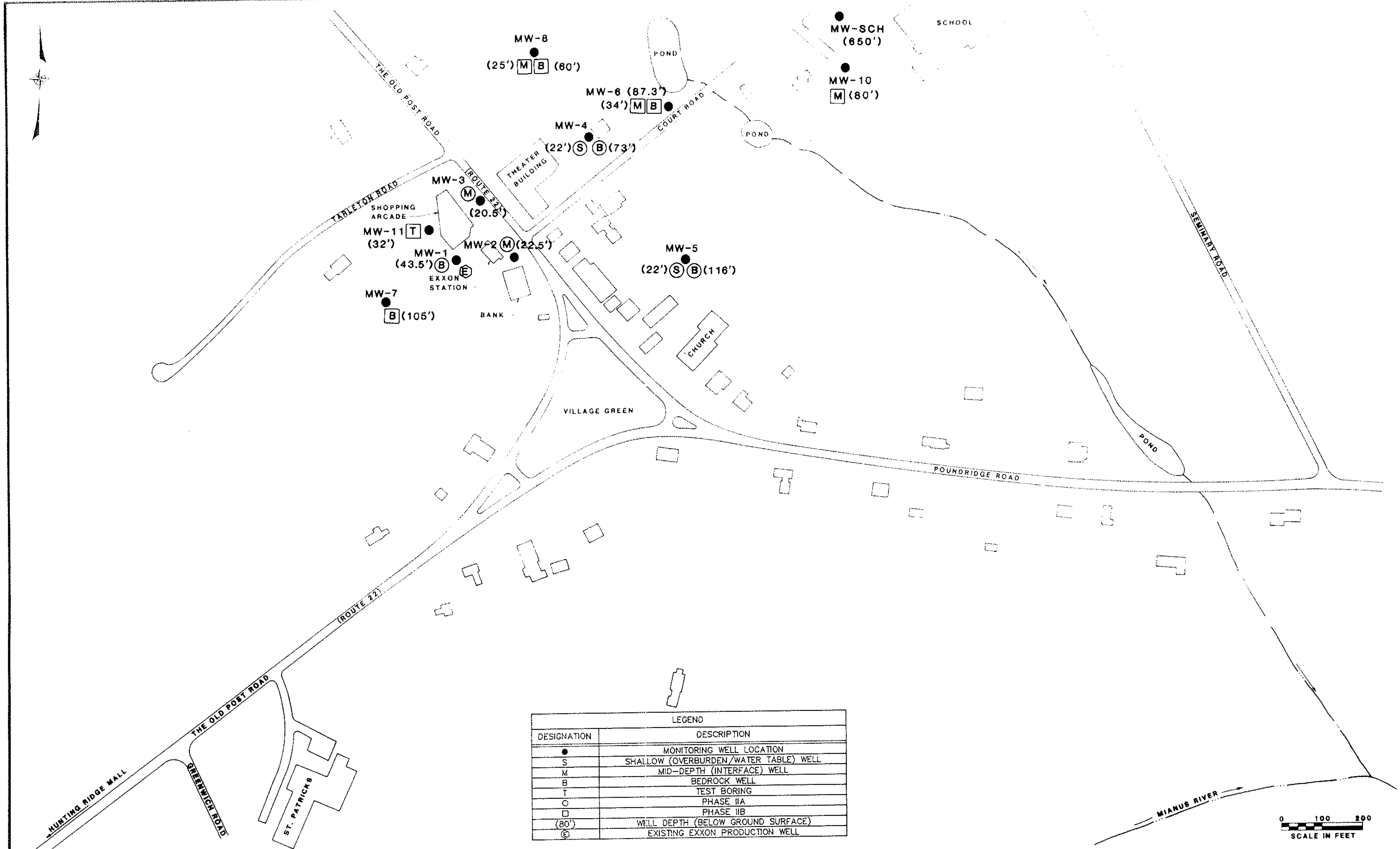
The well depths for each monitoring well which was constructed in Phase IIB in the Shopping Arcade Study Area is provided below. The locations of the wells are illustrated in Figure No. 4-9.

Well Number	Location	Depth (ft)*
MW-6M MW-6B	Immediately north of Court Road and west of the pond system	34 87.3
MM-7B	West and upgradient of the Arcade building	105
MW-8M MW-8B	North of the Theatre Building and northeast of the Arcade	25 60
MW-10M	South of Court Road and east of the pond system on the Bedford School's property	80

* Depth below ground surface

Note: MW-#M refers to a mid-depth (overburden/bedrock interface) well
MW-#B refers to a bedrock well

In total, Phase IIB consisted of the construction of three new mid-depth (interface) wells and three bedrock wells.



LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
S	SHALLOW (OVERBURDEN/WATER TABLE) WELL
M	MID-DEPTH (INTERFACE) WELL
B	BEDROCK WELL
T	TEST BORING
○	PHASE IIA
□	PHASE IIB
(80')	WELL DEPTH (BELOW GROUND SURFACE)
Ⓔ	EXISTING EXXON PRODUCTION WELL

NO.	DATE	REVISION	INT

PROJECT ENGINEER: | DRAWN BY:
DESIGNED BY: | CHECKED BY:

Dvirka and Bartilucci

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE II B
MONITORING WELL LOCATIONS

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 4-9

The following is a discussion of the rationale incorporated for the placement of the six Phase IIB ground water monitoring wells in the study area.

- o MW-6M and MW-6B were constructed on the north side of Court Road adjacent to and west of the Court Road pond. Monitoring ground water at this location provides data pertaining to potential contaminated ground water migration in an area directly downgradient of a suspected source of contamination. The well screen was set on top of bedrock in fine sands lying below the water table at MW-6M. Competent bedrock (gneiss) was encountered at a depth of 51 feet at MW-6B. The 30 feet of rock core taken at this location revealed a significant number of potential water bearing fractures.

- o MW-7B was constructed approximately 400 feet to the west of the Shopping Arcade building. Monitoring ground water at this location provides data pertaining to background ground water quality in an area directly upgradient of a suspected source of contamination. Competent bedrock was encountered at a depth of 23 feet at MW-7B. The 86 feet of rock core obtained at this location revealed very few potential water bearing fractures.

- o MW-8M and MW-8B were constructed approximately 250 feet to the north of the Theatre Building. Monitoring at these locations provides data that will assist in defining the northern extent of the contaminant plume in the study area. The well screen at MW-6M was set on top of bedrock in a saturated sand unit. Competent bedrock (gneiss) was encountered at a depth of 30 feet at MW-8B. The 30 feet of rock core taken at this location revealed several potential water bearing fractures.

- o MW-10M was constructed to the north of a previously mapped drainage divide along Court Road on the Bedford School's property. Monitoring at this location provides data that will show whether or not contaminants are migrating to the north of the drainage divide. The well screen was set in saturated fine to coarse sands on top of bedrock.

4.4.2 Analytical Parameters

For all Phase IIB samples taken, laboratory analysis was conducted to determine the presence of volatile organic chemicals including the analytes of concern (tetrachloroethene, trichloroethene, cis/trans-1,2-dichloroethene, vinyl chloride, 1,1,1-trichloroethane, benzene, toluene and xylene).

4.4.3 Location of Background Ground Water Monitoring Well

The Phase II well drilling program was designed to confirm data obtained in the past, as well as to better define the suspected source and extent of contamination in order to develop an appropriate remedial action. As a result of completion of the Phase IIA program, ground water flow patterns were determined in the water table zone as well as at the overburden/bedrock interface on a preliminary basis.

Part of the Phase II well drilling program included the construction of an upgradient monitoring well at the Shopping Arcade Site. The purpose of an upgradient well is to provide representative ground water samples as a control in the program to document the ambient quality of ground water that is migrating into the study area. This will provide better definition of the suspected source and degree of contamination in the study area. Based upon ground water flow direction information, the upgradient well was located south of Tarleton Road approximately 400 feet behind the Shopping Arcade Site and reaches a depth of 105 feet, 95 feet of which is in bedrock.

4.5 Analytical Results of the Phase IIB Sampling Program

The purpose of this section is to present the analytical results of the ground water samples collected during the Phase IIB component of the sampling program.

During the Phase IIB sampling program, ground water samples were collected from all monitoring wells within the study area. This included the seven monitoring wells installed during Phase IIA of the Remedial Investigation as well as the six Phase IIB monitoring wells, and the abandoned Exxon Gas Station and Bedford School production wells.

The resampling of the existing wells provided data which support the results of data obtained during previous sampling events. Resampling not only provided quality assurance with the integrity of the previous data but also allowed the identification of trends in the data.

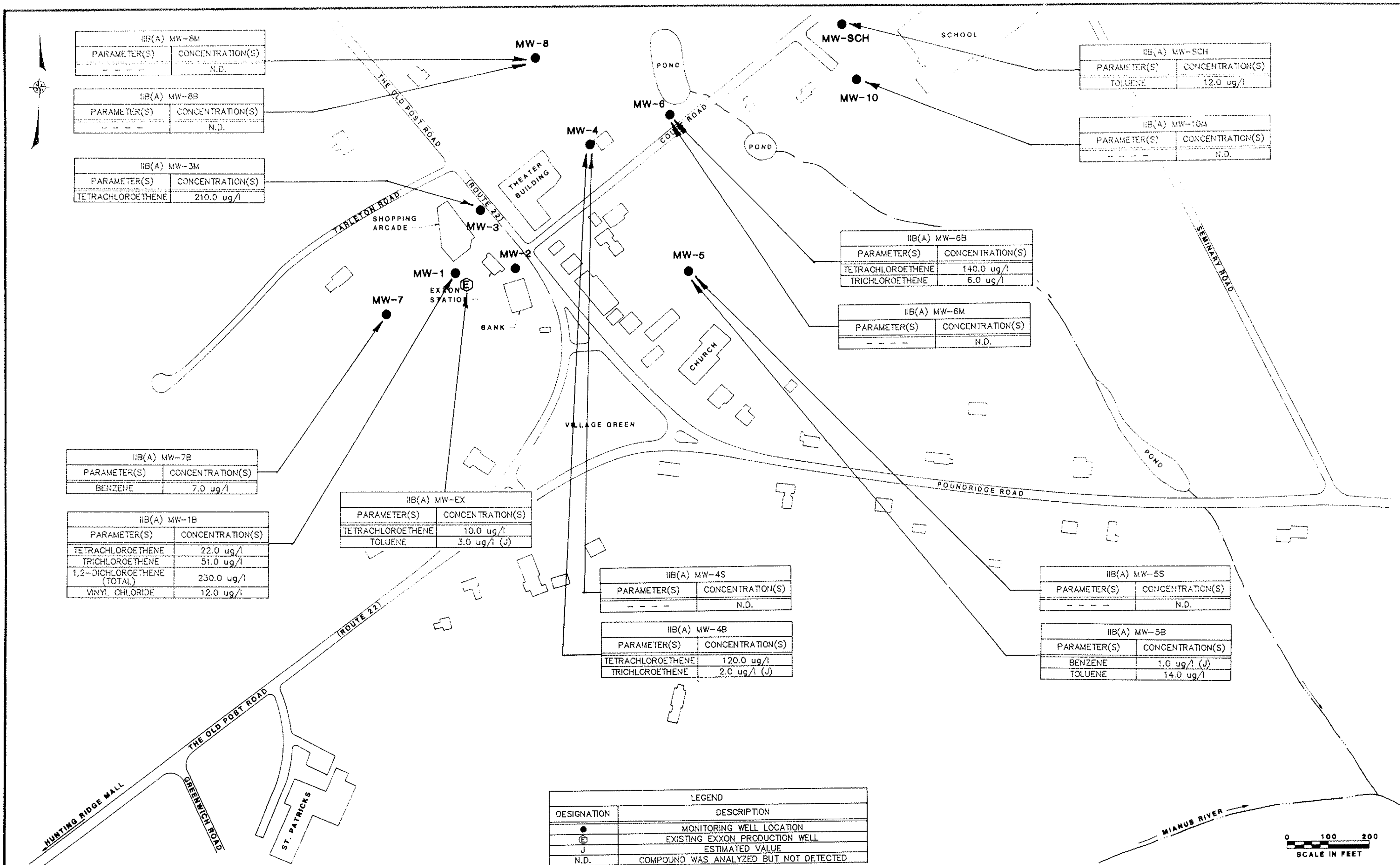
The Phase IIB sampling program generated the most complete data base of ground water contamination underlying the study area to date. This data is essential in determining where and how the analytes of concern are migrating through the ground water system underlying the study area, as well as revealing other possible contributing sources of contamination. This information will be incorporated in formulating the remedial design recommendation, if remediation is deemed necessary in the Shopping Arcade Study Area.

Figure No. 4-10 presents a map of the study area which identifies the locations from which ground water samples were collected, along with the results of each sample for the analytes of concern and other organic contaminants detected. Similar to Phase IIA, for purposes of presenting the sampling program results, each sampling point is identified by an identification number. For example, for a sampling point labeled "IIB(A)MW-1S," the "IIB" portion of the identification number indicates that the sample was collected during the Phase IIB portion of the sampling program. For the remainder of the sample number, the nomenclature is the same as described for the Phase IIA samples in Section 4.3.

This sample identification number is also used on the Chain-of-Custody Forms and Field Log Forms. As such, background information regarding each sampling location including Location Sketches, field personnel involved, date and time, meteorological conditions, etc., can be obtained from the Field Log Forms which are contained in the Field Report by cross referencing the forms to the appropriate sample identification number from Figure No. 4-10.

In the following sections, the sequence of data presentation will be by numerical order of the monitoring wells. For each location there is a presentation of organic sampling results for the compounds detected. Cases where analytes of concern we reported are specifically discussed.

A summary of the analytical results of all samples collected in the Shopping Arcade Study Area during Phase IIB are presented in tabular format in Table No. 4-4. All samples were analyzed for Target Compound List (TCL) volatiles only. As mentioned above, the



IIB(A) MW-8M	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-8B	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-3M	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	210.0 ug/l

IIB(A) MW-SCH	
PARAMETER(S)	CONCENTRATION(S)
TOLUENE	12.0 ug/l

IIB(A) MW-10M	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-6B	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	140.0 ug/l
TRICHLOROETHENE	6.0 ug/l

IIB(A) MW-6M	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-7B	
PARAMETER(S)	CONCENTRATION(S)
BENZENE	7.0 ug/l

IIB(A) MW-1B	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	22.0 ug/l
TRICHLOROETHENE	51.0 ug/l
1,2-DICHLOROETHENE (TOTAL)	230.0 ug/l
VINYL CHLORIDE	12.0 ug/l

IIB(A) MW-EX	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	10.0 ug/l
TOLUENE	3.0 ug/l (J)

IIB(A) MW-4S	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-4B	
PARAMETER(S)	CONCENTRATION(S)
TETRACHLOROETHENE	120.0 ug/l
TRICHLOROETHENE	2.0 ug/l (J)

IIB(A) MW-5S	
PARAMETER(S)	CONCENTRATION(S)
— — — —	N.D.

IIB(A) MW-5B	
PARAMETER(S)	CONCENTRATION(S)
BENZENE	1.0 ug/l (J)
TOLUENE	14.0 ug/l

LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
Ⓔ	EXISTING EXXON PRODUCTION WELL
J	ESTIMATED VALUE
N.D.	COMPOUND WAS ANALYZED BUT NOT DETECTED

NO.	DATE	REVISION	INT.

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Dvirka and Bartilucci CONSULTING ENGINEERS Syosset New York

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
PHASE II B
ORGANIC CHEMICAL SAMPLING RESULTS

PROJECT NO. 842
DATE
SCALE AS NOTED
DRAWING NO. 4-10

Table No. 4-4
BEDFORD VILLAGE
REMEDIAL INVESTIGATION / FEASIBILITY STUDY
SHOPPING ARCADE PHASE IIB SAMPLING PROGRAM
ANALYTICAL RESULTS

PARAMETERS	IIB(A)MW1B 10/6/88 (ug/l)	IIB(A)MW3M 10/6/88 (ug/l)	IIB(A)MW4S 10/6/88 (ug/l)	IIB(A)MW4B 10/10/88 (ug/l)	IIB(A)MW5S 10/6/88 (ug/l)	IIB(A)MW5B 10/12/88 (ug/l)	IIB(A)MW6M 10/7/88 (ug/l)	IIB(A)MW6B 10/7/88 (ug/l)
Volatiles:								
Acetone	18.0 B	8.0 BJ	17.0 B	34.0 B	11.0 B	33.0 B	19.0 B	6.0 BJ
Benzene	ND	ND	ND	ND	ND	1.0 J	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	4.0 J	ND	ND
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene(total)	230.0 E	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	9.0 B	7.0 B	10.0 B	18.0 B	8.0 B	19.0 B	10.0 B	10.0 B
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	22.0	210.0 E	ND	120.0	ND	ND	ND	140.0
Toluene	ND	ND	ND	ND	ND	14.0	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	31.0	ND	ND	2.0 J	ND	ND	ND	6.0
Vinyl Acetate	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	2.0	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND
Other:								
1,1,2-Trichloro-1,2,2-Trifluoro-ethane	7.0 BJ	6.0 BJ	7.0 BJ	8.0 J	7.0 BJ	ND	ND	ND
3-Methyl-pentane	ND	ND	ND	5.0 J	ND	ND	ND	ND

J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
E - Valve exceeds initial calibration range.
ND - Not detected
NA - Not analyzed
Blank space - Data is invalid

Table No. 4-4 (continued)

PARAMETERS	IIB(A)MW7B 10/7/88 (ug/l)	IIB(A)MW8M 10/7/88 (ug/l)	IIB(A)MW8B 10/10/88 (ug/l)	IIB(A)MW10M 10/7/88 (ug/l)	IIB(A)MWSCH 10/13/88 (ug/l)	IIB(A)MWEX 10/12/88 (ug/l)
Volatiles:						
Acetone	13.0 B	ND	12.0 B	8.0 BJ	17.0 B	16.0 B
Benzene	7.0	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	3.0 J	4.0 J
Chloromethane	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene(total)	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND
Ethyl Benzene	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND
Methylene Chloride	10.0 B	[illegible] B	10.0 B	9.0 B	21.0 B	19.0 B
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	10.0
Toluene	ND	ND	ND	ND	12.0	3.0 J
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND
Other:						
1,1,2-Trichloro-1,2,2-Tri fluoro-ethane	ND	ND	6.0 J	ND	ND	ND
Unknown	ND	ND	ND	ND	5.0 J	7.0 J

J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
E - Valve exceeds initial calibration range.
ND - Not detected
NA - Not analyzed
Blank space - Data is invalid

Table No. 4-4 (continued)

PARAMETERS	Field Blank 10/6/88 (ug/l)	Trip Blank 10/6/88 (ug/l)	Field Blank 10/7/88 (ug/l)	Trip Blank 10/7/88 IT (ug/l)	Trip Blank RE 10/7/88 + (ug/l)	Field Blank 10/10/88 (ug/l)	Trip Blank 10/10/88 (ug/l)	Field Blank 10/12/88 (ug/l)	Trip Blank 10/12/88 (ug/l)
Volatiles:									
Acetone	12.0 B	27.0 B	ND	ND	17.0 B	12.0 B	14.0 B	22.0 B	17.0 B
Benzene	ND	ND	ND	ND	ND	ND	ND	7.0	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	4.0 J	3.0 J
Chloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethylene(total)	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	[illegible]	11.0 B	15.0 B	7.4 B	10.0 B	11.0 B	11.0 B	29.0 B	20.0 B
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	8.0	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	3.0 J	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other:									
1,1,2-Trichloro-1,2,2-Tri-fluoro-ethane	6.0 BJ	ND	10.0 J	6.0 J	ND	9.0 J	7.0 J	8.0 J	ND
Unknown	ND	ND	4.0 J	ND	7.0 J	ND	ND	ND	ND

J - Indicates an estimated value.
B - This flag is used when the the analyte is found in the blank as well as a sample.
E - Valve exceeds initial calibration range.
ND - Not detected
NA - Not analyzed
blank space - Data is invalid
IT - Sample was analyzed after the twelve hour time limit for an instrument tune.
+ - Holding time exceeded for volatiles.
RE - Reanalysis

particular analytes of concern in this investigation are the organic compounds tetrachloroethene, trichloroethene, cis/trans-1,2-dichloroethene, vinyl chloride, 1,1,1-trichloroethane, and the BTX compounds (benzene, toluene and xylene).

As listed in Table No. 4-4, where a result is not provided for a specific compound, the following qualifiers are used:

- o The symbol "ND" indicates that the analysis of this compound met the NYSDEC CLP QA/QC requirements, but was not measured above the analytical instrument's detection limits (IDL).

- o The symbol "NA" indicates that the compound was not analyzed.

Qualifiers that accompany the concentrations reported in the table are NYSDEC CLP qualifiers.

In addition, several sample results show the presence of unknown isomers and "other" compounds. These compounds are listed in the table and presented in the text, however, identification and determination of the exact levels of the compounds, as well as a discussion of their presence and extent of contamination is not definable within the context of this program and is not included in the discussion.

4.5.1 Monitoring Well MW-1 (MW-1B [43.5'])

The location for monitoring well MW-1B was chosen to provide soil and ground water quality information immediately adjacent to a suspected source of contamination. The results of the Phase IIB sampling program were similar to those from Phase IIA with the exception of the analytes of concern, tetrachloroethene, trichloroethene, 1,2-dichloroethene and vinyl chloride, whose concentrations decreased in the Phase IIB sample.

4.5.1.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-1B are provided below, of which tetrachloroethene, trichloroethene, 1,2-dichloroethene and vinyl chloride are analytes of concern.

Compound	Concentration (ug/l)
Tetrachloroethene	22.0
Trichloroethene	51.0
1,2-Dichloroethene (total)	230.0 E
Vinyl chloride	12.0
Acetone	18.0 B
Methylene chloride	9.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	7.0 BJ

"J" indicates estimated value.
"B" indicates compound found in method blank.
"E" indicates value exceeded calibration range.

1,1,2-Trichloro-1,2,2-trifluoroethane, which is commonly referred to as freon, was found in the method blanks, as well as in a number of trip and field blanks in Phase IIB, and is most likely a laboratory contaminant. Similar to Phase IIA, methylene chloride and acetone (as well as chloroform) were also found in method, trip and field blanks, and these compounds are also probably laboratory contaminants.

4.5.2 Monitoring Well MW-2 (MW-2M [26.5'])

The location of monitoring well MW-2 was chosen to determine subsurface flow conditions as well as ground water quality in the stratified drift just east (downgradient) of a suspected source of contamination.

Provision was made as part of the Phase IIB sampling program to sample MW-2M; however, there was an insufficient volume of water in the well for ground water sampling.

4.5.3 Monitoring Well MW-3 (MW-3M [20.5'])

The monitoring well MW-3 location was chosen to define the subsurface stratified drift flow conditions, establish the hydraulic gradient in the area as well as to determine ground water quality migrating from the Shopping Arcade.

4.5.3.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-3M revealed the compounds listed below. Consistent with the sample collected in Phase IIA, tetrachloroethene was an analyte of concern that was detected. However, trichloroethene was not found in this phase but was previously detected in Phase IIA.

Compound	Concentration (ug/l)
Tetrachloroethene	210.0 E
Acetone	8.0 BJ
Methylene chloride	7.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	6.0 BJ

"J" indicates estimated value.
"B" indicates compound found in method blank.
"E" indicates value exceeded calibration range.

4.5.4 Monitoring Well Cluster MW-4 (MW-4S [22'] and MW-4B [73'])

The bedrock and stratified drift/interface monitoring wells at the MW-4 location were completed during Phase IIA. This location provides data on ground water quality migrating towards the low lying ponds and wetlands which cross under Court Road and ultimately drain to the Mianus River. Monitoring of these two strata will determine the vertical extent of contamination, as well as provide essential ground water elevation data which contributes to preparing a piezometric contour map of the study area.

4.5.4.1 Organic Sampling Results

The analytical results listed below for sample IIB(A)MW-4S are consistent with the Phase IIA results from this monitoring well. Analytes of concern were not detected in the sample.

Compound	Concentration (ug/l)
Acetone	17.0 B
Methylene chloride	10.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	7.0 BJ

"J" indicates estimated value.
"B" indicates compound found in method blank.

The analytical results for sample IIB(A)MW-4B were consistent with the Phase IIA results in that tetrachloroethene was found in the monitoring well. However, the concentrations of tetrachloroethene were found to have increased since the Phase IIA sampling and trichloroethene was detected in this phase but not previously in Phase IIA. The following compounds were detected, of which tetrachloroethene and trichloroethene are analytes of concern. The source of pentane,3-methyl is unknown.

Compound	Concentration (ug/l)
Tetrachloroethene	120.0
Trichloroethene	2.0 J
Acetone	34.0 B
Methylene chloride	18.0 B
Pentane,3-methyl	5.0 J
1,1,2-Trichloro-1,2,2-trifluoroethane	8.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.5.5 Monitoring Well Cluster MW-5 (MW-5S and MW-5B)

The bedrock and stratified drift/interface monitoring wells at the MW-5 location were completed during Phase IIA. The MW-5 cluster is the farthest removed ground water monitoring point for the Shopping Arcade Study Area and is located downgradient in the drainage valley. It is a monitoring point which may be representative of the ground water quality which is migrating from the Bedford Village commercial district and ultimately discharging into the Mianus River Valley.

4.5.5.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-5S are consistent with the Phase IIA results from this monitoring well in that no analytes of concern were detected. Other organic compounds that were found in the sample are listed below.

Compound	Concentration (ug/l)
Acetone	11.0 B
Methylene chloride	8.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	7.0 BJ

"J" indicates estimated value.
"B" indicates compound found in method blank.

The analytical results for sample IIB(A)MW-5B contained the compounds listed below. Two analytes of concern, benzene and toluene, were found which were not previously detected in Phase IIA.

Compound	Concentration (ug/l)
Benzene	1.0 J
Toluene	14.0
Acetone	33.0 B
Methylene chloride	19.0 B
Chloroform	4.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.5.6 Monitoring Well Cluster MW-6 (MW-6M [34'] and MW-6B [87.3'])

Monitoring well cluster MW-6 was originally to be located behind the Presbyterian Church according to the Work Plan, but was moved to a location just north of Court Road in an area just west of the pond system. This relocation was justified by the fact the new location placed the monitoring well cluster more in line with the potential contamination source(s) according to the Phase IIA ground water flow maps.

4.5.6.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-6M are provided below. Analytes of concern were not detected in the sample.

Compound	Concentration (ug/l)
Acetone	19.0 B
Methylene chloride	10.0 B

"B" indicates compound found in method blank.

The analytical results for sample IIB(A)MW-6B are provided below of which tetrachloroethene and trichloroethene are analytes of concern.

Compound	Concentration (ug/l)
Tetrachloroethene	140.0
Trichloroethene	6.0
Acetone	6.0 BJ
Methylene chloride	10.0 B

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.5.7 Monitoring Well MW-7 (MW-7B [105'])

Monitoring well MW-7B was constructed to the southwest of the Shopping Arcade building and its sanitary leaching field. The purpose of positioning the monitoring well at this location was to provide ground water quality data in an area directly upgradient of a suspected source of contamination (the Shopping Arcade leaching field). Documenting the background ground water quality was essential to the investigation so that a baseline ground water quality entering the study area could be established. This analytical data is used for the comparison of ground water quality values generated from the sampling of the monitoring wells which were strategically placed throughout the study area. With such a comparison it is possible to pinpoint sources of contaminant release as well as map the contaminant plume and project its future migration.

4.5.7.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-7B are listed below, of which benzene is an analyte of concern.

Compound	Concentration (ug/l)
Benzene	7.0
Acetone	13.0 B
Methylene chloride	10.0 B

"B" indicates compound found in method blank.

4.5.8 Monitoring Well Cluster MW-8 (MW-8M [25'] and MW-8B [60'])

The stratified drift/bedrock interface monitoring well and the bedrock well constructed at the MW-8 location were completed as part of the Phase IIB drilling program. Monitoring of these two strata provides ground water quality data to assess the lateral and vertical extent of contamination in the northeast quadrant of the study area. In addition, essential ground water elevation data was obtained at this location which contributed to the preparation of the potentiometric contour maps of the study area.

4.5.8.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-8M are listed below. The analytes of concern were not detected in this sample.

Compound	Concentration (ug/l)
Methylene chloride	9.0 B

"B" indicates compound found in method blank.

The analytical results for sample IIB(A)MW-8B are listed below. Analytes of concern were also not detected in this sample.

Compound	Concentration (ug/l)
Acetone	12.0 B
Methylene chloride	10.0 B
1,1,2-Trichloro-1,2,2-trifluoroethane	6.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.5.9 Monitoring Well MW-10 (MW-10M [80'])

Monitoring well MW-10M was constructed northeast of the Shopping Arcade building, south of Court Road and across the stream/pond system that runs through the valley. The positioning of this well generated ground water quality and potentiometric contour data at the most northeast monitoring point at the site. The ground water quality data was used to determine if the stream bed in the valley "actually" acts as a ground water divide in the stratified drift deposits.

4.5.9.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-10M are listed below. The analytes of concern were not detected in this ground water sample.

Compound	Concentration (ug/l)
Acetone	8.0 BJ
Methylene chloride	9.0 B

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.5.10 The Abandoned Production Well at the Exxon Service Station (MW-EX [310']) and the Abandoned Production Well at the Bedford School Resource Center (MW-SCH [650'])

As part of the Phase IIB ground water monitoring program, samples were collected from two abandoned bedrock production wells located within the study area. One of the wells is located just west of (behind) the Exxon Service Station, the other is located adjacent to Court Road on the Bedford School Resource Center property.

