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Subsurface Investigations
A Division of The Envirovision Group, Inc.

VOLUME I
REMEDIAL INVESTIGATION REPORT
SWIVELIER COMPANY, INC.
33 ROUTE 304
NANUET, NEW YORK
NYSDEC SITE CODE #344036

Prepared For

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Phase I Report

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EXECUTIVE SUMMARY

The Swivelier Company Inc. (Swivelier) is suspected by the New York State Department of Environmental Conservation (NYSDEC) as the source for Tetrachloroethene (PCE) and Trichloroethene (TCE) detected in the regional groundwater approximately 1/4 mile south-southwest (hydraulically downgradient) of their Property. Swivelier is the suspected source based on a previous reported discharge of TCE to a tributary stream which flows along the western Property boundary and the detection of trace concentrations of TCE in two (2) on-site groundwater monitoring wells. The remedial investigation presented in this report summarizes our review of available federal, state, county and local files; a review of geologic, hydrogeologic and topographic drainage features; a review of historical aerial photographs; and a review of relevant published technical papers. The information presented in this report is designed to add support to Swivelier's contention that they are not the source of TCE to regional groundwater and therefore, it is their request that their Property be delisted as a Class #2A Inactive Hazardous Waste Site. The conclusions presented in this report are based on the review of relevant information and have not been confirmed with soil, sediment or groundwater sampling on the Property.

Discharges of dissolved phase TCE by Swivelier have been documented into the stream through a discharge pipe which handled process wash/cooling waters from the

facility. According to Swivelier, inadvertent leakage of TCE from the degreasing equipment within the facility mixed with the process wash/cooling waters resulting in the discharge of dissolved phase TCE to the stream and sediment.

Conceptually, a surface spill of diluted TCE on the stream would be affected immediately by several factors thus causing the bulk of released TCE to be lost. These active factors are: dilution, dispersion and spreading with stream current, evaporation, photo-oxidation, sinking of the dense molecules down the water column, dissolution, sorption to suspended sediments which are transported downstream, adsorption to fine grain sediments in the stream bottom, biodegradation of molecules in the sediment and possible leaching to glacial sediments below. These "environmental fate" factors are directly related to the physical and chemical properties of TCE. TCE is denser than water, relatively insoluble in water and has a high vapor pressure.

Sediment sampling conducted by the RCHD within the stream conducted in 1980 documented the presence of TCE in concentrations in excess of NYSDEC Maximum Contaminant Levels (MCL's). Dredging of the stream by the New York State Department of Transportation on two (2) occasions has effectively lowered the base of the stream by 2 to 3 feet since the original detection of TCE. Based on available information, no dredging of the stream occurred prior to the 1980 sampling. Therefore, it can be assumed that the concentrations reported in the stream are "worst case" values. The maximum concentrations of TCE reported in the stream sediments exceed the reported concentration of TCE in the regional groundwater. However, when considering the extremely low solubility of TCE in water (<0.1%), the maximum concentration reported in groundwater far exceeds the potential leachable concentrations capable from the reported concentrations in the sediment. Also, when

When?

considering the nature of TCE, a Dense Non-Aqueous Phase Liquid (DNAPL), migrating vertically downward through an aquifer, several hydrogeologic factors must be considered; such as:

1. the nature, heterogeneity and characteristics of the local and regional lithologic and geologic units;
2. the degree and frequency of fractures within the bedrock units;
3. the direction of strike and dip of the regional bedrock units; the depth to bedrock;
4. the absence or presence of a confining layer(s);
5. the degree of interaction between the upper unconfined aquifer and the multi-unit leaky bedrock aquifer, and disparity of hydraulic conductivities throughout the water column;
6. the depth, location and assumed withdrawal rates of the regional potable wells; and
7. the effects of attenuation processes on the migration of the TCE plume, primarily, dispersion, volatization and adsorption to organic sediment; this is an interaction of physical and chemical properties of the organic compound and the hydrogeologic regime.

Based on these factors, it does not appear that the TCE discharged to the stream by Swivelier is the likely source of the concentrations reported in the regional downgradient potable wells. The conclusions presented in this report are based on our interpretations of available files; on-site and regional historical environmental soil, sediment and groundwater sampling; published information and technical papers, and do not reflect confirmation through additional on-site sampling of soil, sediment and groundwater.

1.0 INTRODUCTION

At the request of Mr. Michael Schwartz of Swivelier, Subsurface Investigations (SI), the environmental consulting and engineering division of The Envirovision Group, Inc. (EGI), obtained and reviewed available files from various regulatory agencies concerning the Swivelier "Property" located at 33 Route 304, in the Village of Nanuet, Town of Clarkstown, Rockland County, New York. The investigation included: a review of federal, state, county and local government files for the Property and adjoining properties; on-site physical examinations of the Property, building and facility operations conducted on the Property; results of previous available on-site and off-site environmental sampling; a review of relevant technical publications and literature; a review of historical aerial photographs; and a review of available local and regional topographic, geologic and hydrogeological features and published information.

The investigation was conducted in response to the NYSDEC listing and identifying the Property as a ~~suspected Class #2A~~ Class 2 Inactive Hazardous Waste Disposal Site (Site Code 344036). A copy of the April 1, 1992 NYSDEC listing is provided in Appendix A. The NYSDEC listing of the Property was based on a reported December, 1979 discharge of Trichloroethene (TCE) from the Swivelier facility into a tributary of the Nauraushaun Brook, which flows in a southerly direction along the western Property boundary, and the detection of TCE and other compounds in potable wells approximately 1/4 mile to the south-southwest (hydraulically downgradient) of the Property.

The purpose of the investigation was to examine all historical environmental data, past and present facility operations, and potential pathways of contaminant

migration to determine if the Property is the source of TCE detected in the regional groundwater downgradient of the Property. It is the intent of this report not to identify other potential sources of the TCE, but to examine and provide sufficient documentation to evaluate the Property as a potential source through the objectives and methodologies specified in Sections 1.1 and 1.2 of this report, and provide the NYSDEC with supporting documentation for the purpose of requesting delisting of the Property as a ~~suspected~~ Class ~~#2A~~ 2 Inactive Hazardous Waste Disposal Site. Based on our findings from available information, it is SI's opinion that it does not appear likely that the discharge of TCE to the stream could provide sufficient quantities of dissolved phase product to be attributable to the concentrations reported in the potable wells downgradient of Swivelier.

1.1 OBJECTIVES

The primary objectives of this Remedial Investigation Report were to:

a. Examine all available information concerning the detection of TCE and other compounds in potable wells downgradient of the Property as well as their physical and chemical characteristics.

b. Examine present and past on-site usage of TCE and the available information concerning the discharge event.

c. Examine potential off-site sources of TCE as they relate to the Property and the downgradient potable wells.

d. Examine available lithologic, geologic and hydrogeologic information, potential contaminant migration pathways posed by these conditions, and published scientific papers concerning the degradation and interaction of the compounds detected versus the depositional environment.

1.2 AUDIT METHODOLOGY

1.2.1 HISTORICAL REVIEW

SI's historical review of the current and past operations conducted at the Property included the following:

a. Interviews with available current and past owners, tenants, employees, and neighbors to verify where possible, current or past operations on-site which resulted in the storage, generation, and/or discharge of hazardous materials and/or wastes.

b. Interviews with available municipal, county and state officials regarding the Property's current and past activities and land usage, particularly pertaining to the storage and/or handling of hazardous materials and/or wastes.

c. Review of records, maps, correspondence with regulatory agencies, and documentation relating to environmental permitting and compliance with current regulations.

d. Review of all available historical on-site and off-site environmental sampling and other relevant information.

e. SI's historical evaluation also included a review of an informal title/deed search of the Property which was provided by Swivelier.

1.2.2 REGULATORY REVIEW

SI personnel contacted federal, state and local regulatory agencies to identify potential environmental issues that may concern the Property and its surrounding

properties. This regulatory review included, the Environmental Protection Agency's (EPA) National Priority List (NPL), the Facility Index System (FINDS), the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), the most recent Resource Conservation and Recovery Act (RCRA) Information System (RCRIS), the New York State Inactive Hazardous Waste Disposal Site List, the Emergency Response Notification System (ERNS), Hazardous Materials Incident Reporting System (HMIRS), the NYSDEC Petroleum Bulk Storage Data Base and the Leaking Underground Storage Tank list. This review also included the Village of Nanuet, Rockland County Planning Board (RCPB), Rockland County Soil and Water Conservation District (RCSWCD), Rockland County Health Department (RCHD), the NYSDEC and EPA, which may have files pertaining to the Property and its surrounding properties.

1.2.3 ON-SITE INSPECTIONS

During the period of June, 1992 through April, 1993 visual on-site inspections of the Property and its surrounding properties were conducted by SI personnel, with particular attention given to the use and storage of hazardous materials in structures and/or facility operations. Also noted were the location of streams, groundwater wells and drainage basins, which are potential paths of environmental impact, as well as physical signs of potential contamination (i.e. stressed vegetation, surface stainage, and noxious odors). In addition, the past or present existence of underground storage tanks (USTs), aboveground storage tanks (ASTs), and the past or present existence of floor drains and floor drain piping, leachfields and/or drywells which may act as direct groundwater injection sources.

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2.0 SITE DESCRIPTION AND BACKGROUND

2.1 LOCATION

The subject Property is located at 33 Route 304 in the Village of Nanuet, Clarkstown Township, Rockland County, New York. The Property is also designated as Section 33, Block B, Lot 18 (Figure 1).

The Property's zoning classifications are Light Industrial Office (LIO) and Family Recreational for small retail/light manufacturing. A general site plan is provided as Figure 2.

2.2 HISTORY

Records obtained from the tax assessor's office and an informal title/deed search disclosed past ownership as follows:

DATE	OWNER	USE
Prior to July, 1956	Unknown	Vacant Land
July, 1956	Robert and John Maier	Leased to Swivelier
February, 1957	Shabran Realty, Inc.	Same
November, 1959	Orvin Realty Corp.	Same
May, 1965	Salley Nadel	Same
Unknown	Narbar Associates	Same
April, 1989	Nathan R. Schwartz	Same

Copies of the tax assessor's records are provided in Appendix B. A copy of the title/deed search is provided in Appendix C.

2.3 BUILDING AND FACILITY OPERATIONS

The existing structure is a one story masonry and metal frame building serving as offices, warehouse and manufacturing totalling approximately 122,000 square feet of space situated on approximately 9.94 acres of land (Figure 2). The existing building does not have a basement.

The facility is presently occupied by and utilized for the following:

	TENANT	USAGE
1.	Swivelier	Manufacturing, assembly and distribution of lighting fixtures
2.	Academy Auto Parts	Auto parts sales and distribution
3.	Funtime Billiards & Video	Family recreational
4.	Joey's Childrens Wear	Retail, office & warehouse
5.	Kurland Limousine	Office
6.	Coupe Dance Studio	Storage

The original facility was constructed in 1956 by Swivelier, reportedly on vacant land and measured approximately 60,000 square feet. According to Swivelier, in 1970 an additional 62,000 square feet of space was constructed. Swivelier utilizes the facility for the assembly, manufacture, warehousing and distribution of lighting fixtures. Operations at the facility consist of the assembly of prefabricated and fabricated lighting components. Prefabricated components are delivered to the facility and assembled for sale and distribution. On-site fabrication of components includes drilling, welding, tapping and milling prior to assembly. According to Swivelier, TCE was historically stored on-site in a 500 gallon AST which was located in the southeast

corner of the building. The AST was owned and maintained by Guard All Chemical Company, Inc. (Guard All) of South Norwalk, Connecticut who also supplied the TCE. Following fabrication, components were degreased with TCE to remove residual oils. The degreasing process included placing fabricated components on a conveyor which passed through a degreasing machine which sprayed TCE onto each component. TCE not used at this point was recycled through aboveground piping. All supply and return lines from the TCE AST to the degreasing machine were located aboveground. The degreased components were then passed through the oven portion of the degreasing machine, which evaporated the liquid phase TCE. A letter from Swivelier detailing the operation is provided in Appendix D. According to Swivelier, TCE has not been used at their facility since 1980 and all TCE historically used was recovered and reused. However, evaporation of TCE did occur during the degreasing process and could account for substantial TCE loss. In March, 1993, SI contacted Guard All and according to Mr. Jerry Hayes, President of Guard All, they maintain records for a period of only eight (8) years and, therefore, can provide no relevant information concerning quantities of TCE used onsite. A letter from Swivelier testifying to the use and inadvertent spillage of TCE is provided in Appendix E. Disposal documentation for the 500 gallon AST and the TCE are provided in Appendix F. The AST apparently was picked up by Guard-All on February 12, 1980. Details of the December, 1979 wastewater discharge event are provided in Sections 2.5 and 3.1.2 of this report. The duration of the spill event and total volume of product discharged to the stream are unknown.

The entire site has been serviced by public water and electric since construction in 1956. According to drawings obtained and discussions with Swivelier, from 1956 to

1958 all sanitary discharges from the facility were to an on-site septic leachfield (Figure 2 and 3). A copy of the discharge permit for the operation of the leachfield is provided in Appendix G. According to Swivelier, the facility was connected to the municipal sewer system and reportedly all discharges to the leachfield ceased in 1958. However, according to available drawings, all non-contact process wash and cooling waters since construction of the building were piped to the stream to prevent over utilization of the leachfield system. According to Swivelier, the process wash/cooling waters never discharged to the leachfield system. The floor drain system was also connected to this pipe and incidental spillage of TCE onto the facility floor could have migrated into the floor drains, mixed with the process wash waters and resulted in the discharge of dissolved phase TCE to the stream. Presently, sanitary/industrial discharges from the facility are regulated and permitted by the local sewerage district. According to available records, no violations of discharge permitting requirements have been reported.

The facility is presently heated by natural gas. However, prior to 1987 the facility was heated by fuel oil which was stored in (2) 7500 gallon USTs which were removed in 1987 by Tank Tech (TT), EGI's environmental contracting division. Details concerning the removal are discussed in Section 2.4 of this report.

2.4 UNDERGROUND AND ABOVEGROUND STORAGE TANKS

SI has obtained historical documentation and drawings relating to the operational history of the Property. Based on our review of the documentation and drawings, four (4) USTs and three (3) ASTs were located and utilized on the Property. The location of each UST/AST is shown on Figure 2. A copy of the UST registration is provided in Appendix H. The USTs/ASTs were as follows:

UST/AST NO:	CAPACITY(gals)	CONTENTS	TYPE	DATE REMOVED
1	4,000	Diesel	UST	1987
2	1,500	Xylol	UST	1986
3	7,500	Fuel Oil	UST	1987
4	7,500	Fuel Oil	UST	1987
5	500	Xylol	AST	Unknown
6	500	Xylol	AST	Unknown
7	500	TCE	AST	1980

According to available information, subsurface soil sampling was conducted following the removal of USTs #1 and #2 to ascertain baseline soil quality information. The results of soil sampling are discussed further in Section 3.1.1 of this report. Based on field observations and the results of soil sampling, reports of discharges were made to the NYSDEC and the spills were assigned numbers 8707447 and 8604893, respectively. According to available records, at the direction of the RCHD, no subsurface soil sampling was conducted following the removal of USTs #3 and #4. A summary of the UST removal activities are as follows:

2.4.1 UNDERGROUND STORAGE TANK #1

The UST was located at the northwest corner of the Property, 4,000 gallons in capacity and reportedly stored diesel fuel for on-site vehicle fueling. The UST was removed in November, 1987 by TT. According to TT, Mr. Bob Paterson of the RCHD was on-site during the removal. Following removal, a release from the UST

was observed and reported to the NYSDEC (Spill #8707447). Four (4) post-excavation (#1S, #2S, #3S and #5S) were obtained and delivered to EnviroTest Laboratories, Inc. for fingerprinting analysis by New York State Department Of Health Method 310.13.

The results of analysis are discussed in Section 3.1.1 of this report. The results showed the presence of gasoline and diesel fuel (No. 2 fuel oil) compounds in three of four samples.

2.4.2 UNDERGROUND STORAGE TANK #2

The UST was located near the northeast building corner, 1,500 gallons in capacity and reportedly stored xylol (another term for a mixture of xylene isomers). The xylol was used on-site as a paint thinner for finishing components. The UST was removed in August, 1986 by E.C. Mechanical Contractors (E.C.M.) of West Milford, New Jersey under the supervision and direction of Lawler, Matusky & Skelly (LMS) Engineers of Pearl River, New York. According to LMS, personnel from the RCHD were on-site during the removal. Following removal, a release from the UST was observed and reported to the NYSDEC (Spill #8604893). Two (2) post-excavation soil samples were obtained and delivered to Laboratory Resources, Inc. of Westwood, New Jersey for total xylol analysis.

The results of analysis are discussed in Section 3.1.1 of this report. The results showed low level concentrations of xylol in both samples.

2.4.3 UNDERGROUND STORAGE TANKS #3 and #4

The USTs were located near the southeast building corner, both were 7,500 gallons in capacity and reportedly stored No. 6 fuel oil. The USTs were removed in

November, 1987 by TT. Reportedly, Mr. Paterson of the RCHD was on-site during the removal. Following removal, no releases were observed and no post-excavation soil samples were requested by the RCHD.

2.4.4 GROUNDWATER INVESTIGATION

In response to the reported discharges from USTs 1 and 2, groundwater investigations were initiated and included the installation and sampling of five (5) groundwater monitoring wells (MW1N through MW3N, MW1SE and MW2SW). Wells MW1SE and MW2SW were installed and sampled under the supervision of LMS in response to spill number 8604893. Wells MW1N through MW3N were installed under the supervision of personnel from TT in response to spill number 8707447. Copies of the available boring logs for the wells are provided in Appendix I. Sampling of wells MW2N and MW3N currently continues on a quarterly basis under the supervision of SI. In response to low concentrations detected in wells MW1N, MW1SE and MW2SW, termination of sampling was requested and approved by Mr. Joseph McCarthy of the NYSDEC in a letter dated June 5, 1991 (Appendix N). The location of each well is shown on Figure 2. The results of historical groundwater sampling for all wells are discussed in Section 3.1.3 of this report. All wells remain intact and operable.

listed as MW-1 and MW-2

2.5 WASTEWATER DISCHARGES

As previously stated, prior to connection to the municipal sanitary sewer system in 1958 all sanitary discharges from the facility were to an on-site septic leachfield. The approximate location of the leachfield is shown on Figure 2. Discharges to the

leachfield occurred between 1956 and 1958. Based on available drawings provided by Swivelier, SI has prepared a cross-sectional view of the leachfield (Figure 3). According to Swivelier, no industrial wastewater discharges were made to the on-site leachfield. Located within the facility are a series of floor drains which were connected to the municipal sanitary sewer system in 1958 when the sewer lines were installed. However, according to available drawings and interviews with Swivelier, effluent from the floor drains at one point discharged to the creek which flows along the western Property boundary. In December, 1979 and January, 1980, in response to a complaint of odors in the stream, the RCHD investigated the facility and obtained effluent samples from the discharge pipe and sediment samples adjacent to the discharge pipe. The results of analysis showed high concentrations of TCE in the discharge effluent and in the sediment directly below the pipe. Concentrations of TCE in the sediment decreased with distance from the pipe. The results of analysis are discussed in greater detail in Section 3.1.2 of this report. As previously stated, according to Swivelier, TCE leakage or spills onto the facility floors migrated into the floor drains and came in contact with cooling/process waters, dissolved into solution and discharged to the creek (Appendix E). The quantity of dissolved phase TCE discharged to the stream and duration of the release are unknown.

According to documentation in Swivelier's files, the discharge pipe to the creek was crushed and sealed in January, 1980 under the observation of the RCHD and since then no discharges to the stream have occurred. Based on the results of effluent and sediment sampling, the presence of TCE in the stream sediment and past on-site usage, the NYSDEC suspects the Swivelier Property as the source of TCE in the potable wells downgradient of the Property.

Based on available information and interviews with Swivelier, the stream along the western boundary has been dredged several times by the New York State Department of Transportation (NYSDOT) since TCE was first detected. Reportedly, the stream is located within a NYSDOT easement and has been dredged once or twice, resulting in the lowering of the stream a minimum of two (2) to three (3) feet since the TCE discharge event occurred. The dredging was conducted to ease surface water drainage in the area. SI contacted the NYSDOT concerning the dates in which the stream was dredged. At the time of writing of this report, there are no records available from the NYSDOT.