The Exxon well was chosen for sampling because it has had a history of chlorinated solvent contamination. In fact, once the boring was completed and sampled in 1986, it was decided not to utilize the well because it contained significant levels of tetrachloroethene and its breakdown products. The well was capped and abandoned. This abandoned Exxon well is located immediately downgradient of the Shopping Arcade leaching field.

The abandoned Bedford School Resource Center well was chosen for sampling because it was the deepest well readily accessible in the study area for sampling and its location is in the center of the Bedford Village drainage Valley adjacent to Court Road and downgradient of a suspected source of contamination. The ground water quality data generated from this abandoned well allows an assessment to what degree contaminant migration is structurally controlled in bedrock and if contaminants are capable of migration beyond the stream corridor in the valley.

The school well was originally abandoned because its rate of production was insufficient to meet the demand of the school and not because of contamination. Two additional production wells were drilled and are presently being utilized by the school.

4.5.10.1 Organic Sampling Results

The analytical results for sample IIB(A)MW-EX are listed below, of which tetrachloroethene and toluene are analytes of concern.

Compound	Concentration (ug/l)
Tetrachloroethene	10.0
Toluene	3.0 J
Acetone	16.0 B

Methylene chloride	19.0 B
Chloroform	4.0 J
Unknown	7.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

The analytical results for sample IIB(A)MW-SCH are listed below. Toluene, which is an analyte of concern, was detected in this sample.

Compound	Concentration (ug/l)
Toluene	12.0
Acetone	17.0 B
Chloroform	3.0 J
Methylene chloride	21.0 B
Unknown	5.0 J

"J" indicates estimated value.
"B" indicates compound found in method blank.

4.6 Geology

4.6.1 Regional Geomorphology

The following description of regional geology was obtained from a report prepared for the Town of Bedford by Leggette, Brashers and Graham, Inc. entitled "Ground Water Assessment - Town of Bedford, New York, December, 1985."

4.6.1.1 Physical Setting

The Town of Bedford, New York is located in northeastern Westchester County in an area of varied and rugged topography. The Town encompasses approximately 40 square miles, or 25,400 acres, of which approximately 1,300 acres are covered by water, leaving 24,100 acres of land area. Large water bodies include most of the Cross River Reservoir and parts of the New York City reservoir system, and the northern part of Byram Lake which provides drinking water for Mount Kisco.

The northern and southern parts of the Town are typified by ridges and rounded hills with steep slopes and high elevations. The highest elevations in Bedford are more than 800 feet above sea level on Chestnut Ridge, south and east of the Shopping Arcade Site, and 760 feet on Mount Aspetong in east-central Bedford. Rolling hills of lesser relief characterize the topography at the site which also borders the wetlands associated with the Mianus River Valley.

Drainage from the Shopping Arcade Site is to the southeast, eventually to Long Island Sound. The Mianus River, located approximately 1/2 mile southeast of the Shopping Arcade, cuts through hills forming a curving valley which is as much as two-thirds of a mile wide in places, before turning into the narrow fault controlled Mianus Gorge. The Mianus River Valley contains relatively flat flood plains which are commonly covered by swamps and ponds. The river drains an area of approximately five square miles within Bedford which contributes to the Mianus Reservoir, a public water supply impoundment in Stamford that serves the Town of Greenwich, Connecticut (see Figure No. 4-11).

4.6.1.2 General Description of Geology

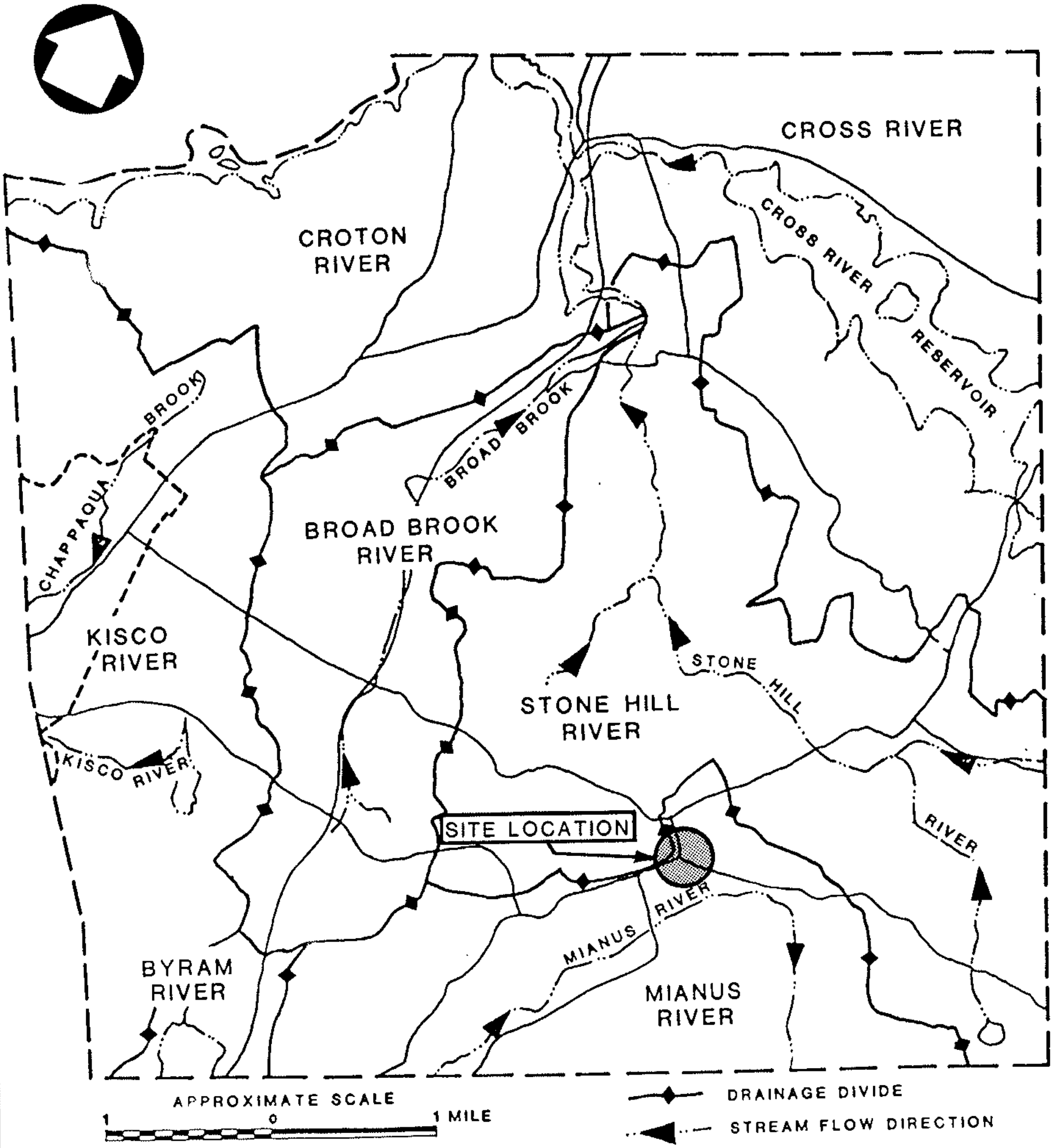
The Town of Bedford lies in the Manhattan Prong of the New England Upland physiographic province of the United States. In general, in this part of Westchester County, the highest hills are underlain by gneiss and granite, intermediate elevations by schist, and the main valleys by marble. The present land surface was smoothed and sculpted by Pleistocene glaciation, which ended in this area approximately 14,000 years ago.

4.6.1.3 Bedrock Geology

The bedrock geology of Bedford is the subject of several reports, and has been depicted on several regional and local geologic maps. This information is summarized in the Westchester County Areawide Waste Management Plan.

The bedrock of Bedford, comprising five different metamorphic crystalline rock formations, is the foundation for the present land forms and topographic relief. The relative susceptibility of the bedrock types to erosion by the passage and retreat of at least two stages of continental glaciation shaped the present land surface, with only geologically-minor changes occurring since that time. The five different formations that comprise the bedrock geology of Bedford include the Fordham Gneiss, Bedford Gneiss, Manhattan Schist, Manhattan Gneiss and the Inwood Marble, which collectively make up the New York City Group, lower Paleozoic and/or PreCambrian in age.

Figure No. 4-12 depicts the general occurrence of the bedrock formations in the Town of Bedford. The most abundant of the rock types is Fordham Gneiss, a rock with pronounced compositional banding which forms most of the hills and ridges in Bedford. A similar rock, Bedford Gneiss, occurs in the southeast corner of the Town. These types of



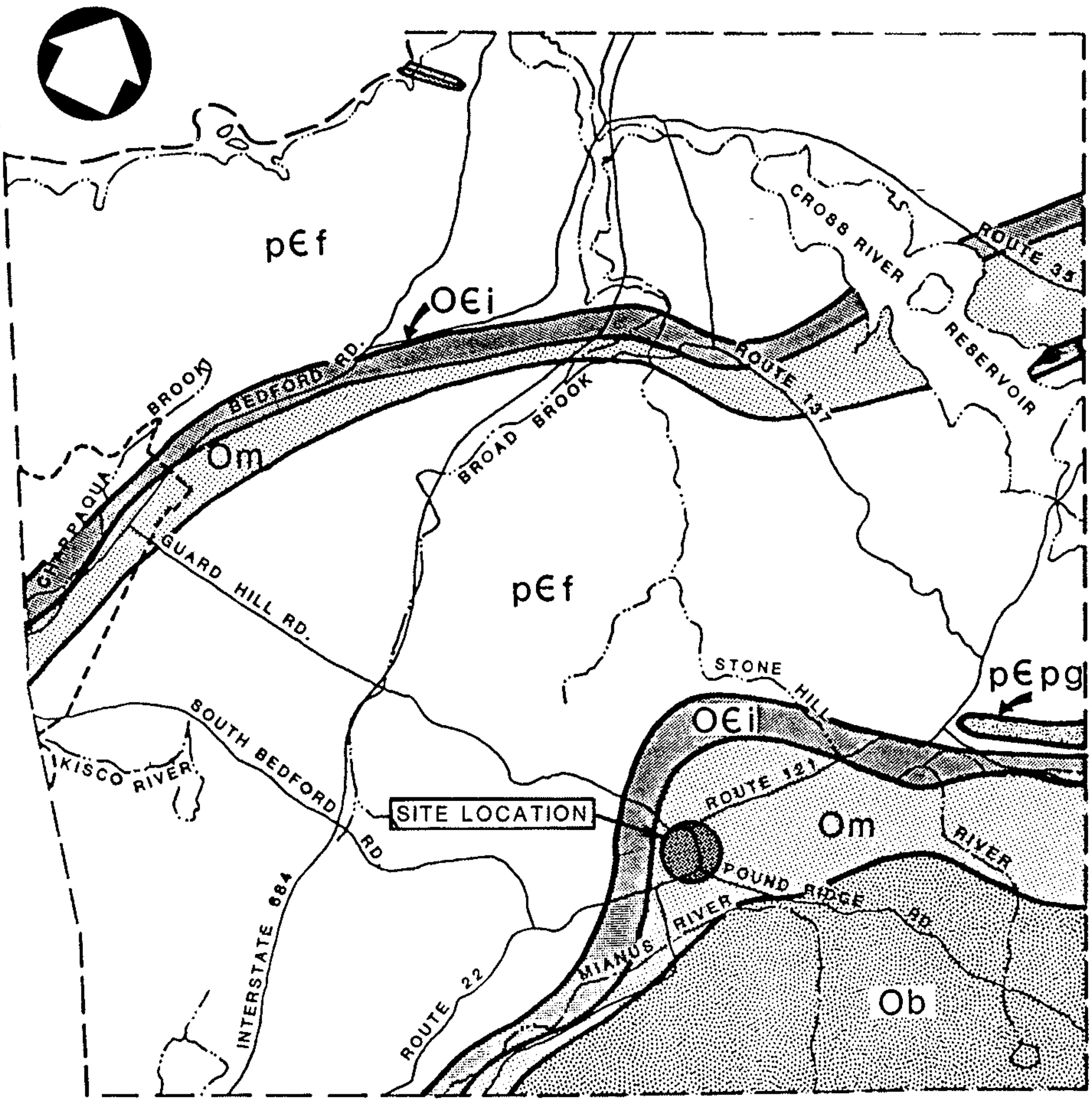
SOURCE: LEGGETTE, BRASHEARS & GRAHAM, INC.

BEDFORD VILLAGE WELLS
SHOPPING ARCADE STUDY AREA

Dvirka and Bartilucci CONSULTING ENGINEERS

TOWN OF BEDFORD
DRAINAGE BASINS

FIGURE NO. 4-11



Ob - BEDFORD GNEISS
Om - MANHATTAN FORMATION
OЄi - INWOOD MARBLE
pЄf - FORDHAM GNEISS
pЄpg - POUND RIDGE GNEISS

APPROXIMATE SCALE
1 0 1 MILE

SOURCE: LEGGETTE, BRASHEARS & GRAHAM, INC.

BEDFORD VILLAGE WELLS
SHOPPING ARCADE STUDY AREA

Dvirka and Bartilucci CONSULTING ENGINEERS

TOWN OF BEDFORD
BEDROCK GEOLOGY

FIGURE NO. 4-12

bedrock are visible in many roadcuts and on steep slopes adjacent to lowlands. Fresh exposures of Fordham Gneiss occur in the Route I-684 roadcut to the south of the Route 172 interchange. Natural outcrops are generally massive and rounded. Banding is prominent except on weathered surfaces, where the rock is a somewhat uniform dark gray. The chief difference between the two gneisses is mineralogical, with the Bedford Gneiss showing less complexity.

Two other crystalline rock types occur in narrow bands across the north central part of the Town, and separate the Fordham and Bedford Gneisses in the southeast. These bands are composed of Manhattan Formation Schist and Gneiss, and the Inwood Marble. Abundant slabby outcrops of strongly-foliated rusty brown rock occur on hills composed of Manhattan Schist. This rock contains a significant amount of mica, accounting for the sheen that is sometimes noticeable.

Inwood Marble commonly underlies lowland swamps and stream valleys and is only rarely found in natural outcrops. The occurrence of cleavage grains within the soil and/or of stands of Equisetum (horsetail plant) indicates the presence of this lithology in the subsurface. Where exposed in outcrop, usually in roadcuts, the marble is white to gray on fresh surfaces and rusty brown where weathered.

Pound Ridge Gneiss occurs in a single narrow band just north of the Stone Hill River at the eastern Town boundary. This pink "granite-like" rock displays moderate to strong foliation.

4.6.1.4 Surficial (Unconsolidated) Geology

Surficial geologic maps have not been published for the Town of Bedford area. The report prepared by Leggette, Brashers and Graham delineated and characterized the surficial deposits using a number of sources. These included a manuscript map prepared by the Westchester County Department of Planning, photographic soil maps from the Westchester County Soil and Water Conservation District, and residential well records obtained from the Westchester County Department of Health.

Most uplands and hill slopes in Bedford are covered with glacial till, a heterogeneous unsorted mixture of clay, silt, sand, gravel and boulders. Two types of till are associated with the glacial deposition: lodgement till, which was deposited beneath the moving glacier and is commonly very compact and relatively impermeable; and ablation till, which was released by the glacier as it melted and is less dense and more permeable. Most till deposits in Bedford are of the latter type, some of which are quite permeable and well drained. Lodgement till commonly occurs as drumlinoid hills or ridges. Till deposits range from inches to tens of feet thick in Bedford.

Glacial stratified drift underlies most of the stream valleys and swampy lowlands. These sorted deposits of sand, silt, clay and gravel also occur in some upland terraces and within zones of significant bedrock faulting. Glacial outwash sediments deposited by running water are well sorted. This mode of deposition produces strata composed of material with similar textural and hydrologic properties. These deposits may vary considerably from place to place and throughout the vertical section due to the meadering nature of glacial streams. The result is sediment with differing capacity for storing and transmitting water. In addition, glacial lacustrine deposits, which may occur on outwash deposits, are very fine grained and do not generally form productive aquifers. Stratified-drift sediments range in thickness from inches to approximately 200 feet within Bedford.

4.6.2 Site Geomorphology

4.6.2.1 Bedrock Geology

The Shopping Arcade Study Area is located on the northern edge of the Mianus River Valley immediately adjacent to an outcropping ridge line composed of Fordham Gneiss. The ridge of Fordham Gneiss slopes steeply under the Arcade and continues sloping southeast towards the Mianus River.

Lithology and Structure

The bedrock underlying the study area is composed predominantly of Fordham Gneiss. The Fordham Gneiss typically consists of a hard, grey to white banded rock with fine to medium grained crystals in matrix and large potassium and calcium feldspar crystals in the bands. The Fordham Gneiss also contains an abundance of biotite.

Located adjacent and to the south the Shopping Arcade building (MW-EX, the abandoned Exxon well) and to the southeast (MW-5B behind the Fire Department), the Inwood Marble was encountered at a depth of 260 feet and 86 feet below ground surface, respectively. Although there were only two boring locations in the Shopping Arcade Study Area in which the Inwood Marble was encountered, it was also found at one location in the adjacent Hunting Ridge Mall Area at the MW-10 monitoring well location adjacent to Turtle Pond, approximately 4,000 feet southwest of the Arcade site. Although the continuity of the Inwood Marble zone in the Mianus River Valley is questionable in all three instances it was encountered, it was found below the overlying Fordham Gneiss and was relatively deep below ground surface.

Many of the bedrock borings encountered zones of high calcium concentrations within the Fordham Gneiss and zones within the Inwood Marble that contained a significant quantity of mafic minerals. The structural relationship between these units is complex and not clearly understood.

The regional Bedford geology map prepared by Leggette, Brashears and Graham (see Figure No. 4-12) notes a thin line (1/4 mile wide) of Inwood Marble transversing through the Mianus River Valley. This is most likely the unit encountered at the abandoned Exxon well and the MW-5 boring locations.

Bedrock Core Samples

Continuous rock core samples were collected in the borings advanced into each of the bedrock wells constructed during this investigation. The rock cores were examined to establish the lithology and physical characteristics of the bedrock unit. A complete visual description of the rock cores were made which included rock type, color, hardness, grain size and shape, boring, cementation and fracturing. (For a detailed description of each rock core collected, refer to the boring logs in Appendix D.)

The top 10 to 15 feet of the Fordham Gneiss was extensively fractured and weathered. A descriptive term referred to as RQD (which is the total length of rock core greater than twice the rock core diameter, divided by the run length) calculates a relative value of rock competency (fracturing). The greater the RQD value, the greater the relative competency of the rock unit (fracturing decreases). A review of the RQD values calculated for the individual rock core runs obtained at the Shopping Arcade Study Area, shows that the Fordham Gneiss generally exhibited fewer fracture zones with depth. This data is important in the review of fluid migration within the fractured metamorphic rock underlying the study area. It appears that there is a pathway for ground water to migrate into the bedrock underlying the stratified drift deposits in the Mianus River Valley. However, the migration of ground water through the bedrock zone will be controlled by fracture density, the interconnection of fractures and the pressures associated with the fluids contained within the fractures.

Bedrock Topography

A bedrock contour map has been prepared for the Shopping Arcade Study Area and is presented in Figure No. 4–13. Fordham Gneiss outcrops directly behind the Shopping Arcade and forms a ridge line which trends northeast–southwest. The Fordham Gneiss slopes steeply to the rear of the Arcade building and then slopes less severely as it trends to the east. At boring location MW–7, 200 feet behind the Arcade building, the gneiss was encountered five feet below ground surface. At boring location MW–3, just in front of the Arcade, the gneiss was encountered at 21 feet below ground surface. At boring MW–4, which is located approximately 350 feet in the front of the Arcade building, bedrock was encountered 33 feet below ground surface.

It appears that the bedrock surface from the Shopping Arcade Site to the MW–6 monitoring location (the furthest downgradient monitoring point at which bedrock was encountered) slopes to the east with a gradient of 0.13 feet (vertical) per 1 foot (horizontal).

The thickest stratified drift deposits (bedrock at greatest depth below ground surface) documented in the Shopping Arcade Study Area was at the MW–10 boring location where weathered bedrock was encountered at 80 feet below ground surface. This boring/well location is the furthest downgradient in the study area.

4.6.2.2 Soil Geology

Overlying the Fordham Gneiss bedrock in the Mianus River Valley and underlying the Shopping Arcade Study Area are glacial stratified drift deposits. These deposits are generally composed of sorted very fine–coarse sands and silts and are described below in detail.

Soil Borings

Early in the Remedial Investigation, a geophysical survey was conducted in the Shopping Arcade Study Area. One of the objectives of this survey was to determine the thickness of the glacial stratified drift deposits within the Mianus River Valley. Examination of this data assisted in planning the depths at which ground water monitoring wells would be placed.

LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
—350—	ELEVATION OF BEDROCK SURFACE (MEAN SEA LEVEL)
—(350')—	ELEVATION OF BEDROCK SURFACE AT BOREHOLE (MEAN SEA LEVEL)

NO.	DATE	REVISION	BY

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Syosset, New York

BEDFORD VILLAGE
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
BEDFORD SURFACE CONTOUR MAP

PROJECT NO. 842
DATE
SCALE AS NOTED

FIGURE NO. 4-13

During construction of the deepest borehole at each well cluster, split spoon samples were obtained at five foot intervals in the unconsolidated deposits to classify the stratigraphic sequences underlying the study area. The samples were logged characterizing the soil type, color, grain size and moisture content. Detailed descriptions of these soil samples are provided in the boring logs contained in Appendix D.

Unconsolidated Stratigraphic Sequences

Overlying the Fordham Gneiss in the Shopping Arcade Study Area is a weathered bedrock zone. This zone is composed of fragmented and weathered bedrock that has little structural integrity. The interaction of ground water at the soil/bedrock interface is the primary cause for this weathered zone. The weathered bedrock zone was encountered in all soil borings advanced to bedrock except the borings at the MW-1, MW-3 and MW-7 monitoring locations. At the MW-3 monitoring location only a six foot saturated zone occurs above the bedrock. It appears advanced weathering of the bedrock has not yet occurred at this location.

Overlying the weathered gneiss and comprising the majority of the unconsolidated deposits in the Mianus River Valley and the study area are fine sands grading to clayey silts. At many of the boring locations, the sand was so finely 'pulverized' that a grain size analysis (ASTM D-2487 w/o hydrometer) was conducted to confirm whether or not 0.010 slot stainless steel screen was a fine enough mesh to keep the formation from silting up the monitoring wells. The results of the test showed that the soil samples may be classified as SP-SM (poorly graded sand with appreciable fines) and 0.006 slot stainless steel screens were used in the construction of several of the wells.

As the underlying bedrock dips to the east-southeast of the Shopping Arcade towards the center of the Bedford Village Valley the unconsolidated deposits thicken to as much as 80 feet (at the MW-10 drilling location). A zone of weathered rock approximately ten feet in thickness, overlies bedrock in the Bedford Village Valley and pinches out toward the higher surface elevations behind the Shopping Arcade. A unit of fine sand approximately 20 feet in thickness in the Bedford Village Valley also pinches out towards the rear of the Shopping Arcade. The uppermost unit in the unconsolidated sediments is a clayey silt approximately 25 feet in thickness in the Bedford Village Valley which grades into a silt and thins to less than five feet in thickness as it approaches the rear of the Shopping Arcade.

The bedrock and soil geology, as described above, is illustrated in three cross sections that were prepared for the study area (Figure Nos. 4-15 through 4-17). Figure No. 4-14 illustrates the locations of the cross sections on a site map. Boring logs used to construct these cross sections are contained in Appendix D.

4.7 Ground Water Hydrology

4.7.1 Regional Ground Water Hydrology

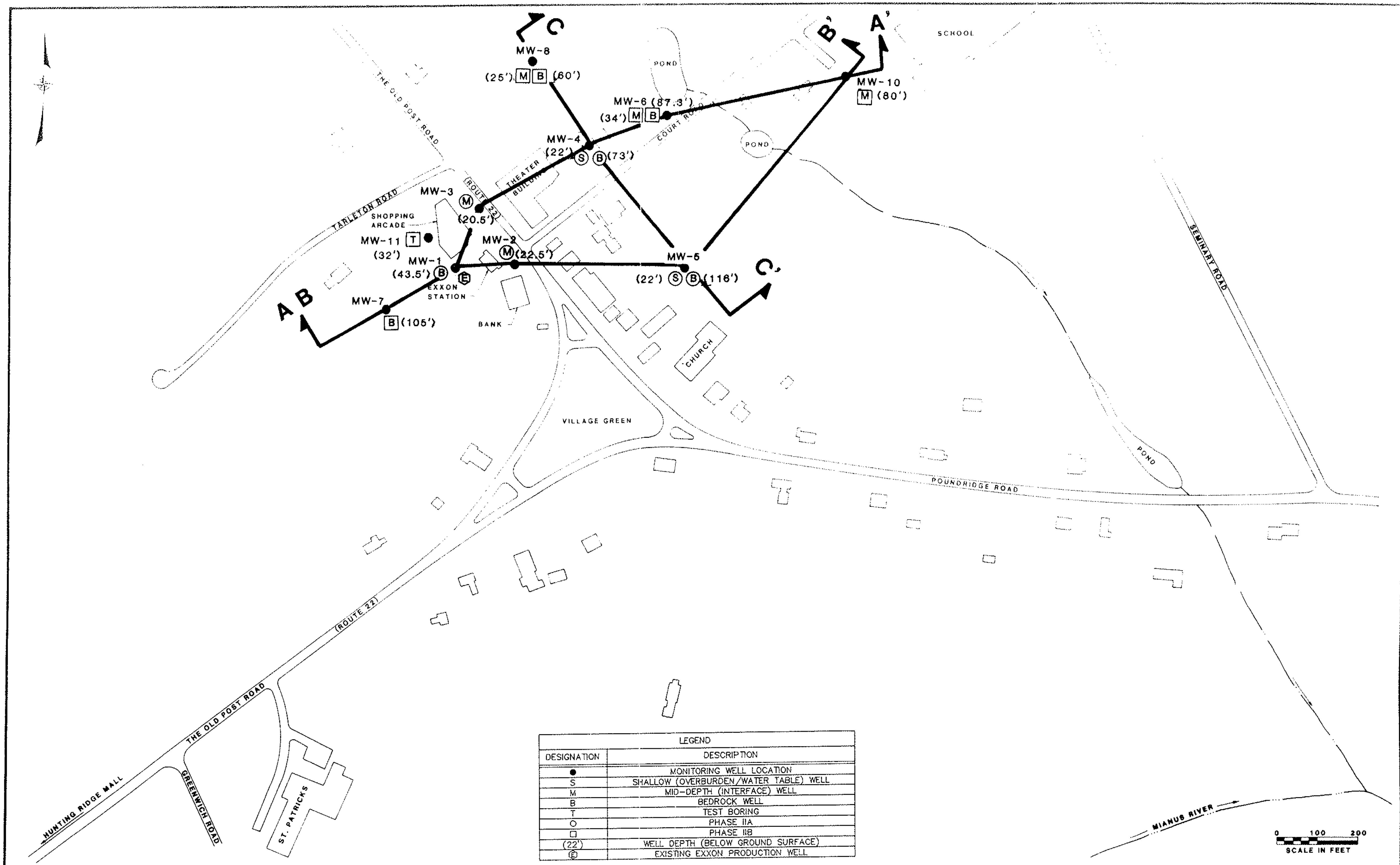
The following description of regional subsurface hydrology was obtained from the report prepared for the Town of Bedford by Leggette, Brashers and Graham, Inc. entitled "Ground Water Assessment - Town of Bedford, New York, December, 1985."

4.7.1.1 Bedrock Aquifers

The crystalline bedrock of Bedford consists of hard, relatively impermeable rock of metamorphic origin which has been extensively fractured as a result of tectonic deformation of the earth's crust.

Hydrogeologically, these rocks can be divided into two groups: one, the foliated silicates represented by Fordham and Bedford Gneisses and the Manhattan Formation, and two, the carbonate Inwood Marble. The first group commonly yields sufficient water for domestic supply. In areas of increased fracture density, these rocks may produce as much as 365 gallons per minute (gpm). In Westchester County as a whole, the Manhattan Schist is the most extensive and one of the most productive bedrock aquifers.

Gneiss is reported to yield small to moderate quantities of water throughout Westchester County and neighboring areas. Approximately 75 percent of Bedford is underlain by this rock type, making it the most aerially extensive aquifer by far. Only approximately 11 percent of the land in Bedford is underlain by Manhattan Formation Schist. Approximately 93 percent of the private residential water supply in Bedford is obtained from these rock types.



LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION
S	SHALLOW (OVERBURDEN/WATER TABLE) WELL
M	MID-DEPTH (INTERFACE) WELL
B	BEDROCK WELL
T	TEST BORING
O	PHASE IIA
□	PHASE IIB
(22')	WELL DEPTH (BELOW GROUND SURFACE)
Ⓔ	EXISTING EXXON PRODUCTION WELL

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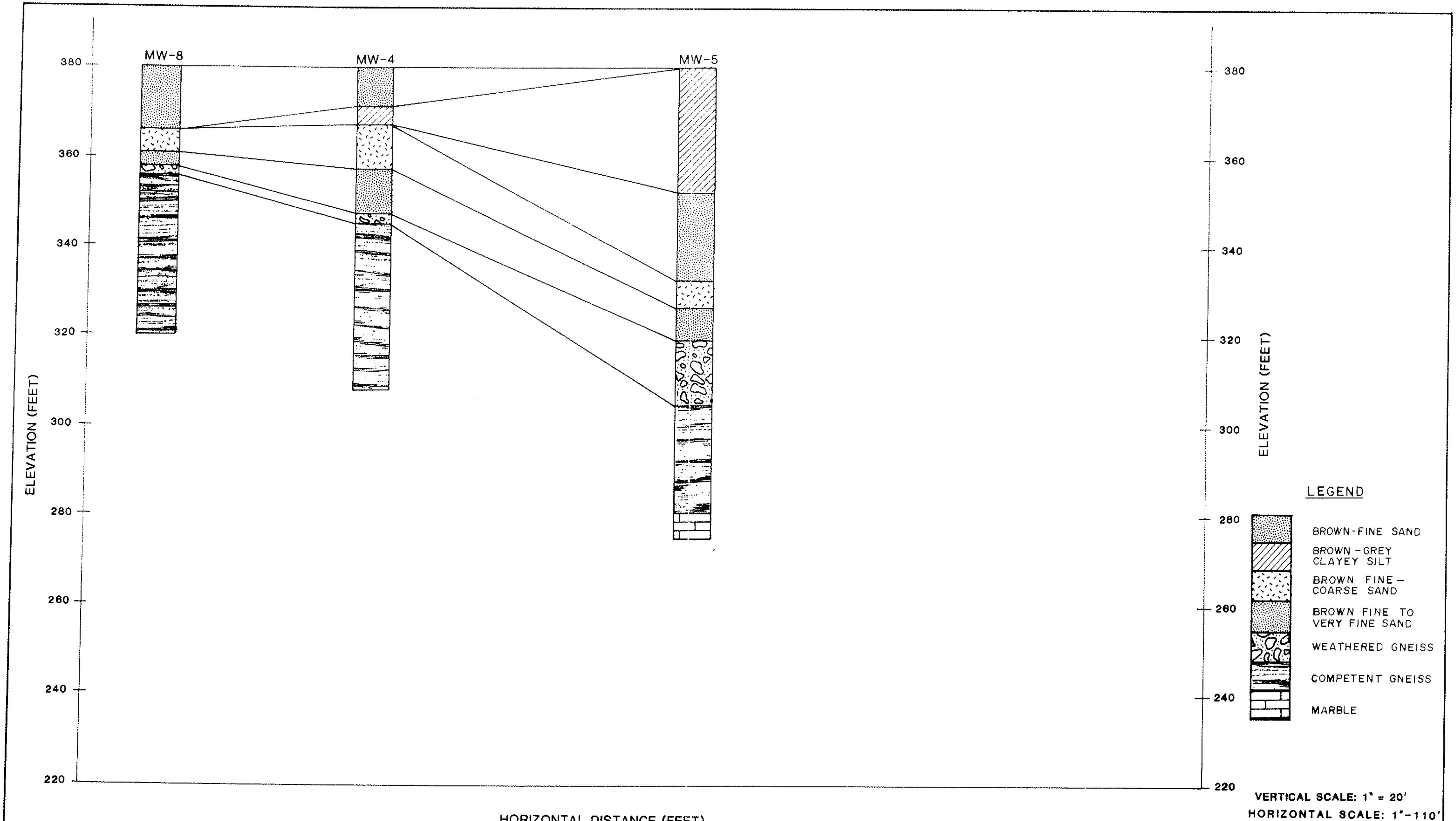
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
LOCATION OF GEOLOGIC CROSS SECTIONS

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 4-14



Dvirka and Bartilucci CONSULTING ENGINEERS

BEDFORD VILLAGE WELLS
SHOPPING ARCADE

CROSS SECTION C-C

FIGURE NO. 4-17

Although of limited extent, the carbonate rocks are known to yield large quantities of water in some areas. Inwood/Stockbridge Marble is the most productive bedrock aquifer in Westchester and Dutchess Counties. An average yield from Dutchess County wells completed in marble is reported to be 22 gpm, with a range from 0 to 220 gpm. Recent well yields in excess of 300 gpm have been achieved from the Inwood Marble in Somers and in Mount Pleasant. Because these rocks are soluble at ambient pressure and temperature, fractures tend to be chemically enlarged by most natural waters. This can improve the water storage and transmitting properties of the rock substantially. In Bedford, the Inwood Marble has undergone significant fracturing. Increased production can be expected where wells intersect openings along which solutioning has occurred.

Only four percent of the private wells surveyed in Bedford produce water from the Inwood/Stockbridge Marble. An average reported yield of only 13 gpm probably reflects the fact that most of the wells were drilled no deeper than necessary to develop a domestic water supply well. In addition, because these rocks often underlie unconsolidated deposits in valleys and lowlands, the potential recharge to the marble is substantially greater than for the upland bedrock units.

4.7.1.2 Soil (Unconsolidated) Aquifers

Glacial till can provide adequate water supply for domestic use from large diameter dug wells placed in relatively thick till deposits. Significant aquifers may occur in stratified drift, where sand and gravel layers are of sufficient thickness and where a source of recharge exists. Stratified deposits exceeding 100 feet in thickness occur in the Stone Hill River Valley near Pitch Swamp, in the central portion of the Mount Kisco-Katonah corridor, in the Davis Brook lowland and at the outlet of Cross River Reservoir. Deposits which range from 50 to 100 feet are found in parts of the Mianus River and Stone Hill River Valleys. The most widespread stratified deposits are less than 50 feet thick. Extensive areas covered by these deposits occur along the Mianus and Stone Hill Rivers and within the Davis Brook drainage system. The narrow valley along the Mount Kisco-Katonah corridor is underlain along most of its length by deposits of less than 50 feet. Isolated lowlands and stream valleys throughout the Town of Bedford also contain minor stratified deposits.

The geographic distribution of stratified-drift deposits is controlled, in part, by the configuration of underlying bedrock. The Inwood Marble is less resistant to chemical weathering than the other rock types and is more easily eroded. In addition, a considerable amount of fracturing has occurred in all rocks of this area as the result of regional tectonic forces and post-glacial rebound. Fractured rock is readily removed by physical erosional processes. Prior to and during glaciation, areas of marble bedrock and zones of fracture in other rock types, were eroded to form stream valleys. During glacial retreat, melting ice released entrained rock and rock debris into streams and lakes at the margin of the glacier. This material partially filled the preformed valleys with stratified drift. In Bedford, several aquifers capable of supporting high-yielding wells occur within these deposits. Wells completed in stratified drift produce from 6 to 600 gpm, with an average yield of about 100 gpm.

4.7.2 Site Ground Water Hydrology

Throughout the well drilling program, water level elevations were obtained from the monitoring wells constructed in the study area. The most comprehensive sets of data were obtained at the end of the field program (September 1, 1988 and November 8, 1988) when all the monitoring wells were completed. Water levels are an essential component to the hydrogeologic investigation because the slope of the water table indicates direction of ground water movement.

The ground water elevations for each monitoring well were plotted on the Shopping Arcade Study Area base map. Ground water contours were mapped for the two subsurface zones investigated (overburden and bedrock) utilizing triangulation and the pre-supposition that ground water flows from a higher to lower hydraulic head. Water level elevations recorded during the investigation for each of the dates for which they were obtained are provided in Table Nos. 4-5 through 4-7.

4.7.2.1 Bedrock Ground Water Flow

Ground water flow in bedrock can be an extremely complex process. The ground water flow in the metamorphic bedrock underlying the study area is characterized by fracture flow. Fracture flow can be effected by numerous factors such as fracture density, the interconnection of fractures and the pressures associated with the fluids within the fractures.

Table No. 4–5

GROUND WATER ELEVATIONS
December 21, 1987

(Measured in Feet)

Monitoring Well Number	Depth of Well Below Ground Surface	Depth to Ground Water (From Top of PVC Casing)	Well Elevation (Mean Sea Level) (Top of PVC Casing	Ground Water Elevation (Mean Sea Level)	Vertical Gradient (ft./ft.)
MW–1B	44.31	15.23	405.30	390.07	—
MW–2M	25.81	7.35	392.61	385.26	—
MW–3M	24.31	13.61	398.29	384.68	—
MW–4S	21.91	5.27	371.05	365.78	
MW–4B	74.21	4.58	370.69	366.11	6.3×10^{-3} (upward)
MW–5S	24.21	8.51	374.02	365.51	
MW–5B	86.21	12.90	374.18	361.28	6.8×10^{-2} (downward)

1171E

Table No. 4–6

GROUND WATER ELEVATIONS
September 1, 1988

(Measured in Feet)

Monitoring Well Number	Depth of Well Below Ground Surface	Depth to Ground Water (From Top of PVC Casing)	Well Elevation (Mean Sea Level) (Top of PVC Casing	Ground Water Elevation (Mean Sea Level)	Vertical Gradient (ft./ft.)
MW–1B	44.3	26.40	405.30	378.90	—
MW–2M	25.8	N/A	392.61	N/A	—
MW–3M	24.3	15.85	398.29	382.44	—
MW–4S	21.9	6.25	371.05	364.80	
MW–4B	74.2	6.28	370.69	364.41	7.5×10^{-3} (downward)
MW–5S	24.2	8.26	374.02	365.76	
MW–5B	86.2	15.77	374.18	358.41	1.2×10^{-1} (downward)
MW–6M	37.0	4.17	367.21	363.04	
MW–6B	87.3	6.69	367.25	360.56	4.9×10^{-2} (downward)
MW–7B	105.0	73.22	471.04	397.82	—
MW–8M	25.0	5.27	371.62	366.35	
MW–8B	60.0	5.77	371.62	365.85	1.4×10^{-2} (downward)
MW–10M	85.5	5.41	367.96	362.55	—

N/A – No ground water in the overburden at this location during this measurement period.

1171E

Table No. 4-7

GROUND WATER ELEVATIONS
November 8, 1988

(Measured in Feet)

Monitoring Well Number	Depth of Well Below Ground Surface	Depth to Ground Water (From Top of PVC Casing)	Well Elevation (Mean Sea Level) (Top of PVC Casing	Ground Water Elevation (Mean Sea Level)	Vertical Gradient (ft./ft.)
MW-1B	44.3	14.79	405.30	390.51	—
MW-2M	25.8	N/A	392.61	N/A	—
MW-3M	24.3	16.20	398.29	382.09	—
MW-4S	21.9	5.80	371.05	365.25	
MW-4B	74.2	5.48	370.69	365.21	7.6×10^{-4} (downward)
MW-5S	24.2	6.25	374.02	367.77	
MW-5B	86.2	13.51	374.18	360.67	1.1×10^{-1} (downward)
MW-6M	37.0	3.84	367.21	363.37	
MW-6B	87.3	4.31	367.25	362.94	8.5×10^{-3} (downward)
MW-7B	105.0	78.35	471.04	392.69	—
MW-8M	25.0	4.67	371.62	366.95	
MW-8B	60.0	5.20	371.62	366.42	0.2×10^{-1} (downward)
MW-10M	85.5	4.88	367.96	363.08	—

N/A – No ground water in the overburden at this location during this measurement period.

To best characterize the general ground water flow direction in the bedrock underlying the study area, it is essential to obtain as many data points over a broad aerial extent as possible. In this way, ground water elevations in bedrock can be compared and a general trend noted.

Initially, bedrock ground water elevations were obtained from the three Phase IIA monitoring wells on December 21, 1987. Later in the Remedial Investigation, upon the completion of additional bedrock monitoring wells, ground water elevations were obtained at six locations in the Shopping Arcade Study Area on September 1, 1988 and November 8, 1988.

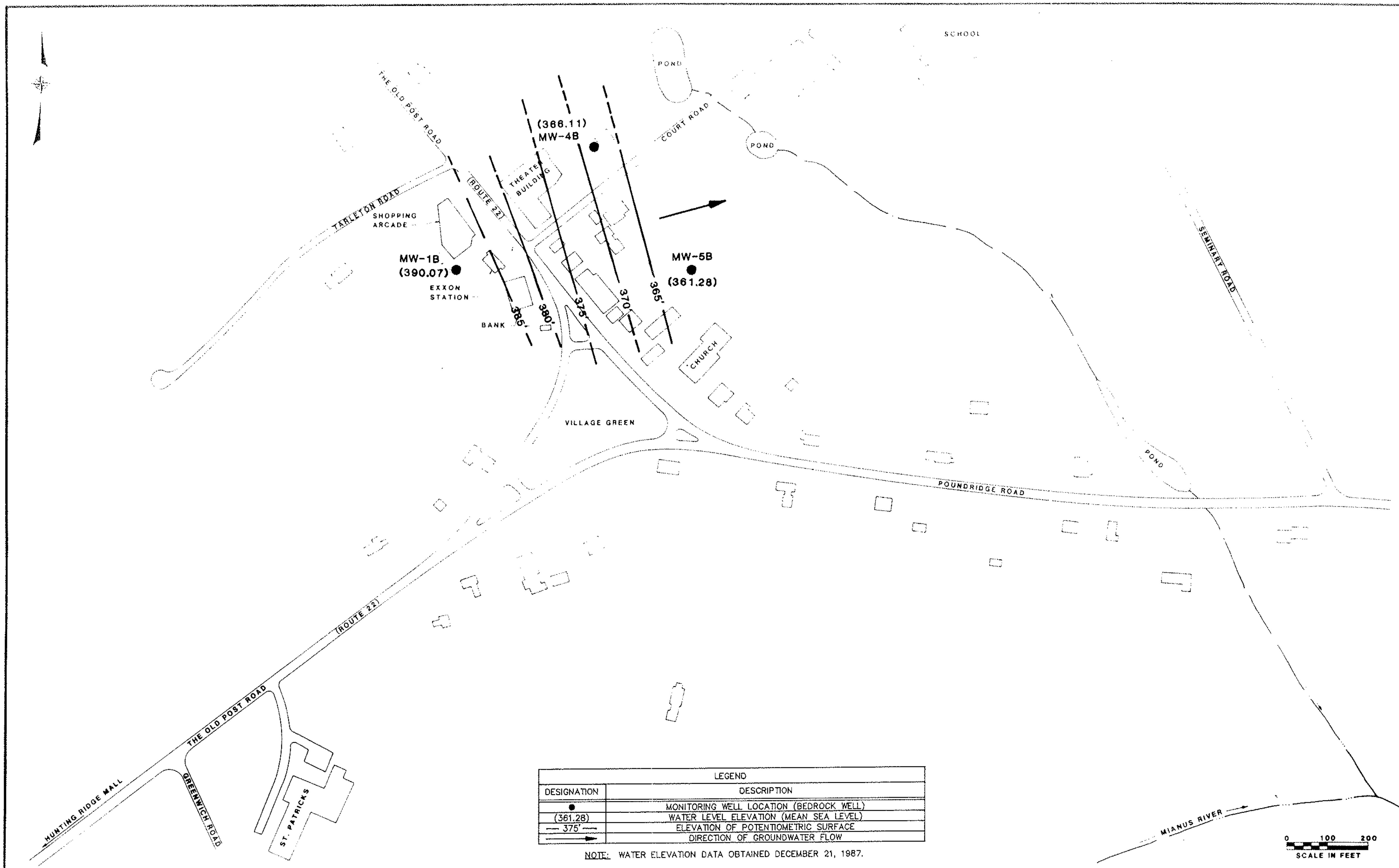
Generally, the ground water within the bedrock can be characterized as migrating horizontally in a east-northeasterly direction from the Shopping Arcade towards the central Bedford Village Valley (see Figure Nos. 4–18 through 4–20). The ground water gradient in the metamorphic bedrock zone underlying the study area is approximately 0.035–0.051 foot of head loss per foot of horizontal distance. Ground water is migrating downward through the unconsolidated deposits at the Shopping Arcade site and recharging bedrock. Vertical gradients range from 7.6×10^{-4} ft./ft. to 1.2×10^{-1} ft./ft.

4.7.2.2 Soil (Unconsolidated) Ground Water Flow

Measurements of water elevations in the unconsolidated deposits were obtained in December 1987, September 1988 and November 1988 in the Shopping Arcade Study Area (see Figure Nos. 4–21 through 4–23).

The ground water elevation measurements obtained during these three distinct periods all exhibit a general northeasterly flow from the Shopping Arcade parallel with Court Road. The horizontal ground water gradient in the stratified drift deposits underlying the study area is approximately 0.035–0.047 foot of head loss per foot of horizontal distance. As mentioned in Section 4.7.2.1, ground water also migrates downward through the unconsolidated deposits and recharges bedrock as indicated by the vertical gradients ranging from 7.6×10^{-4} ft./ft. to 1.2×10^{-1} ft./ft.

It appears from the ground water elevation measurements that ground water flow in the stratified drift deposits follows the slope of the local topography in the study area.



LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (BEDROCK WELL)
(361.28)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 375' —	ELEVATION OF POTENTIOMETRIC SURFACE
——→	DIRECTION OF GROUNDWATER FLOW

NOTE: WATER ELEVATION DATA OBTAINED DECEMBER 21, 1987.

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Syosset, New York

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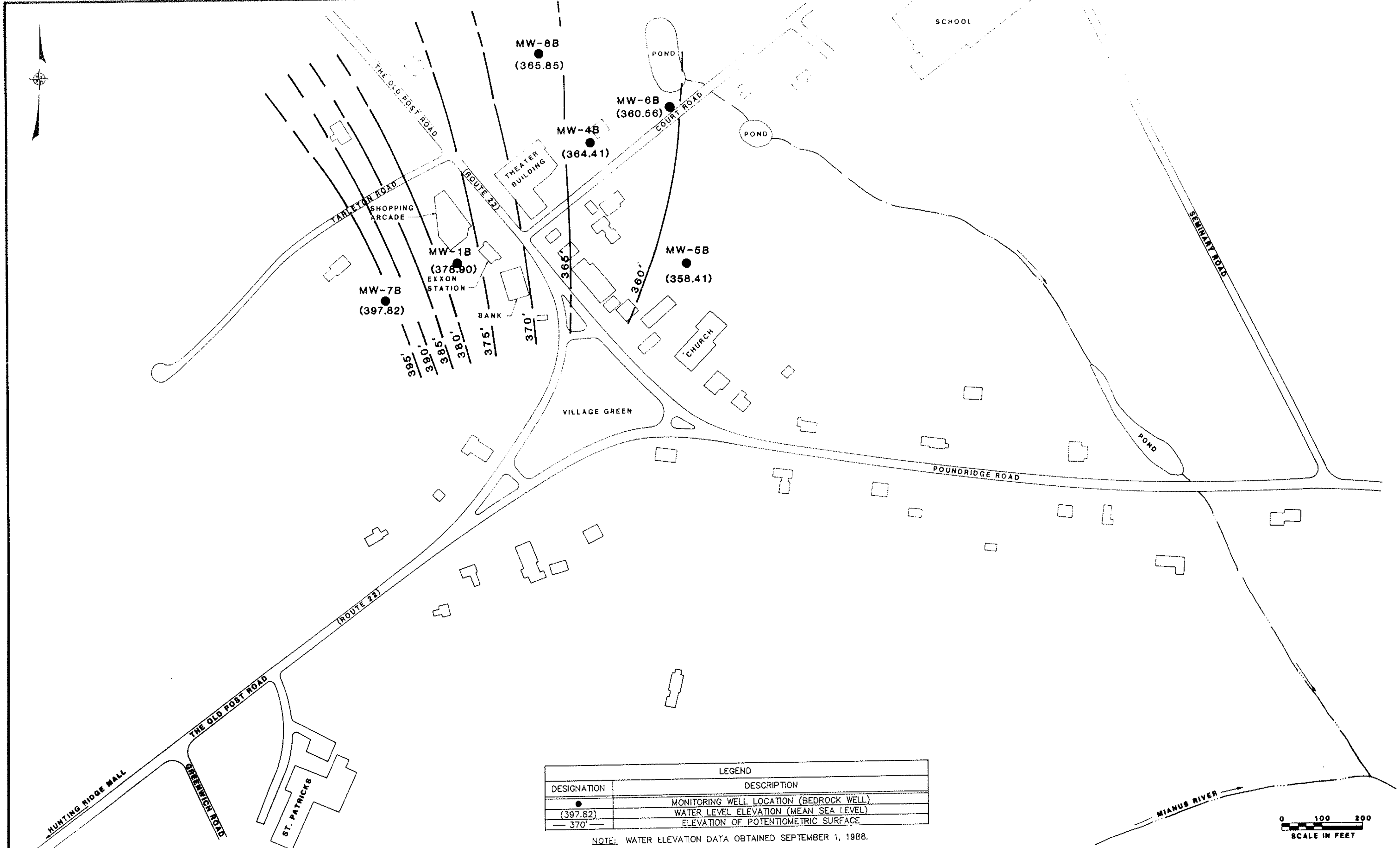
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
BEDROCK WATER LEVEL MAP
DECEMBER 21, 1987

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 4-18



LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (BEDROCK WELL)
(397.82)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 370' —	ELEVATION OF POTENTIOMETRIC SURFACE

NOTE: WATER ELEVATION DATA OBTAINED SEPTEMBER 1, 1988.

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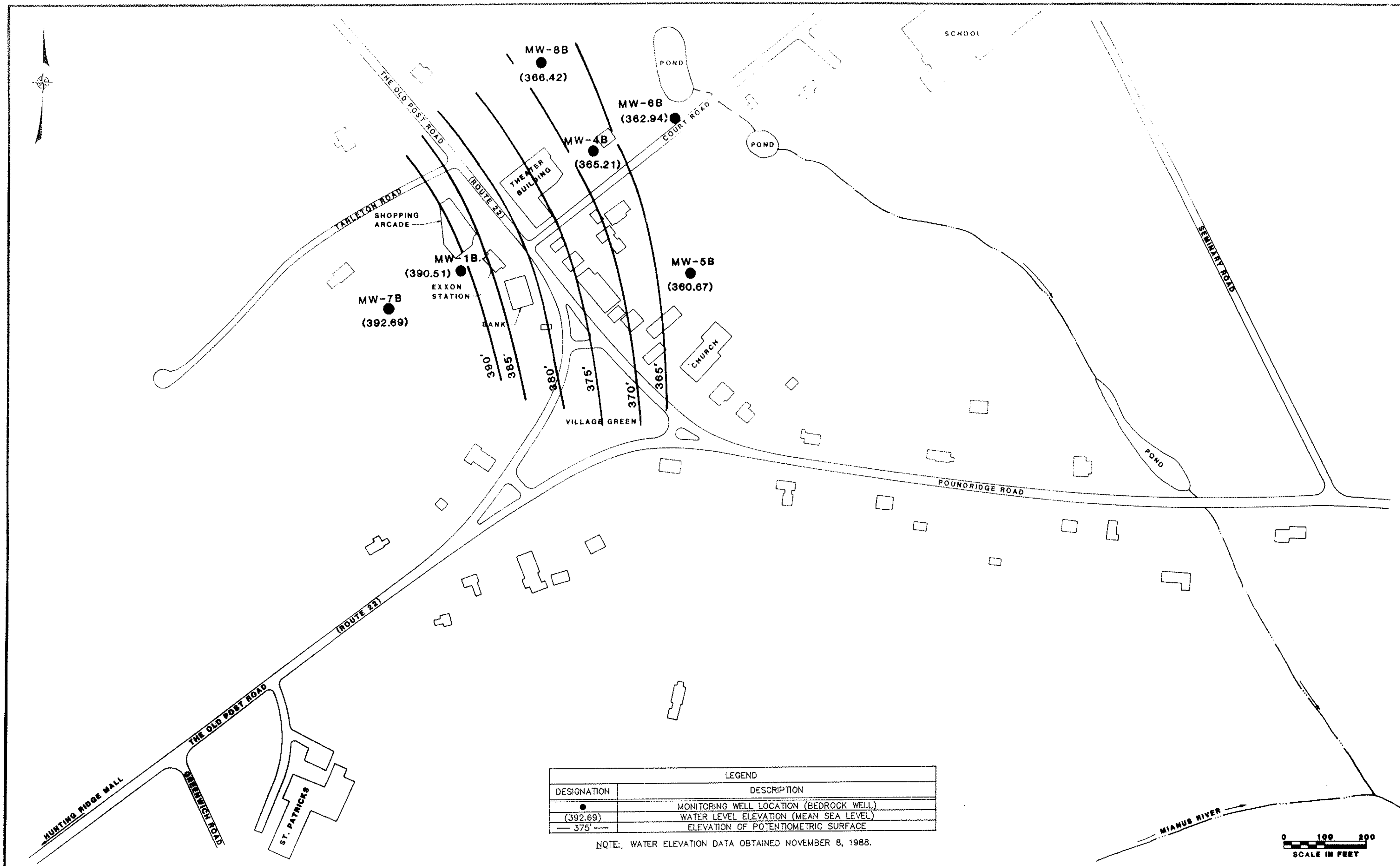
SHOPPING ARCADE STUDY AREA
BEDROCK WATER LEVEL MAP
SEPTEMBER 1, 1988

PROJECT NO. 842
DATE
SCALE: AS NOTED

FIGURE NO. 4-19



LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (BEDROCK WELL)
(392.69)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 375' —	ELEVATION OF POTENTIOMETRIC SURFACE

NOTE: WATER ELEVATION DATA OBTAINED NOVEMBER 8, 1988.

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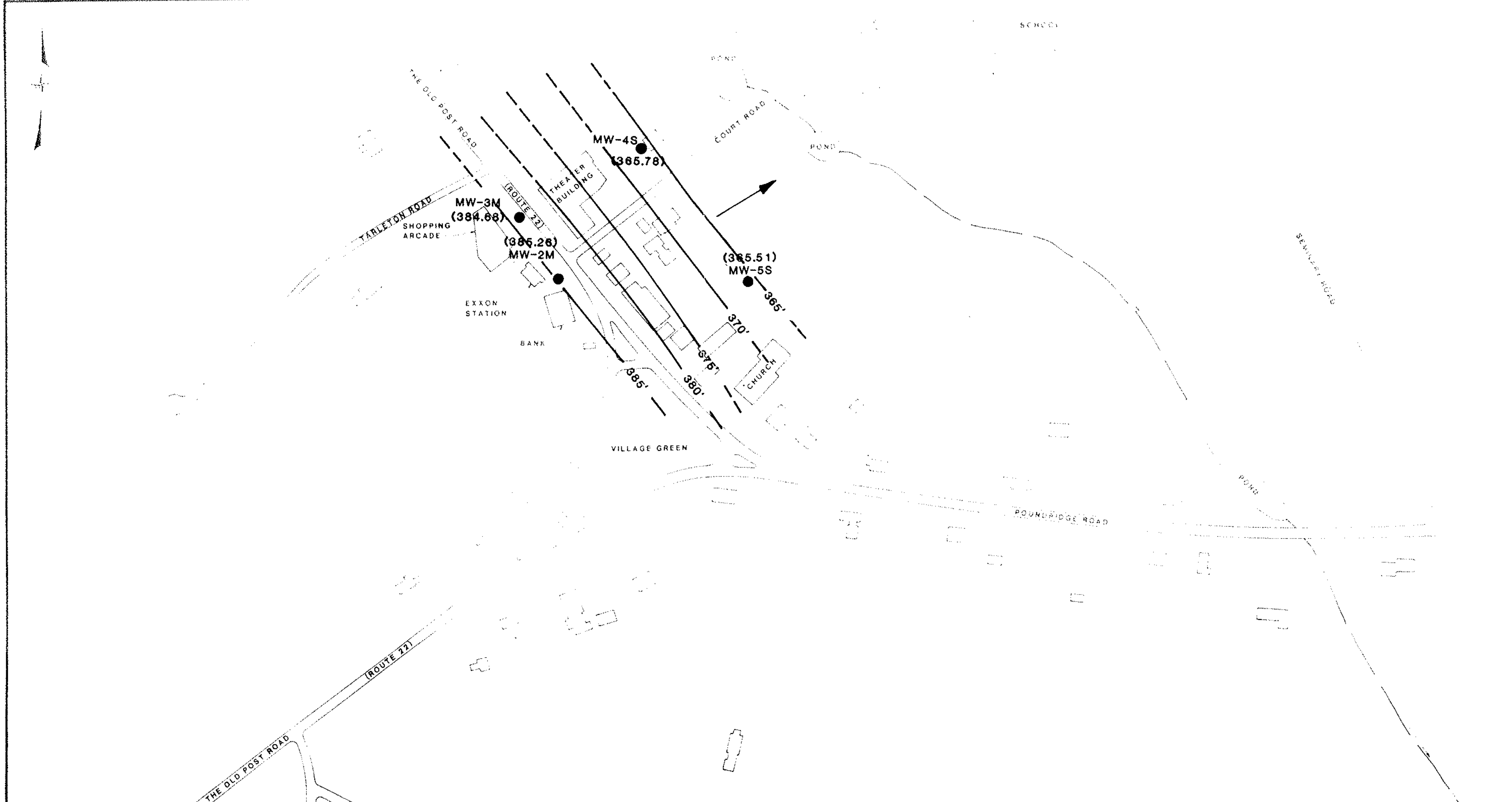
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
BEDROCK WATER LEVEL MAP
NOVEMBER 8,1988

PROJECT NO. 842
DATE:
SCALE AS NOTED
FIGURE NO. 4-20



LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (OVERBURDEN WELL)
(384.68)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 380' —	ELEVATION OF POTENTIOMETRIC SURFACE
———►	DIRECTION OF GROUNDWATER FLOW

NOTE: WATER ELEVATION DATA OBTAINED DECEMBER 21, 1987.