2.6 SURROUNDING PROPERTIES

The Property is bordered to the north by Demarest Mill Road and commercial properties beyond consisting of New York Telephone, County Tile, Ramapo Sheet Metal, Rockland Bakery, County Transmission, Bouton Business Machines and Jitter Gasoline Station; to the east by Route 304, auto dealerships and a gasoline station/auto repair center; to the south by West Nyack Road, a gasoline station, autobody repair center and residential properties beyond; and to the west by Teplitz Scrap Metal (junk yard). Also, along the western Property boundary is a tributary to the Nauraushaun Brook which flows north to south. The surrounding properties are shown on Figure 4. Based on visual inspections during on-site visits of the Property and adjacent properties, no signs of stressed vegetation and no sheens were observed in the stream to suggest that Swivelier is the source of the TCE. This was also confirmed by SI in a review of historical aerial photographs for the years 1965, 1969, 1980, 1984 and 1987. During our review of the aerial photographs at the RCPB and RCSWCD offices, no apparent signs of stressed vegetation were observed.

2.7 LITHOLOGIC CONDITIONS

Based on New York State publication, the subsurface conditions beneath the area of investigation consists of unconsolidated deposits of Pleistocene glacial till and stream deposits overlying the regional bedrock. The glacial till consists primarily of accumulations of poorly sorted sands and gravel. Well logs prepared by LMS during the installation of wells MW1SE and MW2SW confirm the published information with the exception of a clay layer observed by LMS at a depth of approximately 9 feet below the surface followed by a sand and silt layer below (Appendix I).

According to the Rockland County Soil Survey (Figure 5), the subsurface conditions are described as Urban Land (Ux), which consists of fill materials overlying the natural deposits identified as the Wethersfield Gravelly Silty Loam (WeB). The Wethersfield Loam is described as a silty, clayey sand with varying amounts of gravel which exhibit "slow percolation rates". Although, not depicted on the LMS boring logs, it is SI's belief that fill materials, as shown in the Rockland County Soil Survey exist to thicknesses up to 5 feet beneath the site.

2.8 GEOLOGIC CONDITIONS

According to published information, the geologic bedrock unit beneath the site is identified as the Brunswick (Passaic) Formation of the Newark Group. The formation consists of an alternating sequence of sandstones, shales and conglomerates. The predominant lithofacies in the vicinity of the site consists of red brown gravely sandstone and conglomerate. The thickness of the Brunswick Formation are reportedly up to 10,000 feet. Locally, the degree of fracturing and faulting within this unit are

not defined. The age of the formation is Upper Triassic of the Mesozoic Era (approximately 210 to 225 million years old). The depth to bedrock (Figure 6) in the area of Swivelier is believed to range between 20 to 30 feet below the surface. The depth to bedrock was developed through a compilation of boring and well logs located throughout Rockland County and presented in the "Geology and Groundwater Resources of Rockland County, New York (Bulletin GW-42)" prepared for the U.S. Geological Survey and dated 1959[1]. A copy of the available boring logs are provided in Appendix J.

figure showing strikes + dips

A summary of potable wells located in the vicinity of Swivelier is presented in Table 1. The location and designation of each well is shown on Figure 7. According to the well logs in closest proximity to Swivelier, an alternating sequence of sandstone and shale is predominant in the area. In areas in which sandstone is the predominant upper bedrock unit a sand and gravel hardpan overlies the bedrock and in areas in which shale is the predominant upper bedrock unit a clay layer exists above the bedrock. The wells in closest proximity to Swivelier in which logs are available (Ro234, Ro235, Ro243, Ro289 and Ro290) show sandstone with hardpan cover to be predominant.

should be Fig. 9

According to published information the Brunswick Formation strikes between 2 and 5 degrees on a northeast-southwest trend and dips between 5 and 20 degrees to the northwest. Approximations of the regional strikes and dips for the area of Swivelier are presented on Figure 8 and shows a predominant northeast-southwest strike. These approximations were confirmed (Figure 9) in the GW-42 Bulletin which shows a northeast-southwest strike trend and dips of 10 to 12 degrees to the northwest.

5-20

The topography of the site is relatively flat. However, it appears that portions of the site have been cut and graded to allow development (Figure 5). Regional

topography slopes to the south-southwest. Surface drainage from the Property enters into the storm drain system, percolates into the underlying soils through vegetated areas and flows into the adjacent stream. As previously pointed out, according to the Rockland County Soil Survey percolation rates in the Wetherfield Loam are slow. Flow in the stream is variable, from slow to moderate flows during heavy storm water runoff periods. Flooding was a common occurrence prior to dredging by the NYSDOT.

2.9 HYDROGEOLOGIC CONDITIONS

Based on preliminary observations and published information (Appendix K), groundwater occurrence can best be described as a two (2) aquifer or zone system. The degree of interaction between the two aquifers or zones is unknown without the performance of aquifer testing. For the purposes of this report, an aquifer is defined as "a formation, group of formations or part of a formation that contains sufficient saturated permeable material to yield economical quantities of water to wells and springs."[1] An aquitard is defined as "a saturated, but poorly permeable bed, formation or group of formations that does not yield water freely to a well or spring, however, may transmit appreciable water to or from adjacent aquifers."[2]

The shallow aquifer beneath the site could be characterized as an unconfined aquifer comprised of unconsolidated glacially deposited sediments. Groundwater flow directions in the shallow aquifer are influenced by naturally occurring forces (i.e., gravity and depositional environments) as well as induced forces (i.e., pumping). The deep aquifer beneath the site is characterized as a "gently dipping, multi-unit, leaky aquifer system that consists of thin water-bearing units and thick intervening aquitards.

The water-bearing units are associated with major bedding partings and/or intensely fractured seams. Layered heterogeneity of such a dipping multi-unit aquifer system produces an anisotropic flow pattern with preferential flow along the strike of the beds."[3] Therefore, groundwater occurrence and contaminant migration should be influenced primarily by the fractures in the unit and secondarily by bedding planes, as well as pumping. "Differences in permeabilities between the layers resulting either from variation in fracturing, weathering, or a combination of both are believed to account for the presence of many water-bearing units and for substantial head differences."[3] As previously stated, the bedding planes strike in a northeasterly-southwesterly direction and "Systematic fractures both near vertical joints and partings along the bedding, are generally believed to provide the principle passages"[3] for vertical groundwater flow.

The on-site monitoring wells were installed to monitor the shallow aquifer. The aquifer that the regional potable wells pump from is the deep bedrock aquifer. According to Ms. Judy Corchack of the RCHD, the regional pumping wells range in depth from 150 to 200 feet in depth and pump from the bedrock aquifer. Water occurrence in the bedrock (Appendix K) is described as a sequence of aquifer/aquitards in which the mudstones/sandstones act as the aquitard and the shales as water-bearing zones. As previously stated, the Brunswick (Passaic) Formation consists of multiple repetitions of this cyclical sequence. Groundwater withdrawals from the Brunswick Formation could range "from a few to several hundred gallons per minute (gpm)."[3]

The depth to shallow groundwater beneath the site ranges from 5 to 8 feet below the surface. Groundwater measurements obtained from the on-site wells are summarized on Table 2 and a representative groundwater contour map of the shallow

aquifer is provided as Figure 10. Based on field measurements, shallow groundwater flow beneath the site is to the south-southwest with localized discharge at the unnamed tributary of the Nauraushaun Brook. The predominant regional flow paths are shown on Figure 10 and reveal that L.A. Woman is located in an area which appears to have been a filled in swampy area. The drainage patterns also suggest the L.A. Woman site to be a regional low point.

The unnamed tributary stream which runs adjacent to the Swivelier Property flows in a southerly direction (Figure 2). To allow for development to the south, the path of the stream was diverted along the perimeter boundaries of those properties and the former pathway filled. The general flow path of the stream follows the natural direction of flow with a few exceptions. The regional groundwater flow in the unconfined aquifer is to the southwest towards the effected potable wells. However, the area in which the affected wells are located appears to be a junction point for several stream tributaries as well as a centralized regional drainage point.

2.10 REGIONAL WELLS AND GROUNDWATER USAGE

In addition to those wells identified in the GW-42 Bulletin (Figure 7), the RCHD maintains a list of active and inactive potable wells in the region. According to Ms. Judy Hunderfund, potable wells are located on the following sites:

	Owner	Location	Status
1)	Rockland Bakery	Demarest Mill Road	Active
2)	Gas Station	#144 W. Nyack Road	Active
3)	Brown residence	Demarest Mill Road	Active
4)	Chrysler House	Route 304	Active

5)	Mr. Arcade	Route 59 East	Inactive
6)	L.A. Woman (Former Kabuto House)	Route 59 East	Inactive
7)	Sterling Optical	Route 59 East	Inactive
8)	Culinary Deli	Route 59 East	Inactive

The location of each well is presented on Figure 14. According to Ms. Corchack the wells range in depth from 150 to 200 feet and tap the Brunswick (Passaic) Formation. Groundwater withdrawals from these wells is expected to be low, on the order of 2-3 gallons per minute (gpm), with the exception of the Rockland Bakery well. In a discussion with Mr. Salvador Battaglia, the owner of Rockland Bakery, water withdrawals at the facility are on the order of 5-10 gpm. However, usage is periodic at all of these well locations and therefore, withdrawals are expected at best to be between 1/4 and 1/2 or less of the potential yields. Withdrawals of this type are minor and their respective zones of influence would not appreciably impact groundwater movement in the deep aquifer. The results of chemical testing on these wells is presented in Section 3.1.3 of this report.

3.0 SUMMARY OF FINDINGS

3.1 HISTORICAL ENVIRONMENTAL SAMPLING

3.1.1 SOIL

Following the removal of USTs #1 and #2, the RCHD directed the collection of post-excavation soil samples. The RCHD did not require the collection of post-excavation soil samples following the removal of USTs #3 and #4. A summary of soil sampling for each UST excavation is as follows:

3.1.1.1 UNDERGROUND STORAGE TANK #1

(Diesel)

The results of sampling are presented in Table 3 and summarized on Figure 13. The laboratory data sheets are provided in Appendix L. The results of the fingerprinting analysis showed the presence of gasoline related compounds in sample Nos. 1S, 3S and 5S. The results also showed the presence of No. 2 fuel oil (diesel fuel) at concentrations of 1,500 parts per million (ppm) and 10.5 ppm in samples #3S and #5S, respectively. TCE analysis was not requested on these samples.