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SHOPPING ARCADE STUDY AREA

WATER TABLE MAP

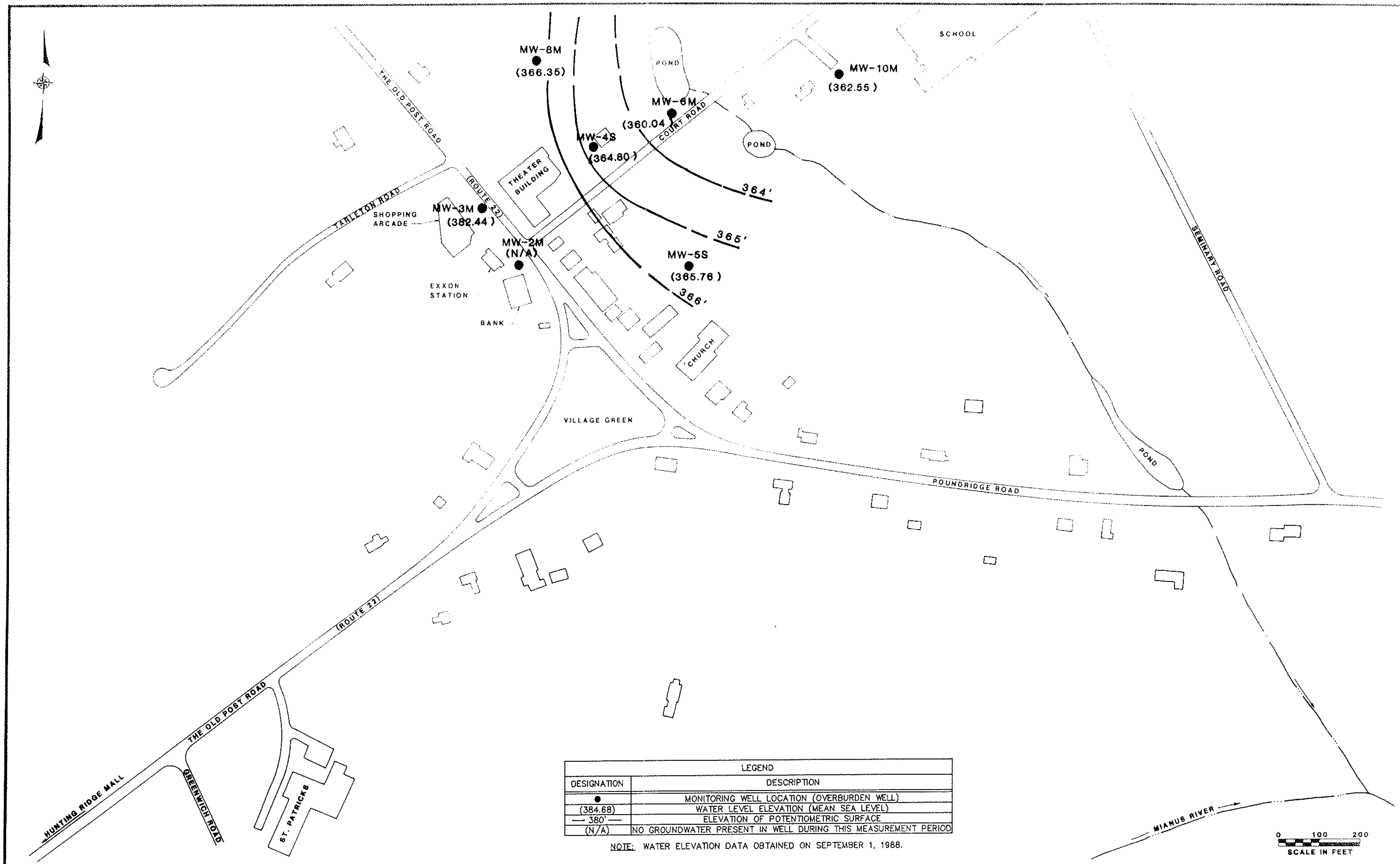
DECEMBER 21, 1987

PROJECT NO. 842

DATE

SCALE AS NOTED

FIGURE NO. 4-21



LEGEND	
DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (OVERBURDEN WELL)
(384.68)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 380' —	ELEVATION OF POTENTIOMETRIC SURFACE
(N/A)	NO GROUNDWATER PRESENT IN WELL DURING THIS MEASUREMENT PERIOD

NOTE: WATER ELEVATION DATA OBTAINED ON SEPTEMBER 1, 1988.

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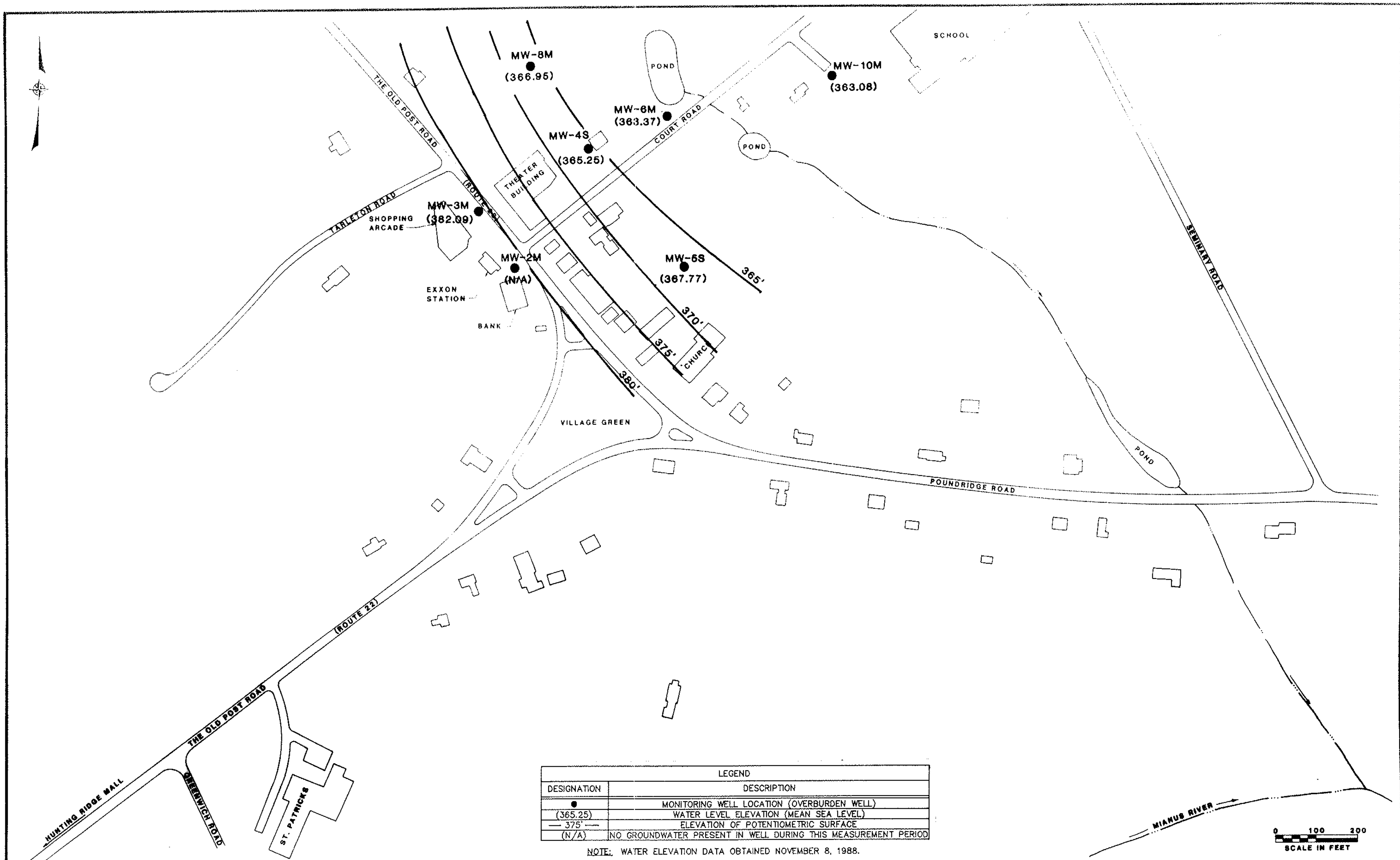
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
WATER TABLE MAP
SEPTEMBER 1,1988

PROJECT NO. 842
DATE.
SCALE. AS NOTED
FIGURE NO. 4-22



LEGEND

DESIGNATION	DESCRIPTION
●	MONITORING WELL LOCATION (OVERBURDEN WELL)
(365.25)	WATER LEVEL ELEVATION (MEAN SEA LEVEL)
— 375' —	ELEVATION OF POTENTIOMETRIC SURFACE
(N/A)	NO GROUNDWATER PRESENT IN WELL DURING THIS MEASUREMENT PERIOD

NOTE: WATER ELEVATION DATA OBTAINED NOVEMBER 8, 1988.

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WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
WATER TABLE MAP
NOVEMBER 8, 1988

PROJECT NO. 842
DATE:
SCALE: AS NOTED
FIGURE NO. 4-23

Section 5

5.0 WATER SUPPLY SAMPLING PROGRAM

The purpose of this section of the Remedial Investigation Report is to describe the basis, institution and proceedings of the Water Supply (Tap Water) Sampling Program, present the analytical results of the samples which were obtained during this program and discuss their relationship and significance to the most current applicable drinking water and ground water standards.

5.1 Description of the Water Supply Sampling Program

5.1.1 Purpose of the Sampling Program

As a result of concern expressed by the residents regarding the quality of water supply in the study area and at the request of the New York State Department of Environmental Conservation (NYSDEC), a comprehensive Water Supply Sampling Program was designed for the Shopping Arcade Study Area to supplement the originally planned Remedial Investigation. The intent of the Water Supply Sampling Program was to:

- Obtain analytical data to determine the levels of drinking water contamination in the private water supply wells in the study area in order to address public health concerns.

- Obtain analytical data to confirm and/or supplement the existing historical data obtained and compiled from previous water supply sampling efforts by the United States Environmental Protection Agency (USEPA) and the Westchester County Department of Health (WCDH), and review this data for the purpose of evaluating trends in water supply contamination.

- Obtain analytical data from the private water supply wells to supplement the data from the monitoring well (ground water) sampling program in order to determine and define the magnitude and aerial extent of ground water contamination by volatile organic compounds (VOC) or Hazardous Substance List (HSL) constituents in the study area. The evaluation of the data would assist in determining where and how the analytes of concern are moving through the ground water and determine and/or confirm possible sources and migration routes of contamination.

- o Obtain analytical data and utilize the results to assist in determining and designing additional future phases of the ground water and water supply sampling programs, if necessary.

- o Obtain analytical data and utilize the results to assist in determining and designing a definitive remedial action in the future, if required.

Once the concept of the this program was approved by NYSDEC, a detailed work plan was prepared for undertaking the sampling program. After the work plan was approved, the sampling program was implemented.

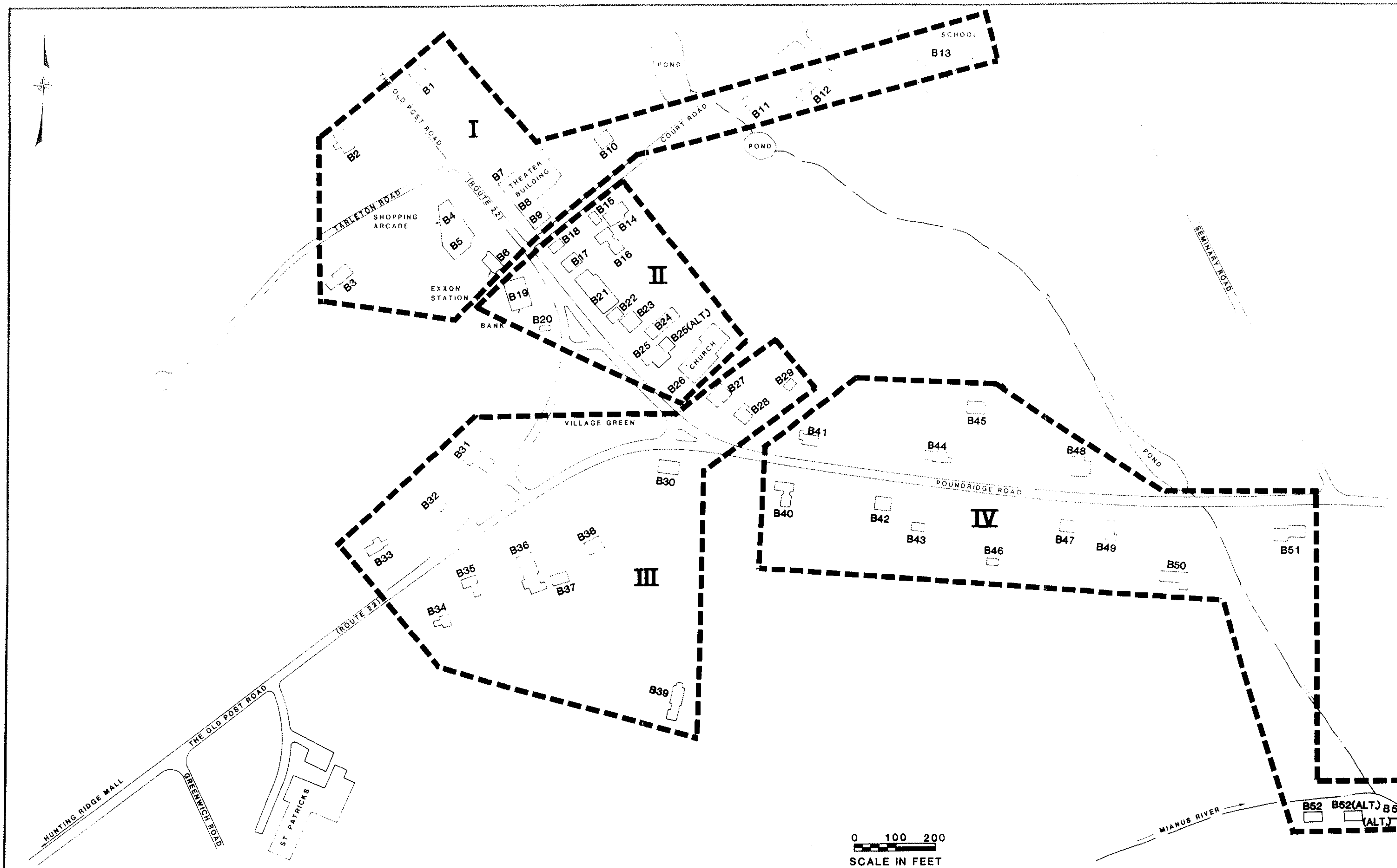
5.1.2 Implementation of the Sampling Program

Prior to the implementation of the actual field sampling portion of the Water Supply Sampling Program, permission request forms were mailed (return receipt requested) to all property owners in order to obtain permission to gain access to their property and collect samples. Follow-up telephone conversations with each property owner or tenant were conducted in order to arrange a convenient time for sample collection. A planning matrix was prepared for implementing the sampling program to ensure optimum organization and coordination of field work by providing orderly arrangement and scheduling of sampling dates and times most convenient to the property owners, as well as the types of analyses that were to be performed and the number of samples to be collected. A planning/implementation matrix included the following information that was obtained for each sampling point/location:

- o Sampling section in which sampling point is located.
- o Owner name and address of property/sampling point.
- o Owner mailing address (if different)
- o Tax map number (section and lot)
- o Location map number
- o Telephone number of owner
- o Date that request letter was sent, date of certified receipt and date that request letter was received.
- o Approval to sample (yes or no)
- o Most appropriate date and time to sample
- o Types of analyses to be performed and number of samples to be obtained
- o Remarks

Figure No. 5-1 is a detailed base map of the Shopping Arcade Study Area illustrating the locations of each sampling point and sampling sector. The number and specific location of each residential unit and commercial establishment sampled is identified in one of four sampling sectors/zones. These sampling sectors were devised for the purpose of achieving optimum efficiency in the scheduling and performance of daily sampling. Water supply sampling was scheduled and samples were collected at all of the sampling points except for the following locations for the reasons indicated.

	Sample Location #	Address	Owner
o	#B5	644-656 Old Post Rd. (Shopping Arcade)	Lashins Arcade Co.
	Reason:	Serviced by same well as B4. Sample collected at B4.	
o	#B8	633-647 Old Post Rd. (Bedford Playhouse/ Theatre)	Bedford Village Playhouse Associates
	Reason:	Serviced by same well as B7. Sample collected at B7.	
o	#B10	12 Court Road	Allan Gordon
	Reason:	Serviced by same well as B7. Sample collected at B7.	
o	#B15	7 Court Road	Bedford Village Associates c/o Love Realty
	Reason:	Serviced by same well as B21. Sample collected at B21.	
o	#B16	5 Court Road	Bedford Village Associates c/o Love Realty
	Reason:	Serviced by same well as B21. Sample collected at B21.	



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WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
WATER SUPPLY SAMPLING PROGRAM
SAMPLING LOCATIONS

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 5-1

Sample Location #	Address	Owner
o #B18	617-621 Old Post Rd. (The Jackson House)	Bedford Historical Society, Inc.

Reason: Well at B18 also services location B17. Sample collected at B17 instead of B18.

o #B20	612-614 Old Post Rd. (The General Store)	Bedford Historical Society, Inc.

Reason: Serviced by same well as B19. Sample collected at B19.

o #B23	32 Village Green (Library Building)	Bedford Historical Society, Inc.

Reason: Serviced by same well as B24. Sample collected at B24.

o #B27	48 Village Green (Minister's Residence)	Presbyterian Church of Bedford

Reason: Serviced by same well as B26. Sample collected at B26.

o #B29	50 Village Green	Philip C. Gardener

Reason: Serviced by same well as B28. Sample collected at B28.

o #B34	497 Old Post Road (1 Pound Ridge Road)	Louise H. Renwick

Reason: Serviced by same well as B35. Sample collected at B35.

o #B42	47 Pound Ridge Road	Gerard H. Wood

Reason: Serviced by same well as B43. Sample collected at B43.

	Sample Location #	Address	Owner
o	#B45	58 Pound Ridge Road (50 Pound Ridge Road)	Richard J. Tegtmeier

Reason: Serviced by same well as B44. Sample collected at B44.

A total of 39 locations were sampled including residential homes and business establishments. At these locations there were a total of 35 samples collected and analyzed for VOC's and another 41 samples tested for nitrates. Also, an additional six samples (IIC[A]B4DB, IIC[A]B4DA, IIC[A]B6DB, IIC[A]B6DA, IIC[A]B7DA and IIC[A]B13D) were obtained and analyzed for the HSL constituents. The HSL analysis was selected for those samples that were collected from sampling points that were located in close proximity to potential source(s) of contamination and/or for samples taken from water supply wells at points that serve a large number of people in the community. Nitrate samples were obtained as an indicator of sewage contamination.

In addition, there were three locations that contained granular activated carbon (GAC) treatment units. Two of these locations (B4 and B6) were commercial establishments and one was an apartment building (B7) that utilized GAC filter units for water purification. The well at location B6, the Exxon gas station, also services location B9 (the Banks building). However, the old well at B9, which is now defunct, was also sampled. The well at location B7 (the Playhouse/Theatre building) services a group of apartments (sample location B7), the Playhouse/Theatre itself (B8), and the residence at B10. With regard to sampling at the establishments that contained GAC units (B4, B6 and B7), two samples were obtained for each parameter to be tested by sampling before and after the treatment units. However, at location B7, only a sample after the GAC unit could be obtained (see subsection 5.1.3 for discussion).

5.1.3 Sampling Procedures

The water supply sampling procedures implemented, as originally outlined in the sampling protocol work plan, were as follows:

1. Fill out Tap Water Sampling Program Sample Information Record.

2. Remove the laboratory pre-cleaned sample bottles from sample cooler, label bottles with a water proof marker, make note of any water purification or conditioning systems, holding tanks, etc. on the Sample Information Record Form and complete the sample Chain of Custody Form.

3. If there is a treatment system, identify a location to sample (if possible) that is ahead of any in-line water purification/conditioning device. If samples are to be collected from a faucet, disassemble any screens and/or terminal purification system that may be attached to the faucet (if possible). Note these conditions on the Sample Information Record Form.

4. Allow the water to run for approximately five minutes to adequately flush the line before sampling.

5. Collect the water directly in the sample bottles taking care not to spill sample on outside of bottle or overfill bottle. For volatile organic samples, make sure that air bubbles are not in the sample vial after it has been capped.

6. Return the sample bottle to cooler.

7. Close the sampling point ahead of the treatment device and reassemble screens and/or water purification/conditioning systems that may have been removed during sample collection.

Please note that samples were taken before and after GAC units when the existing plumbing permitted doing so. At locations B4 and B6 where GAC units were present, either valves or easily accessible and removable couplings were present so that sampling was achieved before and after the units without damaging the piping and the treatment units. However, at location B7 the valve before the GAC unit was inoperable and conditions for obtaining a sample before the unit were deemed unfavorable by field personnel without risking damage to the plumbing and the GAC unit. Therefore, a sample was not obtained before the GAC unit at this location, but only after the unit.

Daily Quality Control Reports were completed for each day of field work. These forms summarized the work that was performed each day, the results of field analysis, and problems encountered and resolutions. Chain-of-Custody Forms provided by the laboratory contracted to perform the analytical services were completed for each sample transaction.

5.1.4 Analytical Methods

The analytical methods that were used for sample testing were in accordance with the 1986 NYSDEC Contract Laboratory Protocol (CLP). Samples collected for HSL metal analyses were not filtered and were preserved in the field with nitric acid as required by NYSDEC.

Provision was made for field and trip blanks, matrix spikes and matrix spike duplicates. In accordance with NYSDEC protocol, a complete Quality Assurance/Quality Control program was instituted and was based on the following guidelines:

- o One field blank per day of sampling - VOC
- o One trip blank per sample pick-up - VOC
- o One matrix spike liquid HSL per 20 samples
- o One matrix spike duplicate liquid HSL per 20 samples
- o One matrix spike liquid VOC per 20 samples
- o One matrix spike duplicate liquid VOC per 20 samples

5.2 Analytical Results of the Water Supply Sampling Program

The purpose of this section of the report is to present the analytical results of the samples which were obtained during the water supply/tap water sampling program.

Table No. 5-1 lists the analytical results for those samples analyzed for organic compounds. Figure No. 5-2 summarizes and presents the results of each organic compound that is an analyte of concern. Analytes of concern are the same as those detected in the monitoring well/ground water sampling program described in Section 4.0, these being tetrachloroethene (designated PCE), trichloroethene (designated TCE), 1,2-dichloroethene (designated 1,2-DCE), 1,1,1-trichloroethane (designated 1,1,1-TCA), benzene, toluene and xylene. Other compounds detected included 2-butanone (designated 2-Butan) or methyl ethyl ketone.

Table Nos. 5-2 and 5-3 provide the results of the samples analyzed for inorganic constituents, namely metals and nitrate-nitrogen, respectively. It should be noted that for the HSL analyses, all results for semi-volatile and pesticides/PCBs were non-detectable except for typical laboratory contaminants such as bis(2-ethylhexyl)phthalate.

Table No. 5-1
BEDFORD WATER SUPPLY SAMPLING PROGRAM
SHOPPING ARCADE
WATER SUPPLY ANALYTICAL RESULTS FOR ORGANIC COMPOUNDS **

PARAMETERS	IIC(A)B1D 10/27/88 653 Old Post	IIC(A)B2D 10/28/88 9 Tarleton	IIC(A)B3D 10/31/88 16 Tarleton	IIC(A)B4DB 11/7/88 644-656 Old Post*	IIC(A)B4DA 11/7/88 644-656 Old Post*	IIC(A)B4DB 11/7/88 644-656 Old Post	IIC(A)B6DB 10/28/88 640 Old Post*	IIC(A)B6DA 10/28/88 640 Old Post*
Methylene Chloride								
Acetone						58.0 DLBL		
Carbon Disulfide								
Trichloroethene				14.0		73.0 DL	20.0	15.0
Tetrachloroethene				610.0 E		710.0 DL	200.0	19.0
1,1,1-Trichloroethane								
Benzene							9.0	
Chloroform								1.0 J
1,1-Dichloroethene								
Toluene								
Chlorobenzene								
1,1-Dichloroethane								
Chloromethane								
Bromomethane								
Chloroethane								
1,2-Dichloroethene(Total)				22.0		24.0 JDL	64.0	60.0
1,2-Dichloroethane								
2-Butanone								
Carbon Tetrachloride								
Vinyl Acetate								
Bromodichloromethane								
1,2-Dichloropropane								
Cis-1,3-Dichloropropene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Trans-1,3-Dichloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
1,1,2,2-Tetrachloroethane								
Ethylbenzene								
Styrene								
Xylene(Total)								
Bis(2-Ethylhexyl)Phthalate							3.0 JBL	3.0 JBL
Diethylphthalate							0.8 J	

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B70A 10/27/88 643-645 Old Post*	IIC(A)B9N 11/3/88 625-629 Old Post	IIC(A)B11D 11/1/88 27 Court	IIC(A)B12D 10/28/88 31 Court	IIC(A)B13D 10/28/88 45 Court*	IIC(A)B14D 11/3/88 11 Court	IIC(A)B17D 11/1/88 615 Old Post	IIC(A)B19D 11/3/88 618-634 Old Post
Methylene Chloride	3.0 JBL					2.0 JBL	2.0 JBL	3.0 JBL
Acetone		7.0 J						
Carbon Disulfide								
Trichloroethene		47.0						3.0 J
Tetrachloroethene		140.0		12.0		26.0	41.0	10.0
1,1,1-Trichloroethane								
Benzene		440.0					2.0 J	1.0 J
Chloroform								
1,1-Dichloroethene								
Toluene	2.0 J	35.0	1.0 J				1.0 J	
Chlorobenzene								
1,1-Dichloroethane								
Chloromethane								
Bromomethane								
Chloroethane								
1,2-Dichloroethene(Total)		29.0						
1,2-Dichloroethane								
2-Butanone	1.0 J							
Carbon Tetrachloride								
Vinyl Acetate								
Bromodichloromethane								
1,2-Dichloropropane								
Cis-1,3-Dichloropropene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Trans-1,3-Dichloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
1,1,2,2-Tetrachloroethane								
Ethylbenzene								
Styrene								
Xylene(Total)		39.0						
Bis(2-Ethylhexyl)Phthalate	5.0 JBL				5.0 JBL			

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B21D 11/1/88 2-24 Village Gr.	IIC(A)B22D 11/3/88 26-30 Village Gr.	IIC(A)B24D 10/31/88 34 Village Gr.	IIC(A)B25D 11/1/88 38 Village Gr.	IIC(A)B26D 11/7/88 44-48 Village Gr.	IIC(A)B28D 11/3/88 50 Village Gr.
Methylene Chloride	2.0 JBL	3.0 JBL		2.0 JBL		6.0 BL
Acetone						
Carbon Disulfide						
Trichloroethene						
Tetrachloroethene	30.0	52.0	85.0	31.0		
1,1,1-Trichloroethane						
Benzene						
Chloroform						
1,1-Dichloroethene						
Toluene	1.0 J	1.0 J				2.0 J
Chlorobenzene						
1,1-Dichloroethane						
Chloromethane						
Bromomethane						
Chloroethane						
1,2-Dichloroethene(Total)						
1,2-Dichloroethane						
2-Butanone						
Carbon Tetrachloride						
Vinyl Acetate						
Bromodichloromethane						
1,2-Dichloropropane						
Cis-1,3-Dichloropropene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Trans-1,3-Dichloropropene						
Bromoform						
4-Methyl-2-Pentanone						
2-Hexanone						
1,1,2,2-Tetrachloroethane						
Ethylbenzene						
Styrene						
Xylene(Total)						
Bis(2-Ethylhexyl)Phthalate						

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B30D 11/2/88 25 Pound Ridge	IIC(A)B30DMS 11/2/88 25 Pound Ridge	IIC(A)B30DMSD 11/2/88 25 Pound Ridge	IIC(A)B31D 11/1/88 608 Old Post	IIC(A)B32D 11/1/88 602 Old Post	IIC(A)B33D 11/2/88 594 Old Post	IIC(A)B35D 11/1/88 1 Pound Ridge	IIC(A)B36D 11/2/88 7 Pound Ridge
Methylene Chloride		2.0 JBL	1.0 JBL					
Acetone				4.0 JBL				
Carbon Disulfide								
Trichloroethene								
Tetrachloroethene								
1,1,1-Trichloroethane								
Benzene								
Chloroform								
1,1-Dichloroethene								
Toluene								
Chlorobenzene								
1,1-Dichloroethane								
Chloromethane								
Bromomethane								
Chloroethane								
1,2-Dichloroethene(Total)								
1,2-Dichloroethane								
2-Butanone								
Carbon Tetrachloride								
Vinyl Acetate								
Bromodichloromethane								
1,2-Dichloropropane								
Cis-1,3-Dichloropropene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Trans-1,3-Dichloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
1,1,2,2-Tetrachloroethane								
Ethylbenzene								
Styrene								
Xylene(Total)								
Bis(2-Ethylhexyl)Phthalate								

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B37D 11/2/88 9 Pound Ridge	IIC(A)B38D 11/2/88 13 Pound Ridge	IIC(A)B39D 11/2/88 17Pound Ridge	IIC(A)B40D 11/1/88 37 Pound Ridge	IIC(A)B41D 11/3/88 38 Pound Ridge	IIC(A)B43D 11/3/88 51 Pound Ridge	IIC(A)B44D 11/1/88 50 Pound Ridge
Methylene Chloride					2.0 JBL	3.0 JBL	
Acetone						1.0 J	
Carbon Disulfide					1.0 J		
Trichloroethene							
Tetrachloroethene							
1,1,1-Trichloroethane							
Benzene							
Chloroform							
1,1-Dichloroethene							
Toluene		1.0 J			1.0 J	1.0 J	1.0 J
Chlorobenzene							
1,1-Dichloroethane							
Chloromethane							
Bromomethane							
Chloroethane							
1,2-Dichloroethene(Total)							
1,2-Dichloroethane		4.0 J					
2-Butanone						1.0 J	
Carbon Tetrachloride							
Vinyl Acetate							
Bromodichloromethane							
1,2-Dichloropropane							
Cis-1,3-Dichloropropene							
Dibromochloromethane							
1,1,2-Trichloroethane							
Trans-1,3-Dichloropropene							
Bromoform							
4-Methyl-2-Pentanone							
2-Hexanone							
1,1,2,2-Tetrachloroethane							
Ethylbenzene							
Styrene							
Xylene(Total)							1.0 J
Bis(2-Ethylhexyl)Phthalate							