3.1.1.2 UNDERGROUND STORAGE TANK #2

(Xylol)

The results of sampling are presented in Table 4 and summarized on Figure 13. The laboratory data sheets are provided in Appendix M. The results of the xylol analysis show reported concentrations of 0.07 ppm and 0.027 ppm, respectively. TCE analysis was not requested on these samples.

3.1.2 SEDIMENT/SURFACE WATER

Following the discovery of TCE discharging to the stream, the RCHD obtained seven (7) sediment samples and two (2) surface water samples from various sampling points along the stream. The samples were obtained during the months of December, 1979, January and February, 1980 and analyzed for volatile organic compounds (VOCs) by EPA Method 8020. The results of analysis are presented in Table 5 and summarized on Figure 14. The laboratory data sheets and RCHD summary reports are provided in Appendix N.

The first two (2) sediment samples were obtained on December 11, 1979 in the stream adjacent to the Property. The samples were obtained immediately below the discharge pipe and at the point where the stream flows beneath West Nyack Road. The results revealed total VOC concentrations of 14,425 parts per billion (ppb) and 8,962 ppb in the sediment samples, respectively. Of the total concentrations reported, 14,300 ppb and 8,800 ppb, respectively, were identified as TCE and 115 ppb and 140 ppb, respectively were identified as Tetrachlorethane (PCE). In evaluating this data, there is a 40% overall decrease in concentration from the discharge pipe to edge of the Property (approximately 310 feet).

Between January 9 and February 5, 1980, the RCHD obtained four (4) additional sediment samples from the stream and Nauraushaun Brook. The reported locations and sampling dates of each sample are as follows:

DATE	LOCATION
January 9, 1980	North side of West Nyack Road
January 9, 1980	In Brook North of former Kabuto House (now L.A. Women)

DATE	LOCATION
January 9, 1980	In Brook 35 feet North of culvert & 100 feet West of former Kabuto House (now L.A. Women)
February 5, 1980	50 feet North of West Nyack Road

The results show high concentrations of total VOCs in the two (2) samples north of West Nyack Road (18,175 ppb and 22,900 ppb, respectively). The results reveal significantly lower concentrations of total VOCs (205 ppb and 34 ppb, respectively) in the samples obtained near the former Kabuto House (now L.A. Women). TCE was detected in all four (4) samples at concentrations of 18,000 ppb, 4200 ppb, 205 ppb and 34 ppb, respectively. PCE was detected in only one sample at a concentration of 100 ppb. In reviewing the results there is a 99% decrease in total VOC and TCE concentrations in sediment between the edge of the Property and the former Kabuto House (a distance of approximately 1/4 mile). This decrease is probably the result of volatization and/or dilution. A fifth sediment sample was also obtained from another upgradient tributary stream, however, the reported sample location indicates the sample is not relevant to this case.

The discharge of TCE to the stream reportedly occurred as the result of incidental spillage or leakage from process wash equipment entering into the floor drain system. Piping diagrams obtained from Swivelier confirm that the floor drains and process wash water discharged to the stream. According to Swivelier, in 1956 when the facility was constructed, in order to prevent over utilization of the leachfield system, piping was installed directly to the stream to discharge the cooling/process waters (Figure 2). However, TCE cross-contamination occurred and was detected in the effluent waters and sediments.

Where were samples taken?

Samples of discharge effluent collected by the RCHD in January 1980 showed concentrations of TCE at 3200 ppb and 1600 ppb, respectively. Samples of surface water upstream (off W. Nyack Road) and downstream (south of Route 59) of Swivelier showed total VOC concentrations of 22.0 ppb and 18 ppb, respectively. The results of analysis are presented in Table 6 and the laboratory data sheets are provided in Appendix O. Two surface water samples were obtained on 4/4/91 also. TCE and cis 1,2-dichloroethene were not detected in the upstream surface water sample, but of the total reported concentration downstream of Swivelier (18 ppb), 2.8 ppb and 4.7 ppb were identified as TCE and cis 1,2-dichloroethene, respectively. The only compounds reported in both the upstream and downstream samples were methyl tertiary butyl ether (MTBE) and methyl isobutyl ketone (MIBK), which were reported as ND in all on-site samplings of the existing monitoring wells.

3.1.3 GROUNDWATER

As previously stated, five (5) groundwater monitoring wells were installed on-site in response to reported releases from a 4,000 gallon diesel fuel UST (UST #1) and a 1,500 gallon xylol UST (UST #2). Wells MW1N, MW2N and MW3N were installed in response to the removal of UST #1 (diesel) and wells MW1SE and MW2SW were installed in the area of UST #2 (xylol).

Wells MW1SE and MW2SW were monitored and sampled quarterly from August, 1987 through May, 1991 when approval was granted from the NYSDEC for terminating the monitoring program. The groundwater samples obtained were analyzed for VOCs using EPA Methods 503 and 602. Wells MW1N through MW3N have been monitored on a quarterly basis since September, 1988. Monthly monitoring and

quarterly sampling of wells MW2N and MW3N continue. However, the NYSDEC no longer requires sampling of well MW1N due to low detected concentrations. Analytical parameters for samples obtained include benzene, toluene, ethylbenzene and xylols (BTEX) by EPA Method 503 and 602. The results of analysis are presented in Table 7 and summarized on Figure 13. The laboratory data sheets for each sampling round are provided in Appendix P.

The results of on-site well sampling are as follows:

to close to tank to be considered bkgd.

3.1.3.1 WELL MW1SE

Well MW1SE was installed as an upgradient background quality well for UST #2. Total VOC concentrations ranged from 28 ppb to 41.3 ppb of which the main compound identified during each sampling round was TCE at concentrations between 28 ppb and 37 ppb. These results suggest an upgradient source of TCE.

3.1.3.2 WELL MW2SW

Well MW2SW was installed as a downgradient well for UST #2. Total VOCs concentrations were reported as non-detectable (ND) with the exception of approximately 200 ppb of BTEX compounds, which was reported in only one round of sampling (June 13, 1988). TCE was not detected in sampling of well MW2SW adding support to the suggestion of an upgradient source.

3.1.3.3 WELL MW1N

Well MW1N was installed as an upgradient background quality well for UST #1 and is in close proximity to the northern Property boundary. Total VOC concentrations

ranged from ND to 42.7 ppb. TCE at a concentration of 8.3 ppb and cis 1,2-dichloroethene at a concentration of 42.7 ppb were detected in separate sampling rounds. These results suggest an upgradient source of TCE.

3.1.3.4 WELL MW2N

Well MW2N was installed as a downgradient well for UST #2. Total VOC concentrations ranged from ND to 14,387 ppb. The primary compounds detected remain BTEX compounds. However, cis-1,2-Dichloroethene was detected at a low concentration (7.8 ppb) in one sampling round.

3.1.3.5 WELL MW3N

Well MW3N was installed as a downgradient well for UST #2 for the purpose of triangulation and determining groundwater flow direction. Total VOC concentrations ranged from ND to 7,758 ppb. On average total VOC concentrations are approximately 200 ppb, with BTEX compounds composing the majority of the total concentration reported. During one sampling round TCE and cis 1,2-dichloroethene were detected at concentrations of 3 ppb and 37.1 ppb, respectively.

Based on well locations (upgradient of suspected source) and degree of contamination reported, it is SI's opinion that the TCE and cis 1,2-dichloroethene (a biodegradation breakdown product of TCE) detected in wells MW1N, MW3N and MW1SE are the result of on-site migration of contaminants from an upgradient source, particularly since these compounds were detected in the upgradient monitoring wells and no facility operations utilizing TCE were conducted between the wells and the Property boundary. TCE usage on-site was restricted to the southern most portions of the building.

3.1.3.6 REGIONAL GROUNDWATER

In March, 1991 in response to routine sampling requirements of the NYSDEC, the RCHD conducted sampling of eight (8) regional potable drinking wells for VOCs. As previously stated, these wells range in depth from 150 to 200 feet. The results of analyses showed the presence of high concentrations of VOCs, particularly TCE and cis 1,2-dichloroethene in four (4) of the eight (8) wells. The wells appear to have been sampled at the well head prior to filtration systems with the exception of the L.A. Woman well, which was also sampled from a faucet after the filtration system on 4/4/91. Sampling after the filtration system showed significantly lower concentrations of TCE. The results of analysis are presented in Table 8 and summarized on Figure 12. The laboratory data sheets are provided in Appendix Q.

The results of analysis from the first and supplementary sampling rounds showed four (4) regional potable wells in which TCE was detected. The concentrations of TCE in these wells ranged from 2.7 ppb to 5400 ppb. The potable well locations are identified as L.A. Woman (formerly the Kabuto House), Sterling Optical, Culinary Deli and the Brown residence. With the exception of the Brown residence, the effected wells are located to the southwest of the Swivelier Property. The Brown residence is located approximately 600 feet to the west of the Swivelier Property and directly adjacent to the Teplitz Property. The well at Sterling Optical is located approximately 300 feet west of the L.A. Woman well and the Culinary Deli well is within 700 feet to the west.

The four (4) wells in which TCE and cis 1,2-dichloroethene were not detected are Rockland Bakery, Chrysler House, #144 West Nyack Road and Mr. Arcade.

Rockland Bakery is located approximately 150 feet to the north of Swivelier; the Chrysler House is located approximately 300 feet upgradient; #144 West Nyack Road borders the Swivelier Property to the southeast and Mr. Arcade is located south - southwest of Swivelier and within 400 feet to the southeast of L.A. Woman.