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B46D 11/3/88 59 Pound Ridge	IIC(A)B47D 11/2/88 65 Pound Ridge	IIC(A)B48D 10/31/88 66 Pound Ridge	IIC(A)B49D 11/7/88 69 Pound Ridge	IIC(A)B50D 11/7/88 77 Pound Ridge	IIC(A)B50DMS 11/7/88 77 Pound Ridge	IIC(A)B50DMSD 11/7/88 77 Pound Ridge
Methylene Chloride	3.0 JBL						
Acetone							
Carbon Disulfide							
Trichloroethene							
Tetrachloroethene							
1,1,1-Trichloroethane							
Benzene							
Chloroform							
1,1-Dichloroethene							
Toluene	2.0 J						
Chlorobenzene							
1,1-Dichloroethane							
Chloromethane							
Bromomethane							
Chloroethane							
1,2-Dichloroethene(Total)							
1,2-Dichloroethane							
2-Butanone							
Carbon Tetrachloride							
Vinyl Acetate							
Bromodichloromethane							
1,2-Dichloropropane							
Cis-1,3-Dichloropropene							
Dibromochloromethane							
1,1,2-Trichloroethane							
Trans-1,3-Dichloropropene							
Bromoform							
4-Methyl-2-Pentanone							
2-Hexanone							
1,1,2,2-Tetrachloroethane							
Ethylbenzene							
Styrene							
Xylene(Total)							
Bis(2-Ethylhexyl)Phthalate							

Table No. 5-1 (continued)

PARAMETERS	IIC(A)B51D 11/3/88 85 Pound Ridge	IIC(A)B52D 11/2/88 33 CartWay Lane W.
Methylene Chloride	3.0 JBL	
Acetone		
Carbon Disulfide		
Trichloroethene		
Tetrachloroethene		2.0 J
1,1,1-Trichloroethane		
Benzene		
Chloroform		
1,1-Dichloroethene		
Toluene	1.0 J	
Chlorobenzene		
1,1-Dichloroethane		
Chloromethane		
Bromomethane		
Chloroethane		
1,2-Dichloroethene(Total)		
1,2-Dichloroethane		
2-Butanone		
Carbon Tetrachloride		
Vinyl Acetate		
Bromodichloromethane		
1,2-Dichloropropane		
Cis-1,3-Dichloropropene		
Dibromochloromethane		
1,1,2-Trichloroethane		
Trans-1,3-Dichloropropene		
Bromoform		
4-Methyl-2-Pentanone		
2-Hexanone		
1,1,2,2-Tetrachloroethane		
Ethylbenzene		
Styrene		
Xylene(Total)		
Bis(2-Ethylhexyl)Phthalate		

Table No. 5-1 (continued)

PARAMETERS	Trip Blank 10/24/88	Field Blank 10/28/88	Trip Blank 10/28/88	Trip Blank 10/31/88	Field Blank 10/31/88	Field Blank 11/2/88	Trip Blank 11/2/88	Field Blank 11/1/88
Methylene Chloride	5.0 BL							
Acetone								
Carbon Disulfide								
Trichloroethene								
Tetrachloroethene								
1,1,1-Trichloroethane								
Benzene								
Chloroform		2.0 J	2.0 J		2.0 J			
1,1-Dichloroethene								
Toluene	1.0 J					2.0 J		
Chlorobenzene								
1,1-Dichloroethane								
Chloromethane								
Bromomethane								
Chloroethane								
1,2-Dichloroethene(Total)								
1,2-Dichloroethane								
2-Butanone								
Carbon Tetrachloride								
Vinyl Acetate								
Bromodichloromethane								
1,2-Dichloropropane								
Cis-1,3-dichloropropene								
Dibromochloromethane								
1,1,2-Trichloroethane								
Trans-1,3-Dichloropropene								
Bromoform								
4-Methyl-2-Pentanone								
2-Hexanone								
1,1,2,2-Tetrachloroethane								
Ethylbenzene								
Styrene								
Xylene(Total)						2.0 J		
Bis(2-Ethylhexyl)Phthalate								

Table No. 5-1 (continued)

PARAMETERS	Trip Blank 11/1/88	Trip Blank 11/3/88	Field Blank 11/7/88	Trip Blank 11/7/88
Methylene Chloride				
Acetone			22.0 BL	
Carbon Disulfide				
Trichloroethene				
Tetrachloroethene				
1,1,1-Trichloroethane				
Benzene				
Chloroform				
1,1-Dichloroethene				
Toluene				
Chlorobenzene				
1,1-Dichloroethane				
Chloromethane				
Bromomethane				
Chloroethane				
1,2-Dichloroethene(Total)				
1,2-Dichloroethane				
2-Butanone				
Carbon Tetrachloride				
Vinyl Acetate				
Bromodichloromethane				
1,2-Dichloropropane				
Cis-1,3-Dichloropropene				
Dibromochloromethane				
1,1,2-Trichloroethane				
Trans-1,3-Dichloropropene				
Bromoform				
4-Methyl-2-Pentanone				
2-Hexanone				
1,1,2,2-Tetrachloroethane				
Ethylbenzene				
Styrene				
Xylene(Total)				
Bis(2-Ethylhexyl)Phthalate				

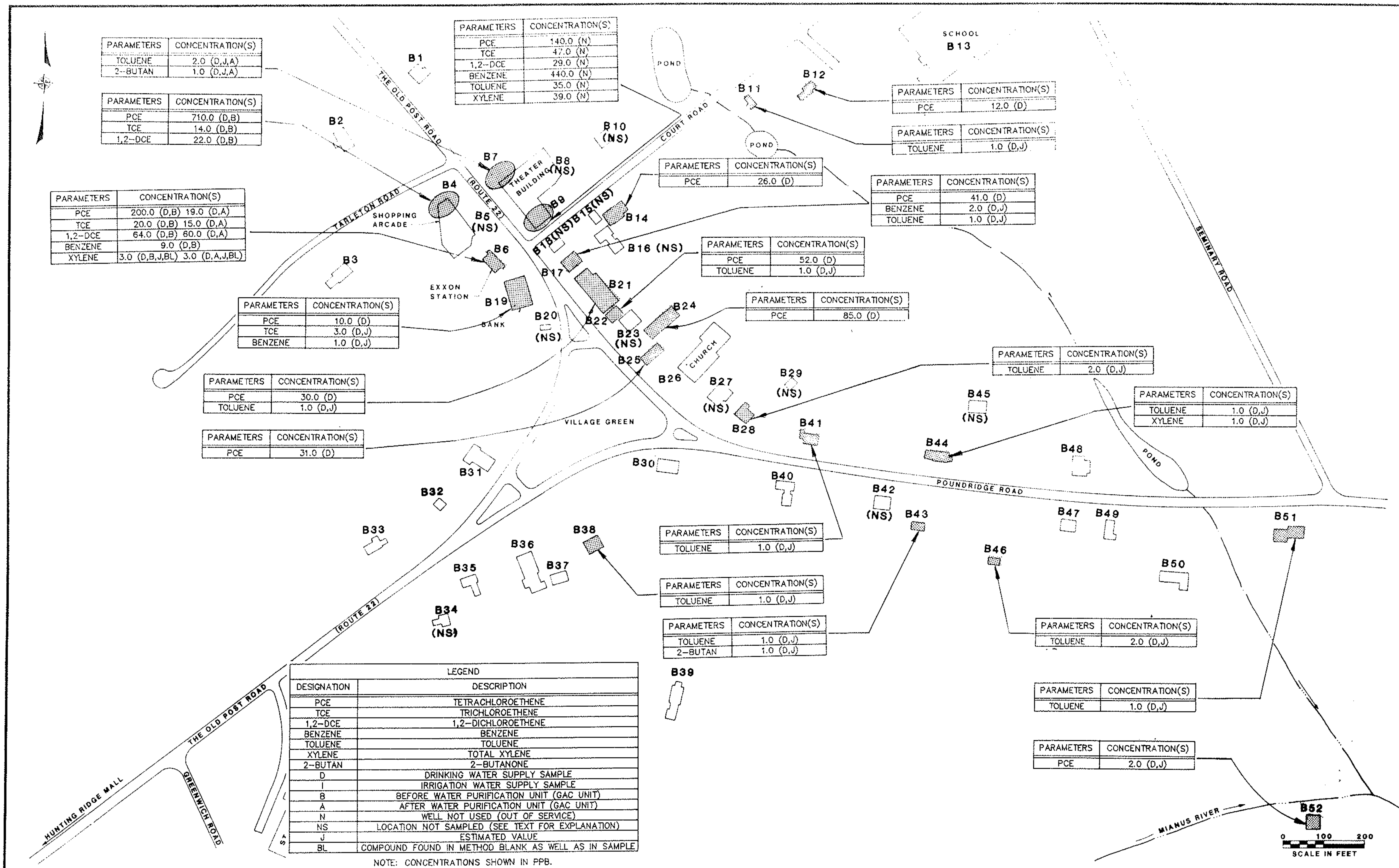
Note: Blank spaces in columns and rows indicate that concentrations of parameters shown were non-detectable.

Analyte Result Flags

J - Indicates estimated value.
E - Value exceeds calibration range.
BL - This compound was found in the method blank as well as in the sample.
DL - Diluted sample
* - This sample was analyzed for full Hazardous Substance List.
** - All concentrations shown in ug/l.

Sample Number Flags

D - Drinking water
I - Irrigation water
B - Before purification unit (GAC)
A - After purification unit (GAC)



PARAMETERS	CONCENTRATION(S)
TOLUENE	2.0 (D,J,A)
2-BUTAN	1.0 (D,J,A)

PARAMETERS	CONCENTRATION(S)
PCE	710.0 (D,B)
TCE	14.0 (D,B)
1,2-DCE	22.0 (D,B)

PARAMETERS	CONCENTRATION(S)
PCE	200.0 (D,B) 19.0 (D,A)
TCE	20.0 (D,B) 15.0 (D,A)
1,2-DCE	64.0 (D,B) 60.0 (D,A)
BENZENE	9.0 (D,B)
XYLENE	3.0 (D,B,J,BL) 3.0 (D,A,J,BL)

PARAMETERS	CONCENTRATION(S)
PCE	10.0 (D)
TCE	3.0 (D,J)
BENZENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	30.0 (D)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	31.0 (D)

PARAMETERS	CONCENTRATION(S)
PCE	140.0 (N)
TCE	47.0 (N)
1,2-DCE	29.0 (N)
BENZENE	440.0 (N)
TOLUENE	35.0 (N)
XYLENE	39.0 (N)

PARAMETERS	CONCENTRATION(S)
PCE	12.0 (D)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	26.0 (D)

PARAMETERS	CONCENTRATION(S)
PCE	41.0 (D)
BENZENE	2.0 (D,J)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	52.0 (D)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	85.0 (D)

PARAMETERS	CONCENTRATION(S)
TOLUENE	2.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)
XYLENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)
2-BUTAN	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	2.0 (D,J)

PARAMETERS	CONCENTRATION(S)
TOLUENE	1.0 (D,J)

PARAMETERS	CONCENTRATION(S)
PCE	2.0 (D,J)

LEGEND

DESIGNATION	DESCRIPTION
PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
1,2-DCE	1,2-DICHLOROETHENE
BENZENE	BENZENE
TOLUENE	TOLUENE
XYLENE	TOTAL XYLENE
2-BUTAN	2-BUTANONE
D	DRINKING WATER SUPPLY SAMPLE
I	IRRIGATION WATER SUPPLY SAMPLE
B	BEFORE WATER PURIFICATION UNIT (GAC UNIT)
A	AFTER WATER PURIFICATION UNIT (GAC UNIT)
N	WELL NOT USED (OUT OF SERVICE)
NS	LOCATION NOT SAMPLED (SEE TEXT FOR EXPLANATION)
J	ESTIMATED VALUE
BL	COMPOUND FOUND IN METHOD BLANK AS WELL AS IN SAMPLE

NOTE: CONCENTRATIONS SHOWN IN PPB.

NO.	DATE	REVISION	INT.

PROJECT ENGINEER | DRAWN BY | DESIGNED BY | CHECKED BY

Dvirka and Bartilucci
CONSULTING ENGINEERS
Syosset, New York

BEDFORD VILLAGE
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
WATER SUPPLY SAMPLING PROGRAM
SAMPLING LOCATIONS AND RESULTS

PROJECT NO. 842
DATE
SCALE AS NOTED
FIGURE NO. 5-2

Table No. 5-2
BEDFORD WATER SUPPLY SAMPLING PROGRAM
SHOPPING ARCADE
WATER SUPPLY ANALYTICAL RESULTS FOR METALS *

PARAMETERS	IIC(A)B4DA		IIC(A)B4DB		IIC(A)B6DA		IIC(A)B6DB		IIC(A)B7DA		IIC(A)B13D	
Aluminum	39.7	BL	41.5	BL	30.6	U	30.6	U	120.0	BL	59.5	BL
Antimony	22.0	U	22.0	U	22.0	U	22.0	U	22.0	U	22.0	U
Arsenic	1.0	U	1.0	U	1.0	UN	1.1	BLN	1.0	UN	1.0	U
Barium	15.9	BL	17.3	BL	51.8	BL	53.6	BL	26.1	BL	14.6	U
Beryllium	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Cadmium	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U	1.8	U
Calcium	49,800		49,600		42,600		44,000		60,500		15,400	
Chromium	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Cobalt	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Copper	14.3	U	14.3	U	19.2	BL	48.5		19.2	BL	14.3	U
Iron	62.7	U	78.1	BL	62.7	U	62.7	U	66.1	BL	95.3	BL
Lead	11,600		11,700		0.6	BLN	6.8	N	1.7	BL	0.9	BLN
Magnesium	3.6	U	3.6	U	11,300		11,000		16,000		3,400	
Manganese	0.2	U	0.2	U	98.7		109.0		34.4		58.9	
Mercury	6.8	U	6.8	U	0.2	U	0.2	U	0.2	U	0.2	U
Nickel	5,120		5,780		6.8	U	6.8	U	6.8	U	6.8	U
Potassium	0.6	BLN	0.6	BLN	4,870		5,280		5,320		2,050	
Selenium	1.5	U	1.5	U	1.2	BLN	1.3	BLN	2.1	BLN	1.6	BLN
Silver	12,500		12,500		1.5	U	1.5	U	1.5	U	1.5	U
Sodium	1.0	UN	1.0	UN	11,900		11,700		13,000		45,700	
Thallium	3.3	U	6.6	BL	1.0	UN	1.0	UN	1.0	UN	1.0	UN
Vanadium	8.4	BL	11.4	BL	3.3	U	3.3	U	3.3	BL	3.3	U
Zinc					34.2		13.4	BL	38.7		29.5	
Cyanide(mg/l)	<.005		<.005		<.005		<.005		<.005		<.005	

* - All concentrations shown in ug/l unless otherwise noted.

Analyte Result Flag:
- J - Indicates estimated value.
- E - Value exceeds calibration range.
- BL - This compound was found in the method blank as well as in the sample.
- U - Indicates that the compound was analyzed for but not detected.
- N - Spike sample recovery not within control limits.

Analyte Number Flag:
- D - Drinking water
- A - After water purification unit (GAC)
- B - Before water purification unit (GAC)

Table No. 5-3
BEDFORD WATER SUPPLY SAMPLING PROGRAM
SHOPPING ARCADE
WATER SUPPLY SAMPLE RESULTS FOR NITRATE-NITROGEN *

Sample Identification	Nitrate-Nitrogen Concentration
IIC(A)B1D	1.51
IIC(A)B2D	<0.10
IIC(A)B3D	1.66
IIC(A)B4DA	0.51
IIC(A)B4DB	1.96
IIC(A)B6DA	2.58
IIC(A)B6DB	2.56
IIC(A)B7DA	2.22
IIC(A)B9N	0.14
IIC(A)B11D	3.40
IIC(A)B12D	<0.10
IIC(A)B13D	<0.10
IIC(A)B14D	0.83
IIC(A)B17D	0.15
IIC(A)B19D	1.40
IIC(A)B21D	0.11
IIC(A)B22D	0.38
IIC(A)B24D	0.42
IIC(A)B25D	<0.10
IIC(A)B26D	0.16
IIC(A)B28D	3.96
IIC(A)B30D	0.76
IIC(A)B31D	1.47
IIC A)B32D	0.65
IIC(A)B33D	1.84
IIC(A)B35D	1.70
IIC(A)B36D	3.98
IIC(A)B37D	0.90
IIC(A)B38D	1.86
IIC(A)B39D	6.10
IIC(A)B40D	<0.10
IIC(A)B41D	<0.10
IIC(A)B43D	<0.10
IIC(A)B44D	<0.10
IIC(A)B46D	<0.10
IIC(A)B47D	<0.10
IIC(A)B48D	<0.10
IIC(A)B49D	<0.10
IIC(A)B50D	2.05
IIC(A)B51D	0.46
IIC(A)B52D	<0.10

D - Drinking water
I - Irrigation water
B - Before water purification unit (GAC)
A - After water purification unit (GAC)
N - Well not in use: out of service

* - All concentrations shown in mg/L.

5.2.1 Results of Samples Analyzed for Organic Compounds

The data presented in Table No. 5-1 indicates that organic chemical contamination was detected in samples that were obtained from approximately 54% of all of the sampling points (21 of 39 locations). The results show that the most commonly found parameters and analytes of concern were tetrachloroethene, trichloroethene, 1,2-dichloroethene and BTX compounds (benzene, toluene and xylene). Tetrachloroethene, trichloroethene and 1,2-dichloroethene were detected at approximately 31% (12 of 39) of the points sampled, while BTX compounds were found at approximately 38% (15 of 39) of the sampling locations. In addition, 2-butanone was detected at two sampling locations.

It should be noted that organic compounds such as chloroform, acetone and methylene chloride were found in sample blanks. All of these compounds are common laboratory contaminants. In addition, toluene and xylene were also found in trip and field blanks. These compounds were probably laboratory contaminants or possibly in the ambient air at the sample location and introduced into the sample when the field blanks were prepared.

As stated above, the most commonly found contaminants and analytes of concern were tetrachloroethene, trichloroethene and 1,2-dichloroethene which are similar to the results obtained from samples collected from the ground water monitoring wells in the study area. These compounds were found in combination or individually in samples obtained from 12 of the 21 (57%) sampling points at which contamination was detected.

Concentrations of tetrachloroethene were found at 57% (12 of 21) of the sampling points that contained contamination and values ranged from 2 to 710 ug/l. The mean concentration of this compound (for samples obtained before GAC units and samples where no GAC unit existed) was 112 ug/l and the median was 36 ug/l. In addition, it is important to note that at one location, namely B6 (the Exxon well), tetrachloroethene was detected at a level of 19 ug/l in a sample that was taken after the GAC unit. This well also services the Banks building and stores (location B9) located directly across Route 22 with potable water as well as the Exxon gas station. The highest level of tetrachloroethene was found at sampling point B4 (710 ug/l) in a sample taken before a GAC unit at the Shopping Arcade. However, no contamination was found in the sample taken after the GAC unit at this location (B4). High concentrations of tetrachloroethene were also detected at sampling location B6 (200 ug/l) in a sample obtained before a GAC unit (as mentioned, 19 ug/l was also detected after this GAC unit) and at location B9 (140 ug/l) in a sample taken from a well that is no longer utilized. In general, tetrachloroethene was found in almost all of the samples collected from the commercial establishments and homes along Old Post Road (Route 22) and Court Road located adjacent and downgradient of the Shopping Arcade. Many of these sampling locations had samples that contained elevated levels of tetrachloroethene such as B24 (85 ug/l), B22 (52 ug/l), B17 (41 ug/l), B25 (31 ug/l), B21 (30 ug/l) and B14 (26 ug/l). The well at B24 also serves location B23 and the well at B17 serves location B18. Also, the well at B21 provides potable water to locations B15 and B16. In addition, it should be noted that although low levels of tetrachloroethene (2 ug/l) were found at sampling point B52, this sampling point is located approximately 2,400 feet southeast of the Shopping Arcade on the south side of the Mianus River (see Section 6.0 for further discussion).

Trichloroethene was detected at only four of the sampling points that contained contamination. However, samples obtained at three of these points (B9, B6 and B4) contained elevated levels of this compound. The highest concentration (47 ug/l) was found at B9, in a sample obtained from a defunct well that was closed due to previous contamination. Samples from B6 and B4 were obtained before GAC units and contained levels of 20 ug/l and 14 ug/l, respectively. It is important to note that the sample taken after the GAC unit at location B6 contained 15 ug/l of trichloroethene and, as discussed, this well at B6 (Exxon gas station) also supplies potable water to the stores in the Banks building at location B9.

Concentrations of 1,2-dichloroethene were found at three sampling points, namely, B4, B6 and B9 and all of the samples collected at these locations contained elevated levels of contamination. The highest concentration, 64 ug/l, was detected in a sample obtained before the GAC unit at sampling location B6 (Exxon). The sample taken after this GAC unit also contained contamination with a level of 60 ug/l of this compound being found. Again, it is important to note that this well also services the Banks building (location B9). The sample collected from the defunct well at location B9 contained 29 ug/l of 1,2-dichloroethene and a sample taken before the GAC unit at sample location B4, the Arcade, contained 22 ug/l (sample obtained after this unit did not contain contamination). All of the sampling points that contained 1,2-dichloroethene contamination were located either at, adjacent to or downgradient of the Shopping Arcade.

BTX compounds were found in combination with each other or individually at 71% (15 of 21) of the sampling points at which contamination was detected. Benzene was found at four sampling points. The highest concentration of benzene, 440 ug/l, was detected in a sample that was obtained from the abandoned well at sample location B9. A concentration of 9 ug/l was found in a sample taken before the GAC unit at B6. However, no contamination was detected in the sample obtained after the GAC unit at this location. Elsewhere, at sample locations B17 and B19, only low levels of benzene (2 ug/l and 1 ug/l, respectively) were found. Toluene was detected at 62% (13 of 21) of the sampling points with levels ranging from 1 to 35 ug/l. However, only one high concentration (35 ug/l) was found at sampling point B9 in a sample obtained from the defunct well that had been closed due to contamination in the past. All other sampling locations where toluene was detected contained low levels (1 to 2 ug/l), three of which contained 2 ug/l (B7, B28 and B46). It should be noted that toluene was found in a trip blank and 2 ug/l was detected in a field blank collected on November 2, 1988. The only location sampled on that day that contained concentrations of toluene was sample location B38 which contained only 1 ug/l. Therefore, the contamination found in this sample may be due to ambient air concentrations that were introduced when sampling as shown by the results of the field blank. Xylene was detected at only three sampling locations, namely, B9, B6 and B44. The highest level found was 39 ug/l at location B9. Samples obtained both before and after the GAC unit at sampling point B6 contained 3 ug/l. However, xylene was also detected at this concentration in the method blanks as well as the samples at B6. Therefore, the sample results are probably due to laboratory contamination.

Two separate samples obtained at sampling points B7 and B43 contained low levels (1 ug/l) of 2-butanone which is also known as methyl ethyl ketone. This organic compound is possibly a laboratory contaminant, however, it was also found in a number of source/surficial samples obtained in the study area and appears more likely to be an environmental contaminant.

5.2.2 Results of Samples Analyzed for Inorganic Constituents

Table No. 5-2 shows the results of the samples analyzed for metals and Table No. 5-3 lists the results of the nitrate-nitrogen analyses. Although a number of inorganic chemicals were detected, three metals namely, lead, nickel and silver exhibited high concentrations and have been identified as contaminants of concern by New York State regulatory agencies. All three of these metals were found at sample location B4. Concentrations of lead were detected at levels between 11,600-11,700 ug/l; nickel between 5,120-5,780 ug/l; and silver at 12,500 ug/l.

5.3 Historical Water Supply Sampling Data

As part of the Water Supply Sampling Program, historical potable water supply data was reviewed. This data included the results of several sampling programs undertaken by the Westchester County Department of Health (WCDH) since 1979.

Table No. 5-4 summarizes the aforementioned data obtained by WCDH and the most recent data obtained from the Water Supply Sampling Program which is designated in the table as NYSDEC. Table No. 5-4 shows that there is extensive data for only two sampling locations, namely, B4 and B7/B8 while there is limited data for only four other locations (B9, B14, B22 and B43). The data collected for B9 includes the results of sampling performed by Exxon in July, 1986 and NYSDEC in November, 1988. Data for B14, B22 and B43 only includes sampling performed by WCDH in May and October of 1986 and NYSDEC in November, 1988.

The data shows that, in general, tetrachloroethene concentrations at sample location B7/B8 have fluctuated and slightly decreased or have remained the same over time since 1979, although the level did increase in the last sample obtained in June, 1985. The mean concentration at B7/B8 between May, 1979 and June, 1985 (not including April, 1984) was 42.9 ug/l and the median was 44 ug/l. At sample locations B14 and B22, tetrachloroethene levels increased between 1986 and November of 1988. At location B4, concentrations fluctuated but also increased between April, 1979 and the latest sampling in November, 1988. The mean concentration of tetrachloroethene in samples obtained before the GAC unit at B4 (between April, 1979 and November, 1988) was 348 ug/l and the median was 305 ug/l. At locations B9 and B43, tetrachloroethene concentrations decreased between 1986 and 1988. Sampling location B6 (Exxon) showed noticeable increasing levels of tetrachloroethene between August, 1986 and October of 1988. Concentrations of tetrachloroethene increased in samples obtained both before and after the GAC unit. Levels before the GAC unit rose from 36 to 200 ug/l and concentrations after the GAC unit increased from non-detectable to 19 ug/l.

In general, levels of trichloroethene fluctuated, slightly decreased or remained the same. The mean concentration in samples obtained (before GAC unit) between May, 1979 and June, 1985 (not including April, 1984) was 8.7 ug/l and the median was 9.0 ug/l. At sampling location B4, trichloroethene concentrations slightly decreased in those samples obtained before the GAC unit. The mean concentration between April, 1979 and November, 1988 was 39 ug/l, and the median was 35 ug/l. Levels of trichloroethene decreased at sample point B14, but increased at sampling location B9. Sampling location

Table No. 5-4
BEDFORD WATER SUPPLY SAMPLING PROGRAM
SHOPPING ARCADE
HISTORICAL WATER SUPPLY SAMPLING DATA *

Parameters	11 Court-IIC(A)B14D		26-30 Village Gr-IIC(A)B22D		38 Pound Ridge-IIC(A)B43D		625-629 Old Post-IIC(A)B9D		640 Old Post-IIC(A)B6D			
	10/1/86 (WCHD)	11/3/88 (NYSDEC)	5/28/86 (WCHD)	11/3/88 (NYSDEC)	5/28/86 (WCHD)	11/3/88 (NYSDEC)	7/17/86 (EXXON)	11/3/88 (NYSDEC)	8/13/86 (WCHD)B	8/13/86 (WCHD)A	10/28/88 (NYSDEC)B	10/28/88 (NYSDEC)A
Trichloroethene	1.2						10.0	47.0	4.0		20.0	15.0
Tetrachloroethane	7.7	26.0	6.0	52.0	4.0 J		250.0	140.0	36.0		200.0	19.0
1,2-Dichloroethene												
1,2-Dichloroethene (Trans)	1.8				6.0							
1,2-Dichloroethene (Total)								29.0			64.0	60.0
1,1-Dichloroethene												
Benzene							870.0	440.0			9.0	
1,1,1-Trichloroethane												
Phenol												
Pyrene												
Toluene				1.0 J		1.0 J	70.0	35.0				
Chlorobenzene							<10.0					
2-Butanone												
1,4-Dichlorobenzene												
Vinyl Chloride												
Total Xylenes							87.0 X	39.0				
Ethyl Benzene							130.0					
Chloroethane												
Bis(2-Ethylhexyl)Phthalate											3.0 JBL	3.0 JBL
Diethylphthalate											0.8 J	
Chloroform												1.0 J

644-656 Old Post-IIC(A)B4D

Parameters	4/18/79 (WCHD)BI	6/12/79 (WCHD)BI	11/28/79 (WCHD)BI	7/25/80 (WCHD)BI	3/24/81 (WCHD)BI	6/21/82 (WCHD)BI	7/11/83 (WCHD)BI	7/15/83 (WCHD)BI	5/29/84 (WCHD)BI	5/29/85 (WCHD)A	6/28/85 (WCHD)A	9/26/85 (WCHD)A	3/24/86 (WCHD)A	9/15/86 (WCHD)A	4/8/87 (WCHD)A	11/7/88 (NYSDEC)B	11/7/88 (NYSDEC)B	11/7/88 (NYSDEC)A*
Trichloroethene	56.0	54.0	33.0	29.0	80.0	22.0	22.0	47.0	37.0					8.9		14.0	73.0 DL	
Tetrachloroethane	300.0	310.0	420.0	190.0	470.0	120.0	600.0	77.0	280.0					44.0		610.0 E	710.0 DL	
1,2-Dichloroethene (CIS)						51.0	93.0	110.0	55.0			4.3		40.0				
1,2-Dichloroethene (Trans)																		
1,2-Dichloroethene (Total)																22.0	24.0 JD	
1,1-Dichloroethene																		
Benzene																		
1,1,1-Trichloroethane														1.3				
Phenol																		
Pyrene																		
Toluene																		
Chlorobenzene																		
2-Butanone																		
1,4-Dichlorobenzene																		
Vinyl Chloride																		
Total Xylenes																		
Ethyl Benzene																		
Chloroethane																		

Table No. 5-4 (continued)

633-647 Old Post-IIC(A)B7D/B8D

Parameters	5/14/79 (WCHD)BI	6/12/79 (WCHD)BI	11/14/79 (WCHD)BI	7/25/80 (WCHD)BI	3/24/81 (WCHD)BI	8/25/81 (WCHD)BI	3/8/82 (WCHD)BI	3/18/82 (WCHD)BI	6/21/82 (WCHD)BI	9/13/82 (WCHD)BI	12/2/82 (WCHD)BI	3/8/83 (WCHD)BI	6/6/83 (WCHD)BI	7/11/83 (WCHD)BI	7/15/83 (WCHD)BI
Trichloroethene	9.0	9.0	13.0	9.0	8.8	11.0	11.0	9.0	8.0	9.2	6.4	9.9	7.7	7.4	6.9
Tetrachloroethane	46.0	60.0	58.0	30.0	49.0	54.0	38.0	35.0	20.0	44.0	14.0	38.0	44.0	60.0	38.0
1,2-Dichloroethene (CIS)							1.0	13.0	4.0	7.2	10.0	8.7	5.1	10.0	4.4
1,2-Dichloroethene (Trans)															
1,2-Dichloroethene (Total)															
1,1-Dichloroethene															
Benzene															
1,1,1-Trichloroethane															
Phenol															
Pyrene															
Toluene															
Chlorobenzene															
2-Butanone															
1,4-Dichlorobenzene															
Vinyl Chloride															
Total Xylenes															
Ethyl Benzene															
Chloroethane															

633-647 Old Post-IIC(A)B7D/B8D

Parameters	12/27/83 (WCHD)	1/5/84 (WCHD)	1/13/84 (WCHD)	4/4/84 (WCHD)	4/23/84 (WCHD)	7/12/84 (WCHD)	8/22/84 (WCHO)	11/27/84 (WCHD)	2/11/85 (WCHD)	4/23/85 (WCHD)	6/13/85 (WCHD)	10/27/88 (NYSDEC)A
Trichloroethene	8.8	10.0	9.5	8.5		3.5	11.0	4.4	11.0	6.7	10.0	
Tetrachloroethane	60.0	40.0	60.0	47.0		18.0	29.0	37.0	53.0	25.0	75.0	
1,2-Dichloroethene (CIS)	3.0	4.3	3.5	3.8		1.9	4.4	4.5	5.9	4.7	6.0	
1,2-Dichloroethene (Trans)												
1,2-Dichloroethene (Total)												
1,1-Dichloroethene												
Benzene												
1,1,1-Trichloroethane										t		
Phenol												
Pyrene												
Toluene												2.0 J
Chlorobenzene												
2-Butanone												1.0 J
1,4-Dichlorobenzene												
Vinyl Chloride	5.0	t	t		t	t	t	t	t			
Total Xylenes												
Ethyl Benzene												
Chloroethane												

Sample Number Flags

D - Drinking water
B - Before purification unit
BI - Before installation of purification unit
A - After purification unit
BL - Compound found in the method blank as well as in the sample.