The highest concentrations of TCE and cis 1,2-dichloroethene were reported at L.A. Woman (5400 ppb and 80 ppb) and Sterling Optical (700 ppb and 19 ppb), which are located approximately 1450 feet (1/4 mile) south-southwest of Swivelier. Only TCE and cis 1,2-dichloroethene as well as trace concentrations (less than 2 ppb) of tetrachlorethene (PCE) were reported in the Sterling Optical well. However, TCE, cis 1,2-DCE and PCE as well as various benzene related compounds, xylenes and Methyl Tertiary Butyl Ether (MTBE) were also detected in the L.A. Woman well. In reviewing results between the L.A. Woman and the Sterling Optical wells, a distance of approximately 300 feet, total TCE concentrations decrease by 85% and between the Culinary Deli and L.A. Woman, a distance of approximately 700 feet, a decrease of greater than 99% occurred. Based on assumed usage as a water supply well and not industrial usage, water withdrawal from these wells is assumed to be relatively low and therefore not a major contributor to contaminant migration. The well located at Mr. Arcade, a distance of approximately 400 feet from L.A. Woman did not report TCE, but did report MTBE concentrations ranging from 6.4 ppb to 13 ppb. This may be the result of differences in either well construction, depth of pumping, pumping frequency/volume or lithologic changes. But, if all these factors were equal and if Swivelier were the source, TCE should have been detected in the well at Mr. Arcade.

As previously stated, three (3) potable wells which are located upgradient but in close proximity of the Swivelier Property did not report the presence of TCE, cis 1,2-dichloroethene or PCE. The most significant of these are the wells located at #144 West Nyack Road and the Rockland Bakery. The well at #144 West Nyack Road is

used for domestic purposes and water withdrawal is assumed to be low. Analytical results from this well showed all compounds as not detectable (ND). The well at Rockland Bakery is used as a high withdrawal supply well. High withdrawals from this well would draw contaminants towards this well particularly since the well appears to be located along the same fracture trend as Swivelier and the L.A. Woman well. However, TCE, cis 1,2-dichloroethene and PCE were not detected.

3.2 HAZARDOUS MATERIALS AND WASTES

RCRA, instituted in 1976, mandated a cradle-to-grave system of managing hazardous waste. Regulations adopted by the EPA carry out that mandate and the chain of regulations now extends to those who generate, transport, store, treat, and dispose of hazardous waste. The overriding concern of RCRA is the effect on the population and the environment of the disposal of discarded hazardous waste. The term hazardous waste means a solid waste, or combination of solid wastes, which because of its quantity, concentration or physical, chemical or infectious characteristics may :

(A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

All facilities that generate, transport, store, treat, and dispose of hazardous waste are required to register with the EPA, and if they meet certain volume levels, are required to file periodic reports with the EPA. Swivelier (EPA ID #NYD001250653) utilized and stored hazardous materials during past on-site operations in the form of

TCE and xylol. TCE was utilized in facility processes as a cleaning agent to remove residual oils and xylol was utilized at the facility as a paint thinner. As previously stated, according to Swivelier, TCE has not been utilized at the facility since 1979 and xylol in bulk has not been utilized since 1986. Hazardous materials are still utilized at the facility in small quantities. However, all discharges since 1958 when the existing sewer system was installed have reportedly been to the sanitary sewer system.

3.3 REGULATORY CONCERNS

SI contacted representatives of federal, state and local environmental agencies to review any record of environmental concerns related to past or present activities by the previous or current owners of the Property. In addition to the Property, information regarding the surrounding properties and their potential environmental impact on the Property were investigated through available state and local agencies records and/or files. A copy of the report obtained by SI is provided in Appendix R.

3.3.1 NATIONAL PRIORITIES LIST

Under Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the EPA is required to annually update the NPL of Superfund sites. A site is proposed as an NPL site after being assessed as to the release or threat of release of hazardous substances that may endanger the environment. A site to be included on the NPL, must either meet or surpass a predetermined hazard ranking systems score, or be chosen as a state's top priority site, or meet all three of the following criteria: (1) the U.S. Department of Health and Human Services issues a health advisory recommending that people be removed from

the site to avoid exposure; (2) EPA determines that the site represents a significant threat; and (3) EPA determines that remedial action is more cost-effective than removal action.

A review of the EPA NPL, which was updated on February 15, 1992, was conducted to evaluate the listed sites located within a one mile radius of the property. The NPL review indicated that there are no NPL sites located within a one mile radius of the Property.

3.3.2 FACILITY INDEX SYSTEM

The FINDS list is a compilation of any property or facility which the EPA has investigated, reviewed, or has been made aware of in connection with its various regulatory programs. Each record indicates the EPA program office which may have files on the property or facility.

The FINDS database, which was updated on March 24, 1992, was reviewed to identify properties or facilities of potential environmental concern to the Property. The review indicated that there are 27 properties or facilities located within a one mile radius of the Property. The Property is listed as EPA ID No. NYD001250653. However the listing appears to be the result of storage of hazardous materials rather than investigation. In addition, ten (10) neighboring or adjoining properties are also listed. The listed properties are as follows:

1. Exxon Co. USA #32808
   16 Route 304 & 59A
   Bardonia, NY
   EPA ID # NYD986955714

2. Chas. Freihofer Baking Co., Inc.
   99 West Nyack Road
   Nanuet, NY
   EPA ID # NYD116005489

3. G & B Autobody
   17 Seeger Drive
   Nanuet, NY
   EPA ID # NYD986887982

4. Classic Autobody Repair Shop
   128 West Nyack Road
   Nanuet, NY
   EPA ID # NYD048395909

5. Kurland Cadillac - Oldsmobile
   32 Route 304
   Nanuet, NY
   EPA ID # NYD012984282

6. Base Lock Rubber Type Co. Inc.
   South side First Street
   Nanuet, NY
   EPA ID # NYD001346212

7. Boutons Business Machines, Inc.
   95 Route 304
   Nanuet, NY
   EPA ID # NYD986891836

8. Kea Motor Car Corp.
   99 Route 304
   Nanuet, NY
   EPA ID # NYD075432229

9. Star Motor Corporation
   10 Route 304
   Nanuet, NY
   EPA ID # NYD131802894

10. Young's Gentle Touch Cleaners Inc.
    228 Route 59, East Caldor Shopping Center
    Nanuet, NY 10954
    (914) 623-4764

These sites are located in close proximity to Swivelier or the effected potable wells (Refer to Figure 4). In addition to these sites there are several other suspected

generators of hazardous waste in the immediate vicinity of Swivelier and effected potable wells. However, waste generation activity may be below minimum reporting requirements of the EPA and NYSDEC.

3.3.3 CERCLIS

The CERCLIS list, which was updated on May 15, 1992, includes a list of properties and/or facilities which are suspected or confirmed to have adversely impacted the environment. The list is comprehensive in that it includes all properties for which allegation has been made (discovery, regardless of the source), regarding environmental abuse. Listed sites are prioritized and scheduled for an initial inspection (Preliminary Assessment) by an EPA representative. Subsequent to the Preliminary Assessment (PA), the subject property is either deleted from the list or scheduled for a Site Investigation.

A review of the EPA Region II CERCLIS list was conducted to evaluate the listed sites located within a one mile radius of the Property. The CERCLIS review indicated that there is one (1) CERCLIS-listed site within a one mile radius of the Property.

The site is listed as:

Pascack Brook at Convent Road
Nanuet, New York 10954
EPA ID # NYD980768766

Based on our review of the information, the site was investigated in 1983 and since then no additional work has been conducted. In addition, the site is located more than one (1) mile to the southwest of the facility.

3.3.4 RESOURCE CONSERVATION AND RECOVERY ACT INFORMATION SYSTEM

The EPA's RCRA program identifies and tracks hazardous waste from the point of generation to the point of disposal. RCRIS is a compilation of the reporting facilities that generate, store, transport or dispose of hazardous waste. The information provided on the list includes the EPA identification number, facility name and address, county and waste activity.

A review of the RCRIS Facilities Database, which was updated on April 19, 1991, was conducted to evaluate the listed sites located a one mile radius of the Property. The review revealed the presence of 37 RCRA facilities within the zip code area of the facility of which 27 facilities are within a one mile radius of the Property and the area of the effected potable wells. Nine (9) of these facilities are located in close proximity to Swivelier and the effected wells. The facilities identified are those listed in Section 3.3.2 of this report. All are small quantity generators except for Boutons Business Machines Inc., Kea Motor Car Corp., Star Motor Corp. and Young's Gentle Touch Cleaners, all of which are large quantity generators.

3.3.5 NEW YORK STATE INACTIVE HAZARDOUS WASTE DISPOSAL SITES

The NYSDEC maintains a list of inactive hazardous waste disposal sites undergoing remediation and investigation in the State of New York. The April 1, 1992 Status report for Rockland County was reviewed to identify sites of potential environmental concern to the Property. The review of the April, 1992 Status Report indicated only the Swivelier Property to be listed.

3.3.6 EMERGENCY RESPONSE NOTIFICATION SYSTEM AND HAZARDOUS MATERIALS INCIDENT REPORTING SYSTEM

The ERNS and HMIRS lists are national databases used to collect information on reported releases of oil and hazardous substances. The databases contain information from spill reports made to federal authorities including the EPA, the U.S. Coast Guard, the National Response Center and the Department of Transportation.

The October 9, 1991 ERNS and December 15, 1991 HMIRS databases were reviewed to identify properties or facilities within a one mile radius of the Property that may pose a potential environmental concern. The review indicated no reported releases or spills within a one mile radius of the Property or in close proximity to the effected potable wells.

3.3.7 THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PETROLEUM BULK STORAGE DATABASE

The NYSDEC PBS Database is an inventory of facilities, maintained by the RCHD, with aboveground and underground storage tanks that have petroleum storage capacities in excess of 1100 gallons and less than 400,000 gallons. Facilities with storage capacities greater than 400,000 gallons are tracked by the Major Oil Storage Facilities (MOSF) Database. The search revealed the existence of numerous USTs and ASTs in the area and on the properties adjacent and in close proximity to the Property. The Swivelier Property has four (4) USTs registered on-site. All four USTs have been

removed from the site. According to a review of NYSDEC records, there are no spills from USTs or ASTs in the area that pose an environmental risk to the Property.

3.3.8 LEAKING UNDERGROUND STORAGE TANK DATABASE

The RCHD under the auspices of NYSDEC maintains a list of sites known to have a discharge from a Leaking Underground Storage Tanks (LUST).

The February 29, 1992 LUST list was reviewed to determine listed sites within a one mile radius of the Property. Based on our review of the LUST list, there are numerous reports of discharges from USTs within a one mile radius of the Property, including a report of discharges on the Swivelier Property and L.A. Woman.

4.0 CONCLUSIONS

The listing of the Swivelier Property by the NYSDEC as a Class #2A Inactive Hazardous Waste Site was initiated following routine and annual sampling of regional potable wells which revealed the presence of TCE in four (4) deep bedrock wells. Since the Swivelier Property is located hydraulically upgradient of those wells and a documented spill or release of TCE was reported to the stream in 1979, the Swivelier Property is suspected by the NYSDEC, but not confirmed, as the source of the TCE. The NYSDEC also suggested that the detection of trace levels of TCE in on-site shallow monitoring wells (MW1SE, MW1N and MW3N) was further proof that the Swivelier Property was the source of TCE.

That the only possible documented source of TCE in stream water and sediment was through an inadvertent release of a mixture predominantly composed of cooling water/process wash water and TCE from an outfall pipe. This statement is supported by the quantified presence of TCE in a few sediment and stream samples collected in 1980 near the outfall pipe and by the fact that Swivelier has no other documented sources of TCE which could have been inadvertently released to the environment. However, there is no conclusive evidence to support the leaching and migration of dissolved TCE with shallow groundwater flow downgradient of the site. Likewise, there is no conclusive evidence that free phase TCE has sunk to the deep bedrock aquifer and migrated down rock dip or that dissolved phase TCE has migrated with groundwater flow along the strike of the rock (northeast to southwest).

To best ascertain if the documented release of the TCE and water mixture to the stream is the source of contaminants in the regional groundwater supply, and to further support these statements, a description of the basic physical and chemical properties of

TCE and three theoretical environmental fate transport possibilities were constructed as based on a correlation and evaluation of the available data. The environmental fate transport possibilities are summarized as follows:

* Inadvertent Release of TCE-Water Mixture on Surface Water
* Transport of Dissolved and/or Free Phase TCE in the Shallow Unconfined Aquifer.
* Transport of Dissolved and/or Free Phase TCE in the Deep Bedrock Aquifer.

4.1 PHYSICAL AND CHEMICAL CHARACTERISTICS OF TCE

Several physical and chemical properties are important in determining TCE's potential environmental fate transport. The primary properties are solubility in water, density, and vapor pressure, accordingly, TCE has a tendency to sink, volatize and/or adsorb to organic material as a result. TCE is characterized as a chlorinated hydrocarbon (C2HCL3) with a molecular weight of 131.40. TCE is described as being practically insoluble (i.e., $<0.1\%$) and heavier than water. TCE naturally biodegrades by replacing chlorine molecules with hydrogen molecules. TCE is a degradation product of Tetrachloroethene (C2H2CL4). The degradation sequence of PCE and TCE is as follows:

Tetrachoroethene (PCE) to Trichloroethene (TCE) to
cis-1,2 Dichloroethene to trans-1,2 Dichloroethene to
1,1 Dichloroethene to Vinyl Chloride

As TCE degrades towards vinyl chloride, the solubility in water increases. The behavior of TCE is that of a Dense, Nonaqueous Phase Liquid (DNAPL) in that it is

relatively insoluble in and heavier than water and therefore would tend to sink through the water column. Only dissolved phase TCE will migrate with groundwater flow at similar velocities.

Based on these characteristics of TCE and the environmental conditions at the site, three possible environmental fate transport possibilities were constructed and are described in the next three sections.

4.2 ENVIRONMENTAL FATE TRANSPORT SCENARIO #1: Surface Water Spill

A surface water spill is probably the most feasible source of TCE in the environment at the site because some conclusive analytical evidence is available. The probable source was an outfall pipe inadvertently discharging a mixture of TCE with the cooling water and process wash water. This pipe was later crushed and plugged in January, 1980. Samples of the steam and sediment have not been obtained since 1980 and the stream has been reportedly been dredged on two (2) occasions some time after the spill event, although the exact dates are not known.

The environmental fate of TCE spilled on surface water is based on its physical and chemical properties and the environmental conditions of the stream. The TCE molecule has a high vapor pressure, low solubility in water and is denser than water. As dissolved phase TCE discharged to the surface of the stream, evaporation occurs. The airborne and separate phase molecules would then further degrade through photodegradation. The remainder of the mass would then be affected by the physical and environmental properties of the stream which allow for dispersion, dilution, spreading and some dissolution (or mixture) of the spill within the stream. These

factors are controlled by the rate of flow through the stream or current, which are dependent on seasonal rainfall events. In addition, a portion of the TCE mass may have sunk through the water column, sorbing with suspended particulates and eventually adsorbing to fine stream bottom sediments which result in an accumulation of mass. Although most of TCE would remain bound to sediments, a small fraction might be degraded by inherent microbial populations or vertically migrate into glacial till below. However, vertical migration will not occur until interstitial pore pressures are exceeded and sufficient mass is present to displace water present in the pore space below the saturated zone.

The primary compound detected in the discharge effluent samples obtained in January, 1980 is TCE at concentrations of 3200 ppb and 1600 ppb (Table 6), respectively. These samples should, therefore, be considered representative of the effluent quality during the discharge event. In addition, sediment samples obtained directly beneath the discharge pipe (Table 5) showed a maximum concentration of 14,300 ppb of TCE.

In evaluating the discharge event and the natural processes occurring, the results of effluent sampling revealed that the maximum reported concentration of TCE was 3200 ppb and the maximum reported concentration of TCE in sediment directly below the discharge point was 14,300 ppb. This indicates that some build up of TCE mass had occurred in the sediment. However, as previously stated, as the effluent discharged from the pipe, several factors acted upon the dissolved phase TCE including evaporation, dispersion, photodegradation and dilution. Residual immiscible TCE will flow along the stream until a stagnation point in the stream is encountered at which point some accumulation will occur. This can be seen in the results where TCE

concentrations were reported at a maximum concentration of 18,000 ppb approximately 50 feet north of the culvert pipe which runs beneath West Nyack Road. This build up of TCE mass would then act as a continuing source of dissolved phase TCE to stream water quality and could, if sufficient volumes were present, overcome adsorptive forces and interstitial pore pressures for vertical migration to occur. However, as previously reported, the stream was dredged on several occasions effectively lowering the base of the stream 2 to 3 feet and removing TCE contaminated sediment. Also, reported concentrations of TCE in the stream sediment decrease with distance from Swivelier and are significantly lower (34 ppb and 205 ppb) downgradient of Swivelier than at the culvert pipe flowing beneath West Nyack Road.

4.3 ENVIRONMENTAL FATE TRANSPORT SCENARIO #2: Transport of Dissolved and Free Phase TCE in the Shallow, Unconsolidated Aquifer

The transport of dissolved phase and/or free phase TCE in the shallow, unconfined aquifer consisting of unconsolidated overburden is theoretically possible, however, no information is available to document that the condition exists.

The stream and stream bed are considered a localized zone of groundwater discharge and in this area, the component of groundwater flow is predominantly upward. Therefore, if TCE is adsorbed to the fine grained sediments of the stream bed, the sorptive quality of the sediment combined with the upward flow movement of groundwater will tend to limit downgradient transport of dissolved phase TCE in groundwater. Also, the stream was supposedly dredged by the NYSDOT, thereby removing sediments with adsorbed TCE. Although residual amounts may have

remained immediately following dredging, the agitation to the stream bed would allow solubilization, evaporation, photodegradation and downstream transport.

Also, assuming that residual concentrations of free-phase TCE remained following dredging, vertical migration by the force of gravity would occur through the strata and act as a continuing source of dissolved phase product to the groundwater. However, as vertical migration of contaminants occurs, attenuation processes such as dispersion and biodegradation also occur thus reducing the concentrations present. Vertical migration of DNAPLs would continue until an impermeable boundary such as bedrock is encountered at which point accumulation and movement of the DNAPL in the direction of dip would occur (Appendix S).

Complicating vertical migration are the heterogeneities that are encountered in depositional environments. As TCE migrates vertically through the overburden soils, fingering occurs as various lithologic lenses and layers are encountered. Attenuation and dispersion processes occur at each of these lenses. However, this assumes the release of large quantities of immiscible liquid. The maximum dissolved phase concentration of TCE detected in the effluent sample was 3200 ppb, in sediment samples 18,300 ppb and only 14,300 ppb in sediment directly beneath the discharge point. Based on the solubility of TCE (<0.1%), the maximum dissolved phase in groundwater to be expected from this concentration would be 18.3 ppb, which is far below the 5400 ppb maximum concentration reported in the L.A. Woman well. Also the study presented in Appendix S states that reported concentrations of DNAPL's are generally significantly lower than the potential solubility allows due to:

1. "The tendency of the majority of a dense solvent fluid to accumulate on the top of bedding planes and form one or more flat source zones that present low cross-sectional areas to oncoming groundwater flow";

2. "Dispersion in the zone downgradient of the source; and/or"

3. "Dilution of this and/or narrow plumes by uncontaminated water in monitoring and pumping wells which are screened over several meters."

Although the potential for 18.3 ppb of dissolved phase TCE could leach from the known reported concentration (18,300 ppb), a leachable concentration less than 18.3 ppb is to be expected based on these studies. The study in Appendix S also states that the rate of groundwater flow and pumping effects do not appear to appreciably impact vertical migration or the width of an immiscible DNAPL plume. This translates into regional pumping wells downgradient of Swivelier, regardless of withdrawal rates, unable to aid in the migration of an immiscible DNAPL plume.

4.4 ENVIRONMENTAL FATE TRANSPORT SCENARIO #3: Transport of Dissolved and Free Phase TCE in the Deep Bedrock Aquifer.

Although the transport of dissolved and free phase TCE in the deep bedrock aquifer is theoretically possible, there is not enough conclusive evidence to support this condition. Theoretically, a TCE plume vertically migrates through the strata at which point accumulation atop the hardpan will occur. Given sufficient time, which is highly dependent upon the permeability of the hardpan and viscosity of the DNAPL, vertical migration through the hardpan into the fractured bedrock will eventually occur. Once into the bedrock, the DNAPL will migrate along the direction of bedding dip (Appendix T)[5] which is to the west-northwest. DNAPL migration through smaller vertical fractures occurs when sufficient "capillary pressure at the entrance of the fracture exceeds the entry pressure of the fracture such that the curvature of the

DNAPL/water interface allows this interface to physically penetrate the fracture." Although dissolved phase DNAPL's may enter these smaller fractures and migrate in the direction of groundwater upward water movement, such as artesian or semiartesian conditions, it slows the rate of vertical migration through the fractures.