Analyte Result Flags

J - Indicates estimated value
E - Value exceeds calibration range
DL - Diluted sample
X - Total of o, m, p isomers
t - Trace, but present

* - All concentrations shown in ug/l.

B6 was the only location that showed noticeable increasing levels of trichloroethene. Concentrations of trichloroethene increased in samples obtained before and after the GAC unit. Levels before the GAC unit rose from 4 to 20 ug/l, and concentrations after the GAC unit increased from non-detectable to 15 ug/l between August, 1986 and October, 1988.

Concentrations of 1,2-dichloroethene fluctuated but generally experienced a slightly decreasing trend at sample location B7/B8 between March, 1982 and June, 1985 (excluding April, 1984) with the mean concentration being 5.5 ug/l and the median being 4.5 ug/l. Levels of 1,2-dichloroethene also decreased at sampling point B4 between June, 1982 and November of 1988, and decreased at sample locations B14 and B43. However, concentrations appeared to increase at location B9. Sampling location B6 (Exxon) showed noticeable increasing levels of 1,2-dichloroethene in samples obtained both before and after the GAC unit. Concentrations before the GAC unit rose from being non-detectable to 64 ug/l, and levels after the GAC unit increased from being non-detectable to 60 ug/l in samples obtained between August, 1986 and October, 1988.

The only sampling points that contained historical data on BTX compounds were B6 and B9. At location B9, levels of benzene, toluene and xylene as well as ethylbenzene decreased between July, 1986 and November, 1988. In addition, sampling location B6 (Exxon) showed a slight increase in benzene concentrations in samples obtained before the GAC unit from non-detectable levels in August, 1986 to 9 ug/l in October, 1988.

It should be noted that data showing concentrations of contaminants in samples that were collected prior to GAC units and where no units were present constitute data that can be used to evaluate ground water contamination. Data from samples obtained after a GAC unit and where no GAC unit existed, but where the water is still used as a potable water supply constitutes data that can be utilized to evaluate the issue of risk to public health. This information will be discussed in the Discussion and Health Risk Assessment Sections (6.0 and 7.0, respectively) of this report.

5.4 Applicable Water Quality Standards and Significance of Sampling Results

5.4.1 Organic Compounds

The New York State Department of Health (NYSDOH) drinking water standards and NYSDEC ambient ground water standards and guidelines for organic compounds are listed in Table No. 5-5. By comparing Table Nos. 5-5 and 5-1 (sample results for organic compounds) it is found that the state standards and guidelines were exceeded. Table No. 5-6 is a summary in matrix form showing the sampling locations and concentrations exceeding the standards and guidelines. It also shows those locations that had samples with concentrations at or above the guidance values or standards.

From inspecting Table Nos. 5-1, 5-5 and 5-6, it is found that 11 of the 38 sampling locations (26%), where samples were obtained before a GAC unit or where no units were present, had sample concentrations that exceeded the standard of 5 ug/l for tetrachloroethene. These locations were B4, B6, B9, B12, B14, B17, B19, B21, B24 and B25. Sampling locations B4 (710 ug/l), B6 (200 ug/l), B9 (140 ug/l), B24 (85 ug/l) and B22 (52 ug/l) contained the highest levels of this compound. Samples obtained after the GAC unit at location B6 contained 19 ug/l of tetrachloroethene. This is important because the well at B6 is used as a source of potable water by the stores in the Banks building (location B9) as well as the Exxon gas station.

Table No. 5-6 also shows that three sampling locations (B4, B6 and B9) had sample concentrations that were in contravention of the drinking water standard of five ug/l for trichloroethene. The highest concentrations were found in samples obtained before GAC units at B9 (47 ug/l) and B6 (20 ug/l). In addition, the sample obtained after the GAC unit at B6 was also contaminated and contained a concentration of 15 ug/l of trichloroethene.

The standard (5 ug/l) for 1,2-dichloroethene was exceeded at three sampling locations, namely, B4, B6 and B9. The highest concentrations were recorded at sample point B6 where 64 ug/l was found in a sample obtained before a GAC unit and 60 ug/l was detected in the sample taken after the GAC unit.

The standards (5 ug/l) for benzene, toluene and xylene were contravened at sample location B9 in a sample obtained from a well that is currently not in use. Concentrations of benzene, toluene and xylene in this sample were 440, 35 and 39 ug/l, respectively. Only one other sample location, B6, had a sample concentration (9 ug/l) that exceeded the benzene standard. No other samples surpassed the standards for toluene and xylene.

Table No. 5-5

NEW YORK STATE
DRINKING WATER AND GROUND WATER STANDARDS
AND GUIDELINES
FOR SELECT ORGANIC COMPOUNDS*

Parameters	NYSDOH Drinking Water Standards (Part 5)	NYSDEC Ground Water Standards (Part 703/TOGS)
Tetrachloroethene	5 (POC)	0.7 (GV)
Trichloroethene	5 (POC)	10
1,1-Dichloroethene	5 (POC)	0.07 (GV)
1,2-Dichloroethene	5 (POC)	NA
1,1,1-Trichloroethane	5 (POC)	50 (GV)
1,1,2-Trichloroethane	5 (POC)	0.6 (GV)
1,1-Dichloroethane	5 (POC)	50 (GV)
1,2-Dichloroethane	5 (POC)	0.8 (GV)
Chloroethane	5 (POC)	NA
Methylethyl Ketone (2-Butanone)	50 (UOC)	NA
Benzene	5 (POC)	ND
Chlorobenzene	5 (POC)	20 (GV)
Ethylbenzene	5 (POC)	50 (GV)
Toluene	5 (POC)	50 (GV)
Xylene(Total)	5 (POC)	50 (GV)

* All concentrations for standards and guidelines are shown in ug/l.

GV – Guidance Value
ND – Non-detectable
NA – None available (no standard or guideline available)
UOC – Unspecified Organic Contaminant (NYSDOH Standard for UOC's = 50 ug/l).
POC – Principle Organic Contaminant (NYSDOH Standard for POC's = 5 ug/l).

Table No. 5-6

SUMMARY MATRIX OF SAMPLING LOCATIONS WITH CONCENTRATIONS EXCEEDING NEW YORK STATE DEPARTMENT OF HEALTH DRINKING WATER STANDARDS FOR ORGANIC COMPOUNDS*

Parameter Exceeded (Concentration Detected in ug/l)

Sample Location	Tetrachloro-ethene	Trichloro-ethene	1,2-Dichloro-ethene	Benzene	Toluene	Xylene
B4 (D) 644-656 Old Post Road (Shopping Arcade)	710 (B)	14	22			
B6 (D) 640 Old Post Road (Exxon)	200 (B), 19 (A)	20 (B), 15 (A)	64 (B), 60 (A)	9 (B)		
B9 (N) 625-629 Old Post Road	140	47	29	440	35	39
B12 (D) 31 Court Road	12					
B14 (D) 11 Court Road	26					
B17 (D) 615 Old Post Road (Court House)	41					
B19 (D) 618-634 Old Post Road	10					
B21 (D) 2-24 Village Green (Empire Building)	30					

Table No. 5–6 (continued)

SUMMARY MATRIX OF SAMPLING LOCATIONS WITH CONCENTRATIONS EXCEEDING NEW YORK STATE DEPARTMENT OF HEALTH DRINKING WATER STANDARDS FOR ORGANIC COMPOUNDS*

Parameter Exceeded (Concentration Detected in ug/l)

Sample Location	Tetrachloro–ethene	Trichloro–ethene	1,2–Dichloro–ethene	Benzene	Toluene	Xylene
B22 (D) 26–30 Village Green	52					
B24 (D) 34 Village Green (Firehouse)	85					
B25 (D) 38 Village Green (Loundsbury Building)	31					

* Drinking water standard for all parameters shown is 5 ug/l.

(D) Drinking water supply well sample

(N) Well not used (out of service)

(A) Location that contained a GAC unit and sample obtained after GAC unit.

(B) Location that contained a GAC unit and sample obtained before GAC unit.

The NYSDEC standards and guidelines for ground water are also shown in Table No. 5-5. By comparing Table Nos. 5-5 and 5-1 it is found that the NYSDEC ambient ground water standards and/or guidance values for tetrachloroethene, trichloroethene and benzene were exceeded. The guidance value (0.7 ug/l) for tetrachloroethene was exceeded at 12 of all 39 sampling locations (31%), the standard of 10 ug/l for trichloroethene was contravened at three locations and the standard (ND, non-detectable) for benzene was exceeded at four sampling locations. All of the aforementioned information is summarized in matrix form in Table No. 5-7.

5.4.2 Inorganic Constituents

The NYSDEC and the NYSDOH standards and guidelines for inorganic constituents in ground water and drinking water are shown in Table No. 5-8. Comparing this table to the sample results for inorganic constituents in Table Nos. 5-2 (metals) and 5-3 (nitrates), it is found that although a number of inorganic chemicals were detected, only three metals namely, lead, nickel and silver were found in high concentrations that exceeded the existing standards and guidelines for ground water and drinking water at only one sampling location (B4). In addition, although there are no drinking water and ground water standards or guidelines for aluminum, calcium, magnesium, potassium and sodium, elevated concentrations were detected in several samples. However, these chemicals are often found naturally in ground water at high levels.

Table No. 5–7

SAMPLING LOCATIONS WITH CONCENTRATIONS EXCEEDING NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GROUND WATER STANDARDS/GUIDELINES FOR ORGANIC COMPOUNDS

Parameter Exceeded (Concentration detected in ug/l)

Sample Location	Tetrachloroethene*	Trichloroethene**	Benzene***
B4 (D) 644–656 Old Post Road (Shopping Arcade)	710 (B)	14	
B6 (D) 640 Old Post Road (Exxon)	200 (B), 19 (A)	20 (B), 15 (A)	9 (B)
B9 (N) 625–629 Old Post Road	140	47	440
B12 (D) 31 Court Road	12		
B14 (D) 11 Court Road	26		
B17 (D) 615 Old Post Road (Court House)	41		2
B19 (D) 618–634 Old Post Road	10		1
B21 (D) 2–24 Village Green (Empire Building)	30		
B22 (D) 26–30 Village Green	52		
B24 (D) 34 Village Green (Firehouse)	85		
B25 (D) 38 Village Green (Loundsbury Building)	31		

Table No. 5-7 (continued)

SAMPLING LOCATIONS WITH CONCENTRATIONS
EXCEEDING NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
GROUND WATER STANDARDS/GUIDELINES FOR ORGANIC COMPOUNDS

Parameter Exceeded (Concentration detected in ug/l)

Sample Location	Tetrachloroethene*	Trichloroethene**	Benzene***
B52 (D) 33 Cart Way Lane West	2		

* Guidance value for tetrachloroethene = 0.7 ug/l.
** Standard for trichloroethene = 10 ug/l
*** Standard for benzene = ND (Non-detectable)

(D) Drinking water supply well sample
(N) Well not used (out of service)
(A) Location that contained a GAC unit and sample obtained after GAC unit.
(B) Location that contained a GAC unit and sample obtained before GAC unit.

Table No. 5-8

NEW YORK STATE DRINKING WATER AND GROUND WATER STANDARDS AND GUIDELINES FOR INORGANIC CONSTITUENTS*

Parameters	NYSDEC Ground Water Standards (Part 703.5)	NYSDEC Ground Water Standards and Guidelines (TOGS)	NYSDOH Drinking Water Standards
Aluminum	--	--	--
Antimony	--	3(GV)	3(GV)
Arsenic	25	25	50
Barium	1,000	1,000	1,000
Beryllium	--	3(GV)	--
Cadmium	10	10	10
Calcium	--	--	--
Chromium	50(Hex)	--	50(Hex)
Cobalt	--	--	--
Copper	1,000	1,000	--
Iron	300**	300	300
Lead	25	25	50
Magnesium	--	35,000(GV)	--
Manganese	300**	300	300
Mercury	2	2	2
Nickel	--	--	7.1(GV)
Potassium	--	--	--
Selenium	20	20	10
Silver	50	50	50
Sodium	--	--	--
Thallium	--	4(GV)	--
Vanadium	--	--	--
Zinc	5,000	5,000	--
Nitrate	10,000	10,000	10,000
Cyanide	200	200	100

* All concentrations shown in ug/l
** Combined concentration of Iron and Manganese shall not exceed 500 ug/l.

GV - Guidance Value (no NYS standard)

Section 6

6.0 DISCUSSION OF SITE CONTAMINATION

The purpose of this section is to provide a discussion of the significance and possible cause of contamination found during this Remedial Investigation. The determination of significance, at least on a preliminary basis (with final determination based on the detailed health risk assessment provided in the following section) will be in relation to Applicable or Relevant and Appropriate Requirements (ARARs). Areas and matrices determined to be "significantly" contaminated will be the focus of the risk assessment. For this Remedial Investigation/Feasibility Study (RI/FS), the ARARs selected in coordination with the New York State Department of Environmental Conservation (NYSDEC) are the ambient ground water and surface water quality, and effluent limitation standards and guidance values established in the April 1987 Division of Water Quality Technical Operational Guidance Series (TOGS) Memorandum, the Maximum Contaminant Levels (MCLs) for drinking water supplies adopted by the New York State Department of Health (NYSDOH), and the New Jersey Department of Environmental Protection Soil Cleanup Guidelines. (It should be noted that USEPA MCLs were reviewed, but because NYSDOH MCLs are as stringent, or more stringent in some cases, the New York State MCLs were utilized as the ARARs for drinking water.)

The focus of discussion below will be with regard to the analytes of concern established for this project, these being the dry cleaning solvent tetrachloroethene, and its breakdown compounds, trichloroethene, cis/trans-1,2-dichloroethene and vinyl chloride (chloroethene), 1,1,1-trichloroethane and the BTX compounds (benzene, toluene and xylene). The selection of these compounds as the analytes of concern is based on their early discovery in suspected sources, environmental samples and drinking water supply in the study area. Following this section and the section on risk assessment (Section 7.0), recommendations are provided for mitigation and evaluation in the Feasibility Study.

6.1 Determination of Applicable or Relevant and Appropriate Requirements (ARARs)

The National Contingency Plan (NCP) requires the determination of the extent to which Federal, state or local public health and environmental standards are applicable or relevant and appropriate to each National Priorities List (NPL) site. In addition, Federal or state advisories, criteria and guidance must be reviewed to determine if they are applicable, relevant or appropriate in developing remedial actions at the site. This section provides a preliminary presentation of these requirements. Although the Shopping Arcade Site is a New York State Superfund site and not a NPL site, because this RI/FS is being conducted in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), the determination of Applicable or Relevant and Appropriate Requirements is germane to this study. As mentioned above, the establishment of ARARs and comparison to the results of this investigation will determine areas of significant contamination on a preliminary basis and provide a point of reference for performance of the health risk assessment in the following section and the subsequent Feasibility Study, and ultimately, the selection of an appropriate remedial action, if warranted.

A large number of potential Federal and state ARARs are available for consideration for site evaluation. For this Remedial Investigation, a review was undertaken of Volume I and II of the New York State ARARs, as well as those listed by the United States Environmental Protection Agency (USEPA). Based upon this review, the following standards/guidelines were selected as being the most appropriate for consideration and use at the Shopping Arcade Site. The discussion below provides a summary of the ARARs selected for the contaminants of concern detected in various medias (wastewater effluent and sludge, surface water, ground water, water supply, soil and sediment) in the study area. Since contamination of ambient air by the analytes of concern (volatile organic compounds) has never been detected above background at the site during the site investigation (as measured with a total organic vapor analyzer), ARARs for air are not addressed in this study.

Federal ARARs

- o <u>Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (40 CFR Part 141.11-141.16)</u> - Safe Drinking Water Act Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are set at levels which would minimize adverse health effects for water used for drinking water supply. MCLs are enforceable standards, whereas MCLGs are non-enforceable health goals and proposed recommendations. Only MCLs are considered relevant and appropriate for developing cleanup standards while MCLGs are "to be considered." For this investigation, only MCLs are considered applicable as ARARs.

- o <u>Resource Conservation and Recovery Act (RCRA) Ground Water Protection Standards (40 CFR 264.90-264.109)</u> - The RCRA Ground Water Protection Standards are appropriate as ARARs because many of the known contaminants are the 40 CFR 261 Appendix VIII list of substances and are present in the ground water above background/ambient levels. The hazardous waste requirements of RCRA applicable to the treatment, storage and disposal of hazardous waste are also potentially applicable to the Shopping Arcade Site.

- Clean Water Act (CWA) Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life (EPA-440/9-76-023) - The CWA Water Quality Criteria for Protection of Aquatic Life are appropriate since fresh water bodies in the study area and the Mianus River support fish and other aquatic organisms and should be protected.

State ARARs

- New York State Department of Environmental Conservation Division of Water Technical and Operational Guidance TOGS (1.1.1) Ambient Water Quality Standards and Guidance Values - The water quality standards and guidance values contained in this document are a compilation of values for toxic and non-toxic pollutants contained in the following:

  - New York State Water Classification and Quality Standards, Chapter X, Part 701-Ambient Water Quality Standards, Appendix 31

  - New York State Water Classification and Quality Standards, Chapter X, Part 703-Ground Water Classifications, Quality Standards, and/or Limitations

  - New York State Water Classification and Quality Standards, Chapter X, Section 703.6-Discharge Criteria for Class GA Waters

  These values are used by NYSDEC in the establishment of discharge permit water quality-based effluent limits and in the evaluation of ambient water quality data. The New York State standards are applicable because it is required that ground water be protected as a potable source and surface water protected as an environmental resource, and that contaminated ground water and surface water be cleaned up to State standards.

- o <u>New York State Department of Health Requirements for General Organic Chemicals in Drinking Water (Public Health Law, Section 201 and 205)</u> – These standards are applicable, because they are established to protect the health of those who are utilizing a ground water or surface water resource as a potable supply. Since all ground water in New York State is classified for drinking water purposes (GA), and since the Mianus River and tributaries in the study area are classified as "AA-Special" because the river is a source of water supply to a downstream community, these requirements are considered as ARARs.

- o <u>New Jersey Department of Environmental Protection Summary of Approaches to Soil Cleanup Levels</u> – Although these cleanup levels were developed for use in New Jersey, since presently, guidance values for soil remedial action have not been established for use in New York, these levels may be applicable for the preliminary assessment of the significance of soil and sediment contamination, as well as cleanup, at the Shopping Arcade Site.

Additional ARARs on the Federal, New York State and local level may be identified based on the results of the selected remedial alternatives (e.g., minimum technology requirements) developed in the Feasibility Study. New York State regulations on treatment, closure/post-closure, landfill requirements, cap performance standards, etc., will be identified, as well as State requirements on air quality, water discharge requirements and injection/recharge regulations.

Table Nos. 6-1, 6-2, 6-3, and 6-4, list the analytes of concern and other contaminants identified in the study area, and the contaminant-specific ARARs for effluent discharge, ground water, surface water and soil, respectively.

As discussed above, for the purposes of this investigation, the ARARs for ambient water will be the New York State surface water and ground water standards and guidelines contained in the TOGS. Where standards or guidelines do not exist in the TOGS, USEPA MCLs or NYSDOH maximum contaminant levels for organic compounds will be used. The NYSDOH MCLs will also be used for ground water, particularly where it applies to drinking water supply.

Table No. 6–1

ARARS FOR EFFLUENT DISCHARGE

Organic Compounds	NYSDEC Part 703.6 (ug/l)
Tetrachloroethene	—
Trichloroethene	—
Cis–1,2–dichloroethene	—
Trans–1,2–dichloroethene	—
1,1,1–Trichloroethane	35
Benzene	ND
Toluene	—
Xylene	—
2–Butanone	—
1,4–Dichlorobenzene	—
Chlorobenzene	—
Ethylbenzene	—
Phenol	—
Metals	
Aluminum	2,000
Antimony	—
Arsenic	50
Barium	2,000
Cadmium	20
Calcium	—
Chromium	100 (Hexavalent)
Copper	1,000
Cyanide	400
Iron	600
Lead	50
Magnesium	—
Manganese	600
Mercury	4
Nickel	2,000
Potassium	—
Silver	100
Sodium	—
Zinc	5,000

Table No. 6-2

ARARS FOR GROUND WATER AND WATER SUPPLY

Organic Compounds	NYSDEC TOGS* (ug/l)	NYSDOH MCL (ug/l)	RCRA MCL (ug/l)	SDWA MCL (ug/l)	SDWA MCLG (ug/l)
Tetrachloroethene	0.7 (G)	5.0	—	—	0
Trichloroethene	10 (G)	5.0	—	5.0	0
Cis-1,2-dichloroethene	—	5.0	—	—	—
Trans-1,2-dichloroethene	50 (G)	5.0	—	—	—
1,1,1-Trichloroethane	50 (G)	5.0	—	—	—
Benzene	ND (S)	5.0	—	5.0	—
Toluene	50 (G)	5.0	—	—	2.0
Xylene	50 (G)	5.0	—	—	—
2-Butanone	—	5.0	—	—	—
1,4-Dichlorobenzene	4.7 (S)	5.0	—	780	780
Chlorobenzene	20 (G)	5.0	—	—	—
Ethylbenzene	50 (G)	5.0	—	—	680
Phenol	1.0 (S)	—	—	—	—
Metals					
Aluminum	—	—	—	—	—
Antimony	3.0 (G)	—	—	—	—
Arsenic	25 (S)	5.0	50	50	—
Barium	1,000 (S)	1,000	1,000	1,000	1,500
Cadmium	10 (S)	10	10	10	5.0
Calcium	—	—	—	—	—
Chromium	50 (Hex)(S)	500	50 (Hex)	50 (Hex)	1.2 (Hex)
Copper	1,000 (S)	1,000	—	—	1,300
Cyanide	200 (S)	200	—	—	—
Iron	300 (S)	300	—	—	—
Lead	25 (S)	50	50	50	20
Magnesium	35,000 (G)	—	—	—	—
Manganese	300 (S)	300	—	—	—
Mercury	2.0 (S)	2.0	2.0	2.0	3.0
Nickel	—	—	13.4	—	—
Potassium	—	—	—	—	—
Silver	50 (S)	50	50	50	—
Sodium	—	—	—	—	—
Zinc	5,000 (S)	5,000	—	—	—

* Class GA Water

(S) Standard
(G) Guidance Value
ND Non-Detectable

Table No. 6–3

ARARS FOR SURFACE WATER

Organic Compounds	NYSDEC TOGS* (ug/l)	CWA Criteria** (ug/l)
Tetrachloroethene	0.7 (G)	5,200/840
Trichloroethene	3.0 (G)	—/—
Cis–1,2–dichloroethene	—	11,000/—
Trans–1,2–dichloroethene	50 (G)	11,000/—
1,1,1–Trichloroethane	50 (G)	
Benzene	1.0 (G)	5,300/—
Toluene	50 (G)	17,000/—
Xylene	50 (G)	—/—
2–Butanone	—	—/—
1,4–Dichlorobenzene	30 (S)	—/—
Chlorobenzene	20 (S)	200/50
Ethylbenzene	50 (G)	32,000/—
Phenol	1.0 (S)	10,000/2,500
Metals		
Aluminum	—	—/—
Antimony	3.0 (G)	9,000/1,600
Arsenic	50 (S)	—/—
Barium	1,000 (S)	—/—
Cadmium	10 (S)	3.9/1.1
Calcium	—	—/—
Chromium	50 (S)	16/11
Copper	200 (S)	18/12
Cyanide	100 (S)	22/5.2
Iron	300 (S)	—/—
Lead	50 (S)	8.2/3.2
Magnesium	35,000 (S)	—/—
Manganese	300 (S)	—/—
Mercury	2.0 (S)	2.4/0.012
Nickel	—	1,800/96
Potassium	—	—/—
Silver	50 (S)	4.1/0.12
Sodium	—	—/—
Zinc	300 (S)	320/47

* Class AA–Special
** Freshwater Acute/Chronic

(S) Standard
(G) Guidance Value
ND Non–Detectable

Table No. 6-4

ARARS FOR SOIL AND SEDIMENT

Organic Compounds	NJDEP Cleanup Level (mg/kg)
Total Volatile Organics	1
Total Base Neutrals	10
Total Acid Extractables	10
Total PCBs	1-5
Total Petroleum Hydrocarbons	100
Metals	
Arsenic	20
Cadmium	3
Chromium	100
Copper	170
Lead	100
Mercury	1
Nickel	100
Selenium	4
Silver	5
Zinc	350
Cyanide	12

6.2 Source/Sanitary System Contamination

6.2.1 Summary of the General Occurrence of Hazardous Substances in Sanitary System Effluent

The primary focus of this Remedial Investigation is to investigate the source and extent of tetrachloroethene contamination and its breakdown compounds (defined as the primary analytes of concern in this study) in the Shopping Arcade Study Area. Based on the nature and location of the chemicals found at the Site, the most likely source of the tetrachloroethene release was a dry cleaner which was located in one of the stores that make up the Arcade. It is believed that wastewater containing dry cleaning solvent (tetrachloroethene) was disposed of to the Arcade's sanitary system. It is also possible that discharges and spills from product and waste material behind the former dry cleaning establishment may have entered the soil.

A 1978 NYSDEC investigation of contamination of municipal water supply wells by volatile organic chemicals initialed concern regarding disposal of the solvent tetrachloroethene from dry cleaning establishments to on-site sanitary and drainage systems. In 1979, as a result of this concern, a study was conducted in Bedford Village by the Westchester County Department of Health and a number of samples were collected from private wells in the vicinity of the Shopping Arcade and a dry cleaner. Analysis of these samples identified an area of contaminated ground water located in the Village Green area immediately downgradient of the Arcade.

As part of this Remedial Investigation, provision was made in the Phase IA sampling program to obtain a sample of the Arcade's sanitary system liquid (supernatant) as well as the sludge. The purpose of this analytical data was to determine if there were continuing related discharges to the sanitary system and if the system continues to act as a source/reservoir of residual contamination within the study area.

The sanitary leaching field that services the Arcade building has not been able to provide sufficient capacity to accommodate the quantity of wastewater generated. To mitigate this problem, septage has been periodically pumped from the septic tank and transported off site. When it was attempted to obtain samples from the septic tank, there was no sludge present. As a result, only a supernatant/effluent sample was collected.

Upon analysis of the septic tank supernatant sample, estimated values of the dry cleaning compound tetrachlorethene and its breakdown products, trichloroethene and 1,2-dichloroethene (total) were detected at 3.4, 3.4 and 2.3 ug/l, respectively. In addition to these compounds, an estimated concentration of 1,1,1-trichloroethane, a common cleaning solvent also used as a septic system cleaner, was detected in this sample at an estimated concentration of 2.4 ug/l.