Groundwater springs are known to occur in this region and variabilities in hydraulic head distribution are believed to be the result of permeability changes in the bedding constituents.[3] Groundwater occurrence in the Brunswick (Passaic) has been characterized as a gently dipping, multiunit leaky aquifer system that contains these water-bearing units and thick interviewing aquitards. Vertical migration is slowed through the aquitard in comparison with the water-bearing units. Based on well logs from the regional wells, sandstone is the predominant unit and flow in the sandstone is dependent upon the degree and frequency of the fractures.

Based on the factors above, it appears likely that the reported concentration in the L.A. Woman well is the result of close proximity to the TCE source and that the discharge of dissolved phase TCE to the stream adjoining Swivelier did not sufficiently accumulate and migrate from the sediments into the deep bedrock aquifer.

4.5 SUMMARY

Conditions of the Swivelier Property were assessed in a manner consistent with general environmental site assessment guidelines. Field investigations included surficial surveys of the exterior and interior of the building and traversing the Property and surrounding properties.

Based on our findings, SI concludes the following:

1. No analytical data is available to show a direct or indirect conclusion, other than TCE detected in the stream and sediment samples that the

Swivelier Property is the source of the TCE in the deep potable wells downgradient of the site. Since the date of detection in 1980, the stream sediments have been dredged by the NYSDOT. The extent of residual contamination remaining is unclear as is the extent of vertical migration, but probably would not warrant the concentration levels detected in downgradient wells.

2. TCE was detected at significantly lower levels in the shallow (unconsolidated) on-site wells (MW1SE, MW1N, MW2N and MW3N) which are located on the northern portion of the Property in comparison to the deep (bedrock) off-site potable wells. Based on direction of groundwater flow south-southwest and that TCE has not been used since 1980 at the site, it is our opinion that these concentrations are probably the result of on-site migration from an upgradient source.

3. The maximum concentration of TCE reported in the stream sediment was 18,300 ppb. Based on the solubility of TCE in water (>0.1%), the theoretical maximum leachable amount of TCE into dissolved phase would be 18.3 ppb. TCE was reported a maximum concentration of 5400 ppb in the L.A. Woman potable well. In addition, effluent water samples discharging from the pipe showed a maximum dissolved phase concentration of 3200 ppb indicating that no immiscible product was present.

4. Based on surficial stream sediment sampling results, there is a 99% decrease in TCE concentrations from the discharge pipe to the former Kabuto House (L.A. Woman).

5. The hydrogeologic conditions beneath the site consist of a shallow unconfined aquifer and a deep gently dipping, multiunit, leaky aquifer containing thin water-bearing units and thick intervening aquitards. According to published information, the regional bedrock units dip to the northwest and strike to the northeast. Groundwater flow in this type aquifer is preferential along the strike of the beds. However, DNAPL migration through this system would not be altered by groundwater flow but would be influenced by the direction of bedding dip with vertical migration controlled through fractures.

   Dissolved phase migration would occur in the direction of groundwater flow but dispersion, fingering and attenuation would act to reduce overall concentrations.

6. Regional groundwater usage appears to be minimal and not to be a major influence in groundwater movement.

7. Additional compounds other than TCE and PCE were reported in the former L.A. Woman potable well. These compounds have not been reported on the Swivelier Property and are indicative of petroleum related (i.e., gasoline stations) operations.

8. As TCE and PCE migrates away from the source area, attenuation processes such as dispersion and biodegradation of the compounds occur. Biodegradation by-products of TCE were not reported other than cis-1,2-dichloroethene. However, reported concentrations suggest close proximity to the source area. Swivelier is located approximately 1/4 mile to the northeast of the effected area.

9. TCE was reported only in dissolved phase concentrations. No accumulation of immiscible solvent has been documented in any of the wells.

10. TCE was reportedly used on-site in small quantities and recycled. The discharge of TCE was due to inadvertent spillage mixing with process wash water and cooling water.

Based on the conclusions and discussions above, it appears that the discharge of dissolved phase TCE to the stream on the Swivelier Property did not accumulate to sufficient quantities to have resulted in the concentrations of contaminants reported in the potable wells downgradient of Swivelier.

The conclusions presented in this report are based on our interpretations of available files; on-site and regional historical environmental soil, sediment and groundwater sampling; published information and technical papers, and do not reflect confirmation through additional on-site sampling of soil, sediment and groundwater.

5.0 LIABILITY LIMITATIONS

SI has undertaken this assignment using our best professional effort consistent with generally accepted environmental assessments practices. SI evaluated information provided by regulatory agencies, site personnel and other knowledgeable parties during this Remediation Investigation Report. The findings presented in the report are based upon the site conditions and information made available at the time of the Remedial Investigation Report. These findings or conclusions are not meant to be indicative of future conditions or operating practices at the Property.

Footnotes:

[1]"Geology and Groundwater Resources of Rockland County," Nathaniel M. Perlmutter Published. U.S. Geological Survey, Paper GW-42, 1959, p. 101-119.

[2]Groundwater and Wells (Second Edition) Fletcher G. Driscoll, Ph. D., (St. Paul, MN: Johnson Filtration Systems, Inc., 1989, p. 100.

[3]Andrew Michalski, "Hydrogeology of the Brunswick (Passaic) Formation and Implications for Ground Water Monitoring Practice," Ground Water Monitoring Review. (Fall 1990), pp. 134-143.

[4]Michael R. Anderson, Richard L. Johnson, and James P. Pankow, "Dissolution of Dense Chlorinated Solvents into Ground Water: 1. Dissolution from a Well-Defined Residual Source" Ground Water. (March-April, 1992), pp. 250-255.

Table 1
Summary of Regional Potable Well Logs
Swivelier Company, Inc.
Nanuet, New York

Well #	Owner	Land Surface Altitude (ft)	Well Depth (ft)	Depth of Bedrock (ft)	Geologic Unit	Depth to Water (ft)	Casing Depth (ft)
Ro 33	R.O. Muller	300	124	10	NG	43	24
Ro 141	R. Faist	400	153	81	NG	58	NA
Ro 142	E. Hamilton	300	129	20	NG	17	24
Ro 234	NYS Dept of Public Works	286	29	23	NG	2	NA
Ro 235	NYS Dept of Public Works	316	25	21	NG	3	NA
Ro 243	NYS Dept of Public Works	280	35	29	NG	Flows	NA
Ro 289	Spring Valley Water Co.	286	477	23	NG	7	50
Ro 290	Spring Valley Water Co.	280	520	23	NG	7	NA
Ro 417	George's Auto Body	290	103	60	NG	15	72
Ro 422	Lederle Laboratories	290	401	24	NG	4	NA

Note:

1. Reference: Peremutter, N., 1959. Geology and Groundwater Resources of Rockland County , New York, USGS Bulletin GW-42.
2. NA - Information Not Available
3. NG - Newark Group

Table 2
Summary of Groundwater Elevations
Swivelier Company
Nanuet, New York

Well #	Product	Odor	Monitoring Well Elevation (Ft)	Static Water Level Elevation (Ft)			
				11/24/1992(4) Nov. 92	12/29/1992(4) Dec. 92	1/28/1993(4) Jan. 93	2/24/1993(5) Feb. 93
1SE	NO	NO	98.32	93.25	93.40	93.51	93.39
2SW	NO	NO	98.19	93.04	93.12	93.17	93.10
1N	NO	NO	100.58	92.80	92.98	93.21	93.04
2N	NO	NO	97.68	92.72	92.94	93.27	*
3N	NO	NO	95.62	92.68	92.86	91.93	92.18

Note:

1. Monitoring well elevations based on assumed elevation of 100.00 ft at top of stairs, NW corner of building
2. Monitoring well and static water level elevations measured from top of PVC casing.
3. * = No Access to Well (Car Parked Over It)
4. SI Quarterly Sampling Report, Petroleum Spill #87-07447, March 1993
5. SI Quarterly Sampling Report, Petroleum Spill #87-07447, June 1993

Table 3
Summary of Soil Sampling - UST #1
Fingerprint Analysis - Diesel Tank Excavation
Swivelier Company, Inc.
Nanuet, New York

Sample ID:	1S	2S	3S	5S
Laboratory ID:	59836-003	59836-004	59836-005	59836-002
Date Sampled:	11/20/87	11/20/87	11/20/87	11/20/87

Results in Milligrams Per Kilogram (mg/kg)

Gasoline	Present	Not present	Present	Present
Lube Oils	Not present	Not present	Not present	Not present
Fuel Oil #1	ND	ND	ND	ND
Fuel Oil #2	ND	ND	1500	10.5
Fuel Oil #3	ND	ND	ND	ND
Fuel Oil #4	ND	ND	ND	ND
Fuel Oil #5	ND	ND	ND	ND
Fuel Oil #6	ND	ND	ND	ND

Note:

1. Analysis by NYSDOH 310.13
2. ND - Not Detected

Table 4
Summary of Sampling - UST #2
Total Xylene - Xylol Tank Excavation
Swivelier Company, Inc.
Nanuet, New York

Sample ID:	Tank	Water - BOH	Soil - BOH	Soil - BOH
Laboratory ID:		5265-66	5265-66	5935
Date Sampled:		11/11/86	11/11/86	12/12/86
		Aqueous Results in Milligrams Per Liter (mg/l)		
		Soil Results in Milligrams per Kilogram (mg/kg)		
Total Xylenes	65.62	7.39	0.027	0.07

Note:

Bott = Bottom of Excavation hole

Table 5
Summary of Sediment Sampling
Swivelier Company, Inc.
Nanuet, New York 10954

Sample ID:	N. Side of W. Nyack Rd.	Outfall Below 3" Drain	#1 N. side of W. Nyack Rd	#2	#3	50' North of W. Nyack Rd.
Laboratory ID:						
Date Sampled:	12/11/79	12/11/79	1/9/80	1/9/80	1/9/80	2/5/80

Results In Micrograms Per Kilogram (mg/kg)