As discussed above, the TOGS established by NYSDEC are used to define values for effluent limitations as well as ambient water quality standards and guidelines. Assuming discharge to ground water which is classified as GA, the guidance value established for tetrachloroethene is 0.7 ug/l, trichloroethene is 10 ug/l and trans-1,2-dichloroethene is 50 ug/l. The estimated concentrations of trichloroethene and trans-1,2-dichloroethene found in the septic system supernatant are below the established guidelines, however, the concentration of tetrachloroethene exceeds the ground water guideline value.

The detection of 1,1,1-trichloroethane most likely indicates solvent use in the Arcade building and disposal to the sanitary system. The ambient ground water guidance value for 1,1,1-trichloroethane is 50 ug/l. The estimated concentration of 2.4 ug/l detected in the sanitary effluent is below the established limit.

Based on the analytical results, it appears that low concentrations of the dry cleaning solvent tetrachloroethene and its breakdown products still persist in the Arcade's sanitary system, or result from the disposal of contaminated water supply to the wastewater disposal system. Also, the solvent 1,1,1-trichloroethane appears to be used in the Arcade building and discharged to the wastewater disposal system, or result from the disposal of contaminated water supply as mentioned above.

In addition, elevated levels of two metals, namely copper (1,750 ug/l) and silver (332 ug/l) were detected in the Shopping Arcade septic tank supernatant. These concentrations exceed the effluent discharge standards for copper (1,000 ug/l) and silver (100 ug/l), as well as the ground water standards of 1,000 ug/l and 50 ug/l, respectively. Also, concentrations of phenol were found at 46.8 ug/l which is above the standard of 1.0 ug/l for ground water.

As part of the Phase IB program, provision was also made to sample the Exxon Gasoline Station sanitary wastewater disposal system to determine whether or not it was a source of contamination. A sludge sample was obtained from the Exxon station septic tank and found to contain high levels of benzene, toluene, xylene (BTX) and other volatile aromatic hydrocarbon compounds. The sludge sample contained benzene at concentrations of 1,700 ug/kg, toluene at 300,000 ug/kg, total xylenes at 37,000 ug/kg and other volatile aromatic hydrocarbons such as ethyl benzene and 1,4-dichlorobenzene at 15,000 ug/kg and 2,500,000 ug/kg, respectively. The high levels of all of these compounds significantly exceed the ARARS for soil and sediment based on the NJDEP cleanup level of 1 mg/kg (1,000 ug/kg) for Total Volatile Organic (TVO) compounds.

As evidenced by the high concentrations of BTX compounds found in the septic tank sludge, these contaminants have been discharged (and possibly continue to be discharged) into Exxon's sanitary disposal system where the contaminanted wastewater is discharged to the system's leaching unit(s) and eventually recharged to ground water. The downgradient ground water contamination by BTX compounds is most likely attributed to contamination from the sanitary system, gasoline spills, leaks from the underground fuel storage tanks at the Exxon Station (and the Bedford School), as well as normal roadway runoff containing low levels of BTX compounds (see Section 6.5.1 Ground Water Contamination for further discussion).

In addition, elevated levels of four metals, namely copper (1,200 mg/kg), lead (1,000 mg/kg), mercury (2.1 mg/kg) and zinc (1,900 mg/kg) were detected in the Exxon Gasoline Station septic tank sludge. These concentrations exceed the ARARs for soil and sediment based on the NJDEP cleanup levels of 170 mg/kg, 100 mg/kg, 1 mg/kg and 350 mg/kg for copper, lead, mercury and zinc, respectively. Also, it should be noted that the pesticide lindane was detected at a level of 24 ug/kg. The source of this pesticide in the septic tank is unknown and may have been discarded into the sanitary system at the gasoline station in the past.

6.3 Surface Water Contamination

6.3.1 Summary of the General Occurrence of Hazardous Substances in Surface Water

Stormwater runoff from the Shopping Arcade and the adjacent Exxon service station along Route 22 and Court Road is diverted through a subsurface drainage system which discharges to an open drainage ditch along Court Road. The storm drainage flows into a small pond adjacent to and south of Court Road before the stream is directed subsurface (piped) under the Bedford Resource Center recreation field. The stream then discharges to a second pond just north of Pound Ridge Road. Overflow from this pond is directed under Pound Ridge Road and travels approximately 700 feet where it discharges to the

Mianus River. The first permanent surface water body that receives the stormwater surface runoff from and in the vicinity of the Arcade is the stream which runs perpendicular to and southeasterly from Court Road.

In Phase IA of the Remedial Investigation, provision was made to collect a surface water sample from the discharge of the pond north of Court Road in order to determine if contamination exists in this upgradient standing water body. Chemical analysis of the surface water sample did not indicate the presence of the analytes of concern.

The two surface water samples collected downgradient of the stormwater discharge to the stream that crosses and flows southeasterly of Court Road (at the head of the small pond just south of Court Road and at the head of the pond just north of Pound Ridge Road) did not contain the analytes of concern. In addition, low levels (2.9 ug/l) of 2-butanone (methyl ethyl ketone), a common paint solvent, were found in the water sample obtain at the head of the small pond just south of Court Road.

Surface water samples were also obtained at the stream discharge to the Mianus River and at the Mianus River downgradient of the study area at Middle Patent Road. The analytes of concern were not detected in these surface water samples. However, 2-butanone was found in low levels (3.7 ug/l) in the sample obtained from the Mianus River downgradient of the study area at Middle Patent Road. In addition, it should be noted that an elevated concentration of silver (28.0 ug/l) was found at the stream discharge to the Mianus River, however, it did not exceed the surface water standard of 50 ug/l. Overall, it appears that there exists no significant surface water contamination within the study area.

6.4 Sediment Contamination

6.4.1 Summary of the General Occurrence of Hazardous Substances in the Stormwater Drainage System Sediment

As part of this Remedial Investigation, sediment samples were collected from the stormwater drainage system during the Phase IA Sampling Program to determine if this conduit is a pathway for contaminant migration in the study area. The focus of the drainage system sampling was placed on four sampling locations located along Route 22 and Court Road.

The first location sampled was a catch basin on Route 22 directly in front of the Shopping Arcade building. The only analyte of concern detected was 1,1,1-trichloroethane at a concentration of 5.0 ug/kg. This organic compound is a common cleaning solvent. It appears that a low concentration of this analyte has leached into the stormwater drainage system sediment. A low level (4.0 ug/kg) of 2-butanone (methyl ethyl ketone) was found in the catch basin sediment. This compound is a common paint solvent. In addition, an elevated level of silver (16.3 mg/kg) was detected in the sediment that exceeded the ARAR for soil and sediment based on the NJDEP cleanup level of 5 mg/kg.

A second catch basin was sampled at the intersection of Court Road and Route 22. The following analytes of concern were detected in this sediment sample: trichloroethene (5.0 ug/kg); 1,1,-dichloroethene (7.0 ug/kg); 1,1,1-trichloroethane (5.0 ug/kg); benzene (6.0 ug/kg); and toluene (9.0 ug/kg). Other compounds detected were 2-butanone (21.0 ug/kg), chlorobenzene (6.0 ug/kg) and 4-methyl-2-pentanone (7.0 ug/kg). The low levels of benzene and toluene are most probably associated with surficial runoff from either Route 22 and/or the adjacent Exxon service station. The remaining compounds (trichloroethene, 1,1-dichloroethene, 1,1,1-trichloroethane, 2-butanone, chlorobenzene and 4-methyl-2-pentanone) are all low concentrations of solvents which are common ingredients in paints, varnishes, lacquers and cleaning products.

A third sediment sample was collected at the stormwater drainage system discharge to the open culvert adjacent to and just north of Court Road. No analytes of concern were detected in this sediment sample. Only a low concentration (9.0 ug/kg) of 2-butanone (a common paint solvent) was detected.

The fourth stormwater drainage system sediment sample was collected at the point where the stormwater drainage ditch merges with the outlet from the pond north of Court Road. No analytes of concern were detected in this sediment sample. Other compounds such a 2-butanone (16.0 ug/kg) were detected and several polycyclic aromatic hydrocarbons (PAH's) such as pyrene (1,300.0 ug/kg), benzo (k) fluoranthene (930.0 ug/kg), benzo (a) anthracene (530.0 ug/kg), fluoranthene (922.0 ug/kg), benzo (b) fluoranthene (690.0 ug/kg) and phenanthrene (280.0 ug/kg) were found at elevated concentrations. The NJDEP action level for Total Base Neutral Compounds which inlcudes PAHS, is 10,000 ug/kg. The PAH compounds are coal tar based and are most likely found in the sediment as a result of runoff from tar and asphalt applied to the street surface. However, during the Phase IB program, this area was re-sampled and the drainage ditch sediment was found to contain low concentrations of several analytes of concern including tetrachloroethene (5.0 ug/kg), 1,2-dichloroethene (9.0 ug/kg), benzene (3.0 ug/kg), toluene (41.0 ug/kg) and total xylenes (52.0 ug/kg), as well as vinyl chloride (3.0 ug/kg). In addition, the high concentrations of PAHs were confirmed and two pesticides, namely, dieldrin and 4,4'-DDD were detected in low levels and are probably present due to roadway runoff and overland flow/drainage from the surrounding area. Also, a slightly elevated concentration of silver (6.4 mg/kg) was detected in the sediment that exceeded the ARAR for soil and sediment based on the NJDEP cleanup level of 5 mg/kg.

A review of the stormwater drainage system sediment data indicates that low levels of organic chemical contamination exist in portions of the stormwater drainage system/catch basins that service the study area. The most substantial contamination occurs in the sediment of the catch basin at the intersection of Court Road and Route 22 and in the sediment sample from the drainage ditch near the outlet of the pond north of Court Road. The total concentrations of volatile organic analytes of concern in the sediment samples obtained from the catch basin and the drainage ditch equals 38 ug/kg and 110 ug/kg, respectively.

As discussed earlier in this section, soil/sediment standards or guidance values do not exist in New York State for organic chemical contamination. As a means of comparison for determining the significance of the levels of contamination found in the sediment during this investigation, the New Jersey Department of Environmental Protection (NJDEP) has established a guidance value of 1 mg/kg or 1,000 ug/kg for total volatile organic chemicals in soil (sediment) in evaluating cleanup requirements.

6.4.2 Summary of the General Occurrence of Hazardous Substances in Pond Sediments

As part of the Phase IA sampling program, sediment samples were obtained from the three ponds in the study area. These ponds run in series and receive stormwater drainage/surface water runoff from the study area and discharge to the Mianus River.

One of the three sediment samples was collected as a background sample from the pond just north of Court Road. The chemical analysis revealed that the sediment contained two analytes of concern, namely 1,1,1-trichloroethane at 11.0 ug/kg and an estiamted concentration of benzene at 3.0 ug/kg. Other compounds that were found included 2-butanone and elevated levels of several phenols and unknown compounds.

The sediment sample collected at the second pond in series located just south of Court Road did not detect any of the analytes of concern. However, the compound 2-butanone was detected at a concentration of 45 ug/kg.

The last pond ('Long Pond') in the study area before the surface water discharge to the Mianus River is located just north of Pound Ridge Road. This pond was sampled near its inlet and the sediment contained an estimated concentration of benzene at 2.0 ug/kg, as well as elevated levels of several phenols and unknown compounds.

The relatively low concentrations of benzene detected in the pond sediments can most probably be attributed to stormwater runoff from adjacent roads. The levels of 2-butanone, a common paint solvent, were also of relatively low concentration.

Concern was raised regarding the detection of 1,1,1-trichloroethane within the pond sediment just north of Court Road. This compound is a common cleaning solvent which is often used by the dry cleaning industry. Thus, it was decided (in consultation with the NYSDEC) to incorporate into the Phase IB sampling program the collection of two additional pond sediment samples at this location in order to determine if residual contamination exists at lower depths in the sediment in the pond north of Court Road. If contamination existed, the pond sediments could be assumed to act as a contaminant reservoir which could contribute to present and future releases.

One of these samples was collected at a depth of one foot below the sediment surface at the ponds outlet. This sample contained an estimated concentration of 2.0 ug/kg of benzene, an analyte of concern. The second sample was collected at a depth of two feet below the sediment surface at the pond outlet and the analytes of concern were not detected in this sample.

Overall it appears that the sediment in the three ponds sampled within the study area contain only low concentrations of the organic compounds of concern and there does not appear to be a significant concern for future releases to the study area from these sediments. Low levels of only two analytes of concern were found only in the pond sediment north of Court Road, however, elevated levels of phenols were found in the last pond in series (Long Pond) located north of Pound Ridge Road as well as the first pond located north of Court Road.

As discussed previously in this section, soil/sediment standards or guidance values do not exist in New York State for organic chemical contamination. As a means of comparison for determining the significance of the levels of contamination found in the sediment during this investigation, the New Jersey Department of Environmental Protection (NJDEP) has established a guidance value of 1 mg/kg or 1,000 ug/kg for total volatile organic chemicals in soil (sediment) in evaluating cleanup requirements. Based on the sample results and this ARAR, only low levels are present in the stormwater drainage system and pond sediments.

6.4.3 Summary of the General Occurrence of Hazardous Substances in the Mianus River Sediments

As part of the Phase I sampling program, three sediment samples were collected from the Mianus River. These samples were obtained at the same locations as the surface water samples discussed in Section 6.3.1, above.

One of the three samples was collected from the Mianus River at a point upstream of from the study area. The purpose of sampling at this location was to document Mianus River sediment quality that has not been impacted by contaminant discharges in the study area. This upgradient sample also serves as a control in identifying Mianus River sediment quality that is entering and may be impacting the study area. The chemical analysis of the upgradient sediment sample detected 2-butanone at a concentration of 39 ug/kg.

The second sediment sample of the Mianus River was obtained at the confluence of the stream/pond system discharge to the river. The purpose of this sample was to identify drainage system sediment contamination that has migrated through the study area and has entered the river. The analytical data for this sediment sample did not show the detection of any of the analytes of concern, however, 2-butanone was found at 6.0 ug/kg and several PAH compounds including fluoranthene (780.0 ug/kg), phenanthrene (520.0 ug/kg), benzo(a)pyrene (560.0 ug/kg) and pyrene (580.0 ug/kg) were detected at elevated concentrations, as well as other unknown compounds.

The third Mianus River sediment sample was collected approximately one-half mile southeast (downgradient) of the stream/pond discharge from the study area to the Mianus River, where Middle Patent Road crosses the river. The chemical analysis of this sample showed that an estimated quantity of trans-1,2-dichloroethene (2.1 ug/kg) was detected and toluene was found at 11.0 ug/kg, but was also found in the method blank.

A review of the analytical results generated from the Mianus River sediment sampling illustrates relatively unrelated low level occurrence of organic contamination from analytes of concern in the Mianus River, as well as those in the other surface waters sediments in the study area. It does not appear that the Shopping Arcade Study Area is significantly contributing to contamination found in the Mianus River sediment, however, it does appear that an unidentified source(s) of 2-butanone exists upgradient and in the vicinity of the study area. The PAH compounds most likely result from roadway/surface runoff.

6.5 Subsurface Soil Contamination

As part of in-field screening (with an organic vapor analyzer), split spoon soil samples were collected from varying depths during construction of the monitoring wells in the study area and selected samples were sent to a field laboratory for volatile organic chemical analysis.

Sample screening provided timely soil chemical data which was used in determining zones of contamination in the borehole, assessing if contamination migration is stratigraphically controlled, and selecting the placement of the well screen in the borehole in order to obtain optimum ground water contamination data.

Split spoon soil samples were collected from the following borings and submitted to the field laboratory for screening:

MW-1B	MW-5S
MW-2M	MW-5B
MW-3M	MW-11 (no monitoring well installed)
MW-4M	

All seven borings are located downgradient of the Shopping Arcade which is the suspected source of contamination.

One soil sample was obtained from the boring advanced at MW-1B, at the depth of 5-7 feet. Bedrock at this location was encountered at a depth of 8.5 feet. The soil screening results indicated that a five ug/kg concentration of toluene was detected in this sample. MW-1B is located directly adjacent to a parking lot, and the toluene concentrations may be attributed to the infiltration of gasoline residuals.

Four soil samples were submitted from MW-2M which is located in the southeast corner of the Exxon Station service area. None of the analytes of concern were detected in these samples.

At the MW-3M location in the front of the Arcade building, three of the four soil samples submitted contained detectable levels of contaminants. In the 5-7 foot sample, six ug/kg of toluene was detected. The 15-17 foot sample contained 22 ug/kg of trichloroethene and 32 ug/kg toluene. The 20-22 foot sample (bedrock was encountered at 23 feet) contained 34 ug/kg of trichloroethene and 50 ug/kg of toluene.

Located near this monitoring well is the Exxon gasoline station sanitary system which was found to contain high levels of toluene. This may account for the concentration of toluene detected. Trichloroethene is a breakdown product of tetrachloroethene which is used in dry cleaning and most likely results from releases from the former dry cleaning establishment in the Shopping Arcade.

Soil samples from MW-4M, just northeast of the Theatre building, did not contain any of the analytes of concern.

Northeast of the Bedford Fire Department building, soil samples were collected from borings advanced at MW-5S and MW-5B. The sample obtained at the 5-7 foot interval in MW-5S contained six ug/kg of toluene. At MW-5B, the sample collected at 40-42 feet contained 15.0 ug/kg of trichloroethene and the sample at 45-47 feet contained 14.0 ug/kg of trichloroethene.

An exploratory source boring (MW-11SA) was advanced directly behind where the former dry cleaning establishment was located within the Shopping Arcade building. The soil sample collected at 0-2 feet contained 10.4 ug/kg of tetrachloroethene. With depth, trichloroethene was detected at 4-6 feet (7.4 ug/kg), 22-24 feet (6.1 ug/kg), and 30-32 feet (5.7 ug/kg), and a water sample collected at the top of bedrock contained 6.9 ug/l of trichloroethene.

The results of the soil samples obtained from the boreholes are consistent with the findings of ground water samples obtained from wells constructed in these locations as described below in Section 6.4.2. A saturated zone did not exist in the overburden at the MW-1B drilling location. As a result, an overburden ground water sample could not be collected to confirm the results of the soil sample screening. Ground water contamination was not encountered at MW-2M and MW-4M. At MW-3M, significant contaminant levels were detected in ground water samples obtained at this location. Although no ground water contamination was detected in MW-5S, its screened interval was only to a depth of 22 feet and most likely did not encounter the contaminants identified by the soil sample screening collected at the 40-50 foot range.

A review of all the subsurface soil samples collected for laboratory screening indicated that none of the soil samples yielded contaminant levels that approach the NJDEP guidelines for cleanup (total volatile organics of 1,000 ug/kg).

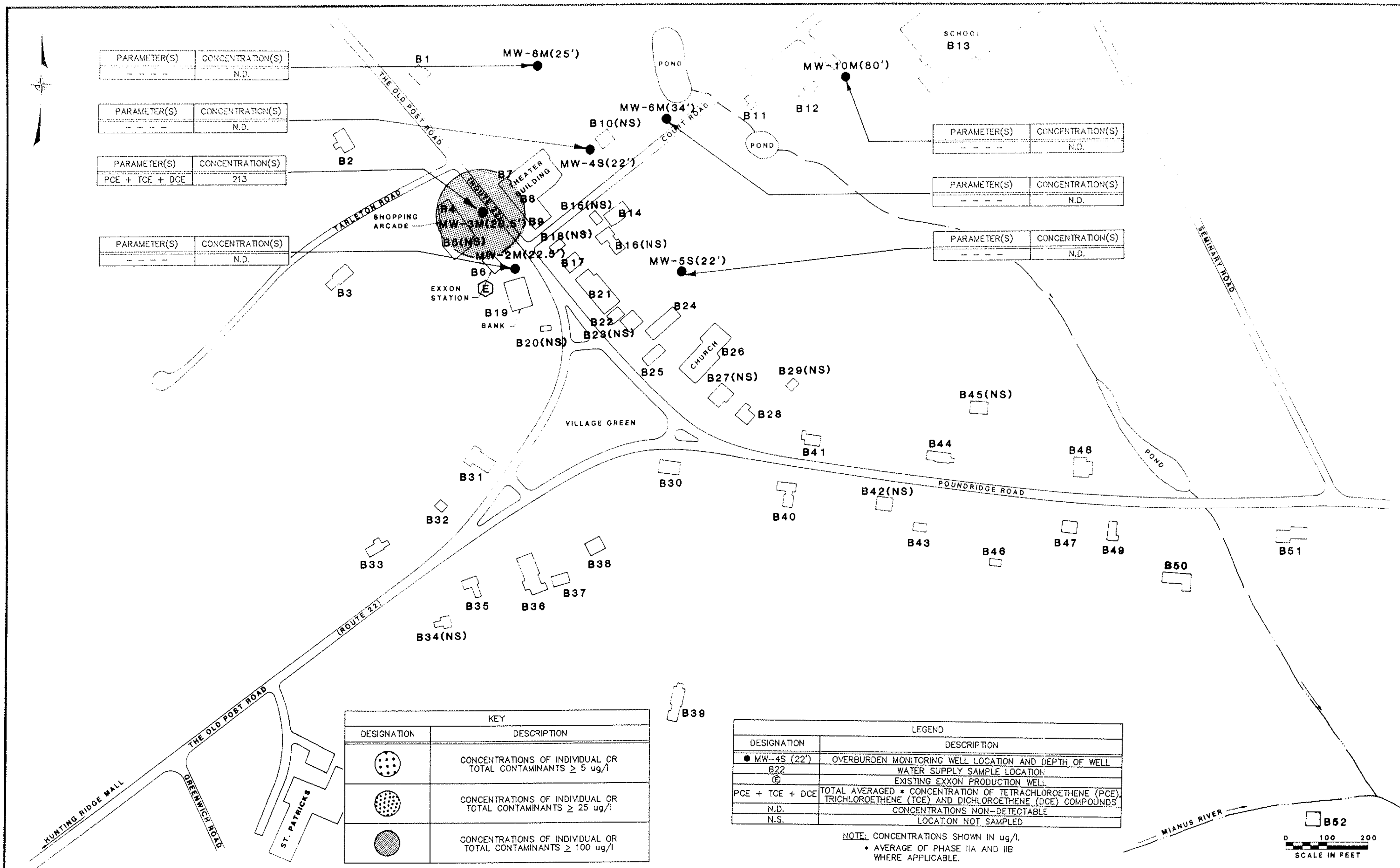
In addition, as part of the Phase IB sampling program, additional soil samples were obtained at two locations immediately adjacent to the sanitary leaching field and one directly behind the former dry cleaner in the Shopping Arcade. These samples were obtained at depths of approximately 2-4 feet below the ground surface using a hand auger. Only the sample that was obtained behind the location of the former dry cleaner contained analytes of concern, namely, low levels of tetrachloroethene (7.0 ug/kg) and 1,1,1-trichloroethane (1.0 ug/kg) that were well below NJDEP guidelines for cleanup.

6.6 Ground Water Contamination

6.6.1 General Occurrence of the Dry Cleaning Solvent (Tetrachloroethene) and its Breakdown Compounds in Ground Water Within the Unconsolidated Stratified Drift Deposits

A review of the data generated from ground water samples obtained from wells (monitoring and private water supply) which draw from the shallow unconsolidated stratified drift deposits begins to define the nature and extent of ground water contamination in the study area. (Refer to Figure No. 6-1.)

The present definition of the plume comprising the dry cleaning solvent tetrachloroethene and its breakdown products in the unconsolidated deposits appears to be isolated to the area immediately around monitoring well MW-3M. All other monitoring wells completed in the unconsolidated deposits have not detected any of the analytes of concern. The MW-3M monitoring well contained concentrations of 190 ug/l of tetrachloroethene and 13 ug/l of trichloroethene during the Phase IIA sampling program and 210 ug/l of tetrachloroethene during the Phase IIB sampling program.



KEY	
DESIGNATION	DESCRIPTION
(open dotted circle)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 5 ug/l
(dense dotted circle)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 25 ug/l
(shaded circle)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 100 ug/l

LEGEND	
DESIGNATION	DESCRIPTION
● MW-4S (22')	OVERBURDEN MONITORING WELL LOCATION AND DEPTH OF WELL
B22	WATER SUPPLY SAMPLE LOCATION
Ⓔ	EXISTING EXXON PRODUCTION WELL
PCE + TCE + DCE	TOTAL AVERAGED * CONCENTRATION OF TETRACHLOROETHENE (PCE), TRICHLOROETHENE (TCE) AND DICHLOROETHENE (DCE) COMPOUNDS
N.D.	CONCENTRATIONS NON-DETECTABLE
N.S.	LOCATION NOT SAMPLED

NOTE: CONCENTRATIONS SHOWN IN ug/l.
* AVERAGE OF PHASE IIA AND IIB WHERE APPLICABLE.

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Dvirka and Bartilucci CONSULTING ENGINEERS Syosset New York

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
TOTAL ORGANIC CONTAMINATION
IN OVERBURDEN WELLS

PROJECT NO. 842
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SCALE AS NOTED
DRAWING NO. 6-1

It appears that the contamination detected in the unconsolidated deposits is limited to an area confined between the outcropping ridge line (150 feet to the southwest of MW-3). The analytes of concern were not detected in MW-2M, located approximately 150 feet to the south-southeast. No contamination was detected at MW-4S located downgradient in the direction of ground water flow approximately 300 feet away to the east-northeast. If the contamination is migrating, it appears that it has not extensively dispersed in the unconsolidated deposits. A few of the scenarios that may explain this data include:

- The contamination detected may be a relatively recent release and has not yet dispersed in ground water.

- A sub-surface geologic feature may be containing the contaminants from extensive dispersion, or

- The ground water and the associated contamination in the unconsolidated deposits at the MW-3M location may be directly recharging the underlying bedrock. This appears to be the most likely scenario since the thickness of the unconsolidated deposits in the vicinity of the contamination source is very thin and would facilitate almost direct recharge to the bedrock surface depending upon the depth that the contamination was released (depth of leaching field above bedrock).

In order to determine the relative significance of ground water contamination, which may pose a potential hazard to human health and the environment, it is necessary to compare the detected concentrations of tetrachloroethene, its degradation products and other selected contaminants to established standards and guidance values established for ambient ground water.

Review of the analytical chemical data obtained during this Remedial Investigation indicates that tetrachloroethene and trichloroethene were detected at concentrations exceeding the established TOGS guidance values of 0.7 ug/l and 10.0 ug/l, respectively for ambient ground water in the vicinity of the MW-3M, which is downgradient of the Shopping Arcade building and former location of the dry cleaning establishment.

In terms of potential public health impact on those consuming the ground water, standards have been adopted by the New York State Department of Health (NYSDOH) which establish Maximum Contaminant Limits (MCLs) for organic chemicals in public/

community drinking water supplies. These standards, although they do not pertain directly to private (individual well) water supplies, are relevant to the Shopping Arcade Study Area because the water obtained from these wells is used for potable purposes. The MCL's established for both tetrachloroethene and the breakdown compound trichloroethene in public drinking water supplies are 5.0 ug/l. Figure No. 6-1 illustrates the occurrence of these parameters as well as the estimated extent of contamination in the unconsolidated deposits/overburden wells. Limited data was available on the depths of private wells. A review of all the currently available data indicates that of the private wells sampled in the Shopping Arcade Study Area, all were constructed in the underlying bedrock. The impact of ground water contamination on these wells is discussed in Section 6.5.1.2

6.6.2 General Occurrence of the Dry Cleaning Solvent (Tetrachloroethene) and its Breakdown Compounds in Ground Water Within the Bedrock

Understanding ground water flow and contaminant migration in fractured bedrock is complex. The physical properties of the underlying bedrock such as its hardness, weathering, direction and degree of fracturing and the continuity of fracturing, as well as the hydraulic properties including the associated hydraulic pressures, recharge, discharge and the effect of pumping wells, all have an influence on ground water flow and contaminant migration.

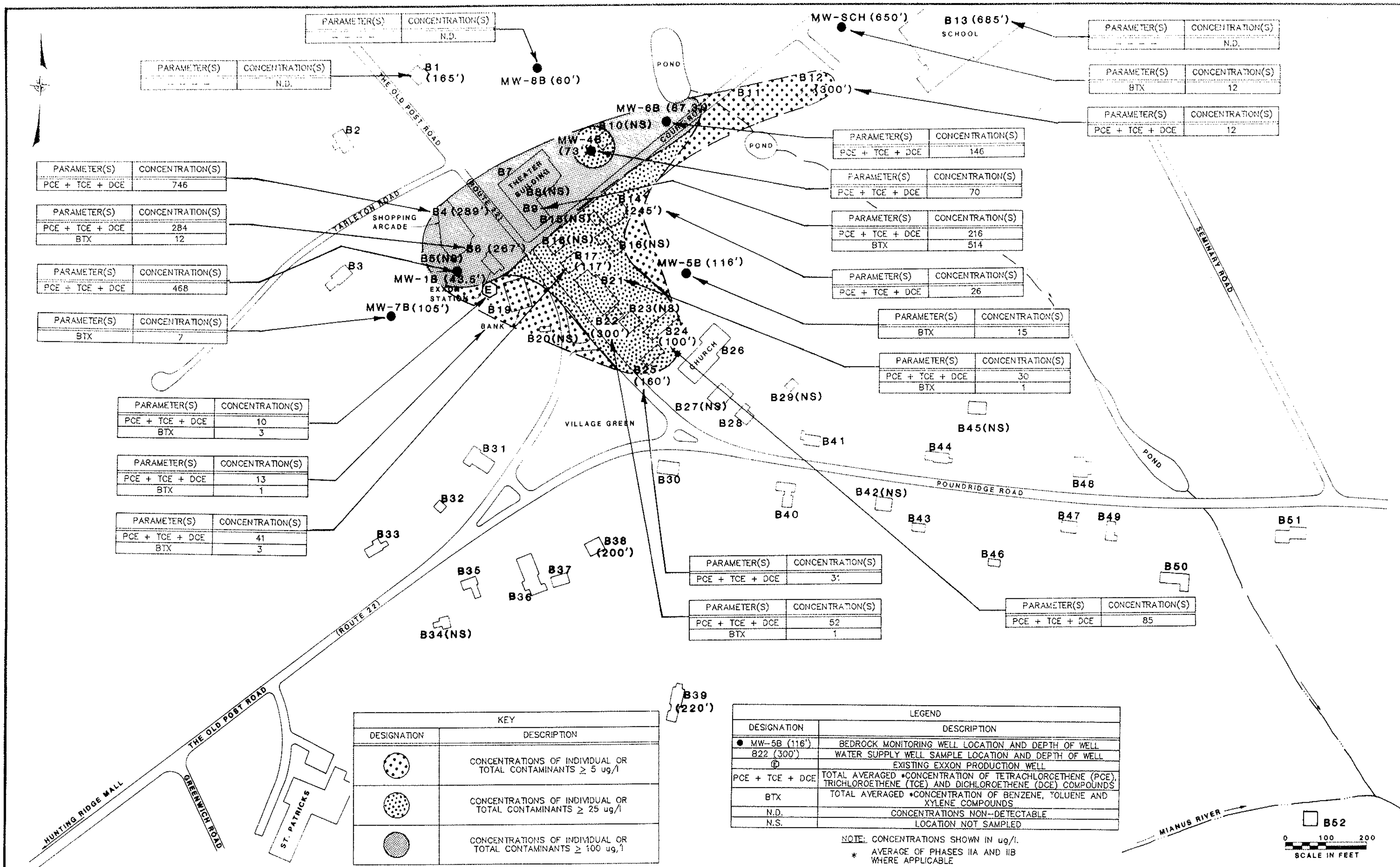
Specific to the Shopping Arcade Study Area, initially it is important to note that ground water contamination exists in the bedrock underlying the Arcade property and contiguous areas. The highest concentration of contamination found in bedrock was detected at water supply sampling location B-4 (Shopping Arcade Building) where concentrations of tetrachloroethene were detected at 710.0 ug/l, trichloroethene at 14.0 ug/l and 1,2-dichloroethene at 22.0 ug/l (Refer to Figure No. 5-2). As shown in Figure No. 6-2, water supply sampling location B-4 also contained the highest total averaged concentration of tetrachloroethene, trichloroethene, and 1,2-dichloroethene compounds at 746 ug/l.

The present definition of the plume comprising the dry cleaning solvent tetrachloroethene and its breakdown products appears to be approximately 700 feet in width and extends approximately 1,000 feet from the Shopping Arcade property to the northeast as far as water supply sampling location B-12. The general trend of contaminant migration in bedrock is in the direction of ground water flow to the northeast and east of the Shopping Arcade. Slight directional variations exist in the contaminant plume migration in bedrock from that of the ground water flow direction. This phenomenon is most likely associated with the fracture flow properties of the bedrock as it is impacted by the production wells which supply the businesses and residents in Bedford Village. An illustration depicting the general outline of the contaminant plume is contained in Figure No. 6-2. Basically the limits of ground water contamination by the analytes of concern within the bedrock are defined by water supply sampling location B-4 (Shopping Arcade building) to the northwest, water supply sampling locations B-12 (31 Court Road) to the northeast, B-14 (11 Court Road) to the east, B-25 (Loundsbury building) to the southeast, B19 (618-634 Old Post Road) to the southwest and monitoring well MW-1B to the west.

The highest levels of ground water contamination are found in close proximity to the Arcade and Theater buildings and downgradient of the Arcade in the direction of ground water flow along the north side of Court Road. Contamination has dispersed to the south and southeast of the Arcade building, south of Court Road and along Route 22 and the Village Green most likely due to the influence of pumping from the many private water supply wells located south of Court Road along Route 22 and the Village Green in combination with the sharp slope/dip in the bedrock surface from Court Road to the southeast. As contamination eminates from the vicinity of the Arcade and migrates across the bedrock surface in the direction of ground water flow to the northeast, some of the contamination is drawn southeasterly by the water supply production wells and drops down across the slope/dip of the bedrock surface and flows to the south and southwast toward the pumping wells.

It appears that there exists a dramatic infiltration of ground water and leaching of the associated contaminants from the overburden zone into the underlying bedrock. If the release of dry cleaning solvent was to the Arcade's septic leaching field and/or discharged directly to the ground surface behind the former dry cleaning establishment, as suspected, it is somewhat surprising that the dry cleaning solvent was only detected in the overburden at the area surrounding the MW-3 monitoring well location and that the vast majority of the contaminants were detected throughout the bedrock zone underlying the study area rather than the overburden deposits.

One scenario that could be proposed to explain this phenomenon is that the majority of the original contaminants released into the overburden zone has already been flushed out of the valley and only isolated pockets of contamination presently remain. However, if the contaminants have been flushed out of the valley in the overburden deposits one would suspect that a low concentration dispersed residual contaminant plume would still



KEY

DESIGNATION	DESCRIPTION
(dot pattern)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 5 ug/l
(fine dot pattern)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 25 ug/l
(dense shading)	CONCENTRATIONS OF INDIVIDUAL OR TOTAL CONTAMINANTS ≥ 100 ug/l

LEGEND

DESIGNATION	DESCRIPTION
● MW-5B (116')	BEDROCK MONITORING WELL LOCATION AND DEPTH OF WELL
B22 (300')	WATER SUPPLY WELL SAMPLE LOCATION AND DEPTH OF WELL
Ⓔ	EXISTING EXXON PRODUCTION WELL
PCE + TCE + DCE	TOTAL AVERAGED *CONCENTRATION OF TETRACHLOROETHENE (PCE), TRICHLOROETHENE (TCE) AND DICHLOROETHENE (DCE) COMPOUNDS
BTX	TOTAL AVERAGED *CONCENTRATION OF BENZENE, TOLUENE AND XYLENE COMPOUNDS
N.D.	CONCENTRATIONS NON-DETECTABLE
N.S.	LOCATION NOT SAMPLED

NOTE: CONCENTRATIONS SHOWN IN ug/l.
* AVERAGE OF PHASES IIA AND IIB WHERE APPLICABLE

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Syosset, New York

BEDFORD VILLAGE WELLS
REMEDIAL INVESTIGATION & FEASIBILITY STUDY
WESTCHESTER COUNTY, NEW YORK
SHOPPING ARCADE SITE

SHOPPING ARCADE STUDY AREA
TOTAL ORGANIC CONTAMINATION
IN BEDROCK WELLS

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DATE
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be detected in the overburden, although this has not been found. Rather it appears that there exists a strong vertical hydraulic gradient (which may also be augmented by the bedrock production wells in the study area) which recharges the ground water, including contaminants, from the overburden into the underlying bedrock. The contamination appears to drop vertically through the very thin layer of unconsolidated deposits and almost directly leaches to the bedrock interface where is then begins to disperse and migrate in the direction of groundwater flow across the bedrock surface, rather then in the unconsolidated deposits. The fact that the overburden deposits are very thin in the area of the Arcade building and the probability that the leaching field lies essentially on the bedrock surface supports/enhances the direct recharge of contamination to bedrock.

6.6.3 General Occurrence of Other Chemicals Detected in Ground Water Within the Study Area

A review of the ground water sampling results from monitoring wells and private water supply wells indicates that there exists four general types of chemical contamination at the Shopping Arcade Study Area.

The type of chemical contamination that is most significant in the study area, and discussed most widely in this report, is the dry cleaning solvent tetrachloroethene and its breakdown products, trichloroethene, trans-1,2-dichloroethene and vinyl chloride.

A second type of chemical contamination detected as a specific group in the ground water are concentrations of benzene, toluene and xylene (BTX). BTX compounds are used as solvents and thinners and associated with paints, lacquers and dyes. Another major source of these compounds is gasoline. In gasoline, BTX compounds are utilized as additives to increase the octane level. The NYSDEC ambient ground water standard for benzene is non-detectable. Toluene and xylene both have established guidance values of 50 ug/l. The established public drinking water supply standard for benzene, toluene and xylene is 5.0 ug/l.

The third group of chemical containments detected in ground water in the study area is 2-butanone (methyl ethyl ketone). 2-Butanone is a common paint solvent. No ambient ground water value has been established at present for 2-butanone, however, the public drinking water supply standard established by NYSDOH for 2-butanone is 50 ug/l.

The fourth group of chemical constituents found in ground water are concentrations of three metals of concern, namely lead, chromium and barium that were found at levels exceeding the NYSDEC TOGS ground water standards of 25 ug/l, 50 ug/l and 1,000 ug/l, respectively.

6.6.3.1 General Occurrence of Benzene, Toluene and Xylene in Ground Water

In general, low levels of BTX contamination were detected in most of the ground water samples collected from the underlying bedrock strata in the study area. Concentrations of these compounds ranged from an 1.0 ug/l to 440 ug/l.

In the private wells sampled as part of the water supply sampling program, 15 wells detected at least one of the BTX compounds, four of which (water supply sampling locations B6, B9, B17 and B19) exceed the NYSDEC TOGS ground water standards, and two of which (locations B6 and B9) exceeded the NYSDOH drinking water standard for benzene (5 ug/l) and one (B9) exceeded the drinking water standards for benzene, toluene (5 ug/l) and xylene (5 ug/l). The highest concentrations of BTX compounds were found at sample location B9 where 440.0 ug/l of benzene, 35.0 ug/l of toluene and 39.0 ug/l of xylene were found. The sample was taken from a well that previously served the Banks building and was abandoned due to contamination in the past from the Exxon station.

BTX contamination was detected in private wells in the vicinity of and downgradient of the Exxon Gas Station as well as throughout the study area along Pound Ridge Road. Based on information provided as part of this investigation, it has been reported that in the past, one of the Exxon gas station tanks was found leaking and was replaced. It appears that the high levels and residual BTX contamination that exists in close proximity to the Exxon station may be associated with this former leak or the high levels of BTX found in the gas station's sanitary system. In addition, the residual/low levels of BTX compounds detected in numerous private wells along Pound Ridge Road may be due to roadway runoff or dishcarges/spills from the Exxon station.

In addition to water supply wells, ground water samples obtained from four monitoring wells contained concentrations of benzene and/or toluene. Monitoring well MW-5B which is located downgradient of the Exxon gas station contained 14.0 ug/l of toluene and an estimated concentration of 1.0 ug/l of benzene in the bedrock zone. The Exxon production well contained 3.0 ug/l of toluene. Monitoring well MW-7B, located immeditalely upgradient of the gas station, contained 7.0 ug/l of benzene. Lastly, the abandoned well at the Bedford School contained toluene at 12.0 ug/l. Contamination in the abandoned school well is probably due to leakage that occurred from an underground fuel storage tank at the school and may not be related to an upgradient source of BTX.

6.6.3.2 General Occurrence of 2-Butanone in Ground Water

Low concentrations of 2-butanone were detected in two of the private wells sampled as part of the water supply sampling program. The concentration found in both wells was 1.0 ug/l which does not exceed the standard for this compound.

6.6.3.3 General Occurrence of Metals in Ground Water

Concentrations of lead, chromium and barium were found at levels that exceeded ground water standards in monitoring wells MW-2M and MW-3M. As mentioned in Section 6.6.3, the NYSDEC TOGS ground water standards for lead, chromium and barium are 25 ug/l, 50 ug/l and 1,000 ug/l, respectively. Monitoring well MW-2M, located downgradient of the Exxon Gasoline Station, contained concentrations of lead, chromium and barium at 65 ug/l, 54 ug/l and 1,200 ug/l, respectively. Monitoring well MW-3M, located immediately downgradient of the Shopping Arcade building, contained lead, chromium and barium at 33 ug/l, 1,000 ug/l and 2,400 ug/l, respectively.

Based on the nature of the chemicals found, the detection of lead in the Exxon station septic tank sludge at a level (1,000 mg/kg) exceeding the NJDEP soil/sediment cleanup guideline (100 mg/kg), and the location of the aforementioned contaminated wells downgradient of the Exxon station's sanitary wastewater disposal system and underground gasoline storage tanks, it appears that the source of the contamination could be attributed to discharges/leaching from the Exxon (as well as Shopping Arcade) sanitary system, leakage from underground gasoline (leaded) tanks, and/or spillage of fuels and waste oils containing metals at the Exxon station.

In addition, MW-2M and MW-3M contained concentrations of iron, magnesium and manganese, and MW-1B contained levels of iron and manganese that exceeded ground water standards, however, these chemicals are often found naturally in ground water at high levels.

6.7 Comparison Between Source, Soil, Sediment and Ground Water Contamination

A review of the historical data complemented by the analytical chemical data generated as part of this Remedial Investigation has significantly increased the understanding of contaminant migration in the Shopping Arcade Study Area.

As previously discussed, as part of the April, 1979 testing program conducted by the Westchester County Department of Health (WCDH), ground water samples were collected from three private water supply wells at the Shopping Arcade, Theater building and the Exxon gasoline station. The chemical analyses of these samples indicated the presence of high concentrations of tetrachloroethene, trichloroethene and cis-1,2-dichloroethene.

Between 1982 and 1984, studies performed by NYSDEC showed fluctuating levels of the volatile organic chemical contamination in the wells and in 1985 the Shopping Arcade building and the Theater building installed GAC treatment filters.

In 1986, WCDH and USEPA investigations confirmed that volatile organic contamination exists in all three private water supply wells and low concentrations of volatile organic chemicals also appeared east and southeast of the Arcade in private wells which were previously uncontaminated.

Based on the aforementioned findings and the nature of the chemicals found, the source of contamination was thought to be from the dry cleaning establishment formerly located in the Shopping Arcade. It was suspected that the dry cleaner in the Arcade disposed of waste/wastewater containing the solvent tetrachloroethene into the Arcade's sanitary system which discharges to a leaching field behind the Arcade building. In addition, surface soils behind the dry cleaner were believed to have also been contaminated from past disposal practices and that contamination may have entered the stormwater drainage system in the vicinity of the site. The drainage system becomes a drainage ditch and stream which eventually discharges to a series of surface water bodies in the study area before entering the Mianus River.

Concern was expressed as to whether the Arcade's sanitary disposal system septic tank and leaching field were continuing to be sources of contamination to groundwater and whether contamination had entered (and continues to enter) the area's stormwater drainage system from which it could reach the surface water bodies in the immediate study area and eventually enter the Mianus River.

A review of the results of the chemical analyses performed on the Shopping Arcade's sanitary disposal system septic tank supernatant, soil samples in the vicinity of the leaching field and behind the former location of the dry cleaning establishment, as well as a sludge sample from the Exxon gasoline station septic tank is listed as follows:

- o Low levels of tetrachloroethene (3.4 ug/l), trichloroethene (3.4 ug/l), 1,2-dichloroethene (2.3 ug/l) and 1,1,1-trichloroethane (2.4 u/gl) were detected in the Shopping Arcade's septic tank supernatant (effluent). In addition, elevated levels of silver and copper, as well as phenols were found at concentrations exceeding ARARs.

- o No contaminants were detected in the two soil samples that were obtained in the vicinity of the Shopping Arcade's leaching field.

  This finding does not appear to be consistent with the recent results of the septic tank effluent sample showing VOC contamination and the reported VOC contamination from past disposal practices which would have been discharged to the leaching field and most likely cause the leaching field soils to become contaminated. A few scenarios that could be used in explaining this finding are:

  - The Arcade's septic tank was pumped out on a regular basis because of failure of the leaching system, and little, if any, of the VOC contamination was discharged to the leaching field.

  - After the dry cleaning establishment vacated the Shopping Arcade building and the heavily contaminated discharges ceased, the concentrations of VOCs previously discharged to the leaching field were either flushed out or volatilized in the shallow soils.

  - The effluent from the leaching field discharged essentially directly on top of the underlying bedrock (reported to be only three to four feet below ground surface) and recharged either directly to bedrock or flowed over the bedrock surface and recharged elsewhere, or at least in part, discharged to the parking area behind the Arcade and Exxon buildings and into the stormwater drainage system leaving no residual contamination in the overlying soils. (This seems to be the most plausible circumstance).

- The soil samples were obtained at locations on the periphery or slightly askew and not downgradient of the leaching field, and that since bedrock is very shallow the effluent from the leaching points discharged essentially directly on top of the underlying bedrock, recharged directly to bedrock without dispersion in the overburden deposits and flowed across the bedrock surface downgradient of the leaching field. Therefore, if the soil samples were not obtained directly in the leaching field or directly downgradient, contamination might not be detected.

o The soil sample taken behind the location of the former dry cleaning establishment contained tetrachloroethene (7.0 ug/kg) and 1,1,1-trichloroethane (1.0 ug/kg).

o The sludge sample obtained from the Exxon gasoline station septic tank contained very high levels of benzene (1,700 ug/kg), toluene (300,000 ug/kg) and xylene (37,000 ug/kg). These levels exceeded the NJDEP cleanup guidance value of 1,000 ug/kg for total volatile organic chemicals in soil. (Concentrations of lead [1,000 mg/kg] were also found at levels that exceeded the NJDEP cleanup guideline value of 100 mg/kg for lead in soils.)

A review of the results of the chemical analyses performed on several of the stormwater drainage system sediment samples suggests that some contamination from the Shopping Arcade and Exxon gasoline station has entered the drainage system along Court Road, and has traveled downgradient via the open drainage ditch and reached the first pond north of Court Road where it has concentrated at the location where the drainage ditch merges with the pond outlet, as well as in the shallow pond sediment near the pond outlet. A summary of the sample results is as follows:

o The sediment sample from the drainage system catch basin on Route 22, directly across from the Shopping Arcade building, contained levels of 1,1,1-trichloroethane (5.0 ug/kg) and 2-butanone (4.0 ug/kg).

o The sediment sample obtained from the drainage system catch basin located at the intersection of Court Road and Route 22 contained concentrations of tetrachloroethene (5.0 ug/kg), 1,1-dichloroethene (7.0 ug/kg), 1,1,1-trichloroethane (5.0 ug/kg), benzene (6.0 ug/kg), toluene (9.0 ug/kg), chlorobenzene (6.0 ug/kg) and 2-butanone (21.0 ug/kg).

- o The sediment sample taken from the open drainage ditch along the north side of Court Road contained only 2-butanone (9.0 ug/kg).

- o The sediment sample obtained where the drainage ditch merges with the pond outlet (north of Court Road) contained tetrachloroethene (5.0 ug/kg), 1,2-dichloroethene (9.0 ug/kg), vinyl chloride (3.0 ug/kg), benzene (3.0 ug/kg), toluene (41.0 ug/kg), xylene (52.0 ug/kg) and 2-butanone (16.0 ug/kg), as well as high concentrations of several polycyclic aromatic hydrocarbons (PAHs) and low levels of two pesticides.

- o The pond sediment sample taken near the outlet of the pond located north of Court Road contained concentrations of 1,1,1-trichloroethane (11.0 ug/kg), benzene (3.0 ug/kg) and 2-butanone (150.0 ug/kg).

- o A shallow sediment sample taken in the pond north of Court Road contained benzene (2.0 ug/kg), however, the deeper sample did not contain contamination.

As mentioned above, the low levels of VOC contamination from the analytes of concern found in the stormwater drainage system catch basins on Route 22 and Court Road is most likely due to contaminated stormwater/surface runoff from areas where these contaminants were disposed of by the former dry cleaner (i.e., soils and asphalt surface behind the dry cleaner), as well as possibly from overflows of contaminated wastewater from the Arcade's sanitary system.

The benzene, toluene and chlorobenzene contamination in the drainage system catch basin located at the intersection of Route 22 and Court Road (directly downgradient of the Exxon gasoline station) is most likely due to contaminated stormwater/surface runoff and fuel spills from the Exxon gas station, as well as possibly from overflows of contaminated wastewater from the Exxon station sanitary system. In addition, generally stormwater runoff from adjacent roadways contains BTX compounds and most likely has contributed to this contamination.

The BTX contamination found in the sediment obtained where the drainage ditch merges with the outlet of the pond north of Court Road and the benzene detected in the pond's sediment may be due to BTX contamination associated with the Exxon station and roadway runoff, however, it could also be attributed to the contamination associated with leakage from the underground fuel tank at the Bedford School.

Other contaminants that were found in sediment samples obtained at different locations in the stormwater drainage system, ditch and pond that appear to be unrelated to the contamination associated with the Shopping Arcade Site, were 2-butanone (methyl ethyl ketone, a common paint solvent) and various polycyclic aromatic hydrocarbons (PAHs). Because 2-butanone has a high vapor pressure, it would be expected to volatilize readily, however, because if its high water solubility, volatilization is probably limited in aquatic systems or wet soil/sediment. This could explain why 2-butanone was found consistently in almost all of the sediment/soil samples obtained from the stormwater drainage system catch basins, drainage ditch and ponds while other more volatile and less water soluble contaminants were not detected. As for PAH compounds, these chemicals are associated with coal tars and their presence in the sediments is most likely attributed to runoff from tar and asphalt applied to the adjacent street surfaces.

A review of the other surface water and surface water sediments sampled from the ponds south of Court Road and at the confluence of the stream discharge to the Mianus River suggests that these locations do not appear to contain contamination that can be attributed to the Shopping Arcade site as well as the Exxon gasoline station contamination. A summary of the sample results is as follows:

- The sediment sample obtained at the entrance to the pond immediately south of Court Road contained levels of 2-butanone (45.0 ug/kg) and the surface water sample also contained 2-butanone (2.9 ug/l).

- The sediment sample taken at the entrance to the pond immediately north of Pound Ridge Road contained concentrations of benzene (2.0 ug/kg) and the surface water sample did not contain contamination.

- The sediment sample obtained at the confluence of the stream discharge to the Mianus River contained levels of 2-butanone (6.0 ug/kg) and high concentrations of PAHs. The surface water sample at this location contained elevated levels of silver (28.0 ug/l). The surface water standard for silver is 50.0 ug/l.

- The sediment sample taken downstream in the Mianus River at Middle Patent Road contained concentrations of 1,2-dichloroethene (2.1 ug/kg) and toluene (11.0 ug/kg). The surface water sample obtained at this location contained only 2-butanone (3.7 ug/l).

The detection of benzene in the sediment sample obtained at the entrance to the pond immediately north of Pound Ridge Road may be due to contamination from a leaking underground fuel storage tank that was located on the Bedford School property or the Exxon gasoline station located upgradient. Contamination from this spill appears to have reached ground water in the vicinity of the school (as shown in the monitoring well data) and if the pond is fed by ground water, this contamination could have reached the pond directly from ground water inflow or from the stream that enters the pond.

The high PAH concentrations that were found in the sediment sample obtained at the confluence of the stream discharge to the Mianus River are most likely due to roadway runoff from asphalt street surfaces and/or unknown source(s) upstream in the study area and/or the Mianus River. The surface water sample taken at this sampling location contained elevated levels of silver. The source of this metal is unknown. Although high concentrations of silver were found in the Shopping Arcade's septic tank effluent sample at levels that exceeded ARARs for effluent discharges, ground water and surface water, it is doubtful that the silver concentration in the river water is due to the Arcade's septic tank effluent since the metal was not detected in any other surface water sediment samples obtained downgradient of the Arcade.

The concentration of toluene detected in the sediment sample obtained from the Mianus River at Middle Patent Road is probably due to roadway runoff or some other unknown source or related to the BTX contamination near the Shopping Arcade Site or the Bedford Resource Center. The detection of 1,2-dichloroethene in the sediment could be associated with remnants of VOC contamination from the Arcade site that happened to deposit and remain in this area, however, this compound is not found in any other sediment or surface water sample in the study area south of Court Road and, therefore, is most likely from an unknown source.

6.8 Evaluation of Contaminant Migration in Ground Water

A review of Figure Nos. 6-1 and 6-2 reveals that three areas of elevated contaminant concentrations have been identified within the ground water in the Shopping Arcade Study Area. The first area of elevated levels of contamination consisting of tetrachloroethene and its breakdown compounds exists in the unconsolidated/overburden deposits at monitoring well MW-3M. As depicted in Figure No. 6-1, this highly contaminated "pocket" of contamination is generally centered around MW-3M where a total averaged (average of Phase IIA and IIB sampling results) concentration of tetrachloroethene and its breakdown products was found to be 213 ug/l. The areal extent of this pocket of contamination has been approximated due to limited data on the depths of private wells in the study area.

The second area of ground water contamination consisting of tetrachloroethene and its degradation compounds is the large primary plume of significantly contaminated ground water in bedrock migrating/extending northeastward from the vicinity of the Shopping Arcade's private water supply well (sample location B4) downgradient to approximately monitoring well MW-6B (see Figure No. 6-2). The total averaged (average of Phase IIA and IIB sampling results) concentrations of tetrachloroethene and its breakdown compounds ranged between a low of 146 ug/l at MW-6B to a high of 746 ug/l at the Shopping Arcade water supply well (sampling location B4). Other high values recorded were 468 ug/l at MW-1B, 284 ug/l at the Exxon gasoline station water supply well and 216 ug/l (as well as 514 ug/l of BTX contamination) in an abandoned water supply well at sample location B9.

As shown in Figure No. 6-2, a portion of the primary plume of highly contaminated ground water in the bedrock has migrated perpendicular to Court Road in a southeasterly direction along the east side of Route 22 near the center of the village. This third area or secondary plume of contamination contained concentrations of tetrachloroethene and its breakdown products that ranged from a total averaged level of 26 ug/l in the private water supply well at sample location B14 (residence at 11 Court Road) on Court Road to 85 ug/l in the private water supply well at sample location B24, the Fire Department building, on the Village Green.

The most likely routes of contamination entry into the subsurface were:

- o Disposal of contaminants by the former dry cleaning establishment and Exxon gas station into sanitary disposal systems and direct discharge of the contaminated wastewater from the sanitary system leaching fields to the thin layer of unconsolidated deposits and/or direct recharge to the bedrock surface.

- o Direct disposal of contaminants by the former dry cleaning establishment to surface soils behind the Arcade building and leaching through the thin layer of unconsolidated deposits to the bedrock surface.

- o Sanitary system leaching field failures and resultant overflows of contaminated wastewater reaching the stormwater drainage system serving the area and distribution contaminated runoff by the drainage system to other portions of the study area.

- o Direct disposal of contaminants by the dry cleaning establishment to the surface, runoff to stormwater drainage system and distribution of contaminated runoff to other portions of the study area.

- o Tank leakage and spills at the Exxon station and the Bedford School.

The most highly contaminated and extensive ground water contamination exists in the bedrock underlying the Arcade property and extending in plumes migrating to the northeast downgradient in the direction of ground water flow (primary plume) and southeasterly across the bedrock surface (secondary plume). As discussed earlier in this section of the report, it appears that there exists significant infiltration of ground water and leaching of the associated contaminants from the overburden zone into the underlying bedrock. Contamination released from the Arcade's sanitary system leaching field and via other routes appears to drop vertically through the very thin layer of unconsolidated deposits and almost directly leaches to the bedrock interface where it begins to disperse and migrate in the direction of ground water flow and across the bedrock surface, rather than in the unconsolidated deposits. The general trend of the contamination migration is in the direction of ground water flow to the northeast and east (primary plume) of the Arcade site. Slight directional variations exist in the contaminant plume migration in bedrock from that of the ground water flow direction. This phenomenon is most likely associated with fracture flow properties of the bedrock and the dip of the bedrock surface as it is impacted by the production wells which supply the businesses and residents in Bedford Village. This is exemplified by the migration pattern of the secondary plume which is moving southeasterly toward the Village Green as it drops down across the dip of the bedrock surface and is drawn toward the many water supply wells south of Court Road and east of Route 22 in the vicinity of the Village Green.

Whichever the scenario, three areas of high levels of ground water contamination have been detected within the Shopping Arcade Study Area. The first pocket of contamination in the unconsolidated deposits is located above and is contributing to a second area or primary plume of highly contaminated ground water in the bedrock which is migrating in the direction of ground water flow in a northeasterly direction. A third area of contamination, the secondary plume, is migrating from the primary plume across the dip in the bedrock surface and is being drawn in a southeasterly direction. Concentrations of tetrachloroethene within the pocket in the overburden deposits and the contaminant plumes in the bedrock exceed the NYSDOH drinking water standard (5.0 ug/l) by more than a multiple of 10 (some locations more than a multiple of 100), and the NYSDEC ambient ground water guidance value (0.7 ug/l) for tetrachloroethene was often exceeded by a factor of greater than 100 (at one point greater than 300). In addition, concentrations of trichloroethene and trans-1,2-dichloroethene also exceeded the water supply standard of 5.0 ug/l and the ground water guideline of 10 ug/l for trichloroethene and 50 ug/l for trans-1,2-dichloroethene.

In a review of the historical and present chemical analytical data obtained from both monitoring wells and private water supply wells, it appears that in general the ground water contamination concentrations in the Shopping Arcade Study Area have slightly declined, most likely due to the cessation of waste discharges and periodic clean out/pump out of the Arcade's sanitary system. However, more recent analytical results indicate that some private water supply wells (especially at the Arcade and Exxon station) showed increases in some contaminants which could be possibly due to added flushing of the contaminated overburden deposits and leaching of contaminants to the bedrock wells. In general, contamination in the ground water is relatively steady state and will be slowly, over time, decreasing in concentration due to dilution, adsorption, migration, biological decay, etc.

The plumes of contamination that presently exist in the area of the Shopping Arcade Site, with time, will also migrate downgradient through the study area towards the Mianus River.

Although it is anticipated that with natural attenuation, ground water will improve in the long term, it is expected that levels of ground water contamination in the study area, in particular in the immediate vicinity and downgradient of the Arcade, will remain above ambient ground water and drinking water guidance values and standards for sometime.

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