Compound:						
1,1-Dichloroethane	ND	ND	ND	ND	ND	5300
1,2-Dichloroethane	ND	ND	ND	ND	ND	8700
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	790
Carbon Tetrachloride	ND	ND	ND	ND	ND	2900
Trichloroethylene	8800	14300	18000	34	205	4200
Methylene Chloride	22	10	75	ND	ND	ND
Tetrachlorethane	140	115	100	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	1100
Total:	8962	14425	18175	34	205	22990

Note:

1. ND - Not Detected

Table 6
Summary of Discharge Pipe and Surface Water Sampling
Swivelier Company, Inc.
Nanuet, New York

			Surface Water	
Sample ID:	Discharge Pipe	Discharge Pipe	Upstream	Downstream
Date Sampled:	1/4/80	1/7/80	4/4/91	4/4/91
	Results in Micrograms Per Liter (mg/l)			
Compound:				
N-butylbenzene	ND	NA	0.86	ND
1.4-Dichlorobenzene	ND	NA	0.63	ND
Hexaclorobutadiene	NA	NA	4.4	ND
Carbon Tetrachloride	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NA	NA	0.71	ND
Methyl Tertiary Butyl Ether	NA	NA	12.0	7.9
Methyl Isobutyl Ketone	NA	NA	2.3	2.6
Naphthalene	NA	NA	1.1	NA
Trichloroethylene	3200	1600	NA	2.8
CIS 1,2-Dichloroethene	NA	NA	ND	4.7
Total VOCs:	3200	1600	20.9	18.0

Note:

1. ND - Not Detected
2. NA - Not Analyzed
3. VOCs - Volatile Organic Compounds

Table 7
Summary of On-Site Groundwater Sampling
Swivelier Company, Inc.
Nanuet, New York 10954

Well #1N
Date Sampled: 6/13/88 9/28/88 12/21/88 9/8/89 5/31/90 5/7/91 10/1/91 12/26/91 4/1/92 7/9/92

Results In Micrograms Per Liter (mg/l)

Compound:										
Benzene	NA	ND	ND	NA	ND	ND	ND	1.2	NA	NA
Chlorobenzene	NA	ND	ND	NA	ND	ND	ND	ND	NA	NA
1,2-Dichlorobenzene	NA	ND	ND	NA	ND	ND	ND	ND	NA	NA
1,3-Dichlorobenzene	NA	ND	ND	NA	ND	ND	ND	ND	NA	NA
1,4-Dichlorobenzene	NA	ND	ND	NA	ND	ND	ND	ND	NA	NA
Ethylbenzene	NA	ND	ND	NA	ND	ND	ND	1.6	NA	NA
Toluene	NA	ND	ND	NA	ND	ND	ND	ND	NA	NA
Total Xylenes	NA	ND	NA	NA	ND	ND	ND	ND	NA	NA
Cis 1,2-Dichloroethen	NA	ND	NA	NA	42.7	NA	NA	NA	NA	NA
Trichloroethene	NA	8.3	NA	NA	ND	NA	NA	NA	NA	NA
Trichlorofluorometha	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA
Vinyl Chloride	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	ND	NA	NA	ND	NA	NA	NA	NA	NA
TOTAL:	**NA**	**8.3**	**ND**	**NA**	**42.7**	**ND**	**ND**	**2.8**	**NA**	**NA**

Notes:

1. ND - Not Detected
2. NA - Not Analyzed
3. Wells are screened in the unconfined aquifer (glacial overburden).

Table 7 (Cont'd)
Summary of On-Site Groundwater Sampling
Swivelier Company, Inc.
Nanuet, New York 10954

Well #2N Date Sampled:	6/12/88	9/28/88	12/21/88	9/8/89	5/31/90	5/7/91	10/1/91	12/26/91	4/1/92	7/9/92
Results in Micrograms Per Liter (ug/l)										
Compound:										
Benzene	NA	150	6	ND	62.6	42.1	ND	168	366	57.2
Chlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	NA	730	110	ND	370.6	224	ND	550	1340	108
Toluene	NA	3800	67	ND	16.6	10.2	ND	97.9	215	2
Total Xylenes	NA	7130	NA	ND	489	356	ND	683	2480	49.2
Cis 1,2-Dichloroethene	NA	ND	NA	ND	7.8	NA	NA	NA	NA	NA
Trichloroethene	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
Trichlorofluoromethane	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
Vinyl Chloride	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
Napthalene	NA	260	NA	ND	ND	NA	NA	NA	NA	NA
N-Propytlbenzene	NA	43	NA	ND	ND	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	34	NA	ND	ND	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	NA	1800	NA	ND	ND	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	NA	440	NA	ND	ND	NA	NA	NA	NA	NA
TOTAL:	**NA**	**14387**	**183**	**ND**	**946.6**	**632.3**	**ND**	**1498.9**	**4401**	**216.4**

Notes:

1. ND - Not Detected
2. NA - Not Analyzed

Table 7 (Cont'd)
Summary of On-Site Groundwater Summary
Swivelier Company, Inc.
Nanuet, New York 10954

Results in Micrograms Per Liter (ug/l)

Well #3N / **Date Sampled:**	**6/13/88**	**9/28/88**	**12/21/88**	**9/8/89**	**5/31/90**	**5/7/91**	**10/1/91**	**12/26/91**	**4/1/92**	**7/9/92**
Compound:										
Benzene	NA	ND	ND	68	ND	3.2	NA	NA	ND	1.5
Chlorobenzene	NA	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,2-Dichlorobenzene	NA	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,3-Dichlorobenzene	NA	ND	ND	ND	ND	ND	NA	NA	ND	ND
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	ND	NA	NA	ND	ND
Ethylbenzene	NA	ND	ND	750	27.8	40.1	NA	NA	44.9	117
Toluene	NA	ND	ND	1600	10.8	9.1	NA	NA	6.2	15.3
Total Xylenes	NA	ND	ND	3740	85.8	72.3	NA	NA	101	475
Cis 1,2-Dichloroethene	NA	ND	NA	ND	37.1	NA	NA	NA	NA	NA
Trichloroethene	NA	ND	NA	ND	3.0	NA	NA	NA	NA	NA
Trichlorofluoromethan	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
Vinyl Chloride	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	ND	NA	ND	5.1	NA	NA	NA	NA	NA
N-Propylbenzene	NA	ND	NA	100	ND	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzen	NA	0.8	NA	330	ND	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzen	NA	ND	NA	980	ND	NA	NA	NA	NA	NA
Napthalene	NA	ND	NA	190	ND	NA	NA	NA	NA	NA
TOTAL:	**NA**	**0.8**	**ND**	**7758**	**169.6**	**124.7**	**NA**	**NA**	**152.1**	**608.8**

Notes:

1. ND - Not Detected
2. NA - Not Analyzed

Table 7 (Cont'd)
Summary of On-Site Groundwater Sampling
Swivelier Company
Nanuet, New York 10954

Well #1SE Date Sampled:	8/12/87	6/13/88	9/28/88	11/2/88	12/21/88	9/8/89	5/31/90	5/7/91	10/1/91	12/26/91	4/1/92	7/9/92
Results in Micrograms Per Liter (ug/l)												
Compound:												
Benzene	ND	ND	ND	1.7	ND	NA	0.6	ND	NA	NA	NA	NA
Chlorobenzene	NA	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Ethylbenzene	ND	ND	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Toluene	ND	ND	ND	ND	ND	NA	1.9	ND	NA	NA	NA	NA
Total Xylenes	ND	ND	ND	ND	NA	NA	ND	ND	NA	NA	NA	NA
Cis 1,2-Dichloroethene	ND	ND	ND	ND	NA	NA	7.8	NA	NA	NA	NA	NA
Trichloroethene	37	ND	28	30	NA	NA	27.7	NA	NA	NA	NA	NA
Trichlorofluoromethan	ND	ND	ND	ND	NA	NA	2	NA	NA	NA	NA	NA
Vinyl Chloride	ND	ND	ND	ND	NA	NA	1.3	NA	NA	NA	NA	NA
1,1-Dichloroethane	ND	ND	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
TOTAL:	**37**	**ND**	**28**	**31.7**	**ND**	**NA**	**41.3**	**ND**	**NA**	**NA**	**NA**	**NA**

Notes:

1. ND - Not Detected
2. NA - Not Analyzed

Table 7 (Cont'd)
Summary of On-Site Groundwater Sampling
Swivelier Company
Nanuet, New York 10954

Well #2SW Date Sampled:	8/12/87	6/13/88	9/28/88	11/2/88	12/21/88	9/8/89	5/31/90	5/7/91	10/1/91	12/26/91	4/1/92	7/9/92
Results in Micrograms Per Liter (mg/l)												
Compound:												
Benzene	ND	140	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Chlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,2-Dichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,3-Dichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
1,4-Dichlorobenzene	ND	NA	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Ethylbenzene	ND	28	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Toluene	ND	3.7	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Total Xylenes	ND	28	ND	ND	ND	NA	ND	ND	NA	NA	NA	NA
Cis 1,2-Dichloroethe	ND	NA	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
Trichloroethene	ND	NA	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
Trichlorofluorometh	ND	NA	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
Vinyl Chloride	ND	NA	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
1,1-Dichloroethane	ND	NA	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA
TOTAL:	**ND**	**199.7**	**ND**	**ND**	**ND**	**NA**	**ND**	**ND**	**NA**	**NA**	**NA**	**NA**

Notes:

1. ND - Not Detected
2. NA - Not Analyzed

Table 8
Summary of Off-Site Potable Well Sampling
Swivelier Company, Inc.
Nanuet, New York 10954

Sample ID:	L.A. Woman	L.A. Woman Before Filtration	L.A. Woman After Filtration	L.A. Woman	Rockland Bakery	Rockland Bakery	Brown	Chrysler House	144 West Nyack Rd.
Date Sampled:	3/28/91	4/4/91	4/4/91	4/19/91	4/4/91	4/9/91	4/17/91	4/17/91	4/18/91
				Results in Micrograms Per Liter (ug/l)					
Compound:									
CIS - 1,2-Dichloroethene	80	31	ND	39	ND	ND	ND	ND	ND
Tetrachloroethene	8.9	1.5	ND	3.7	ND	ND	ND	ND	ND
Trichloroethene	4600	5400	3.6	1600	ND	ND	2.7	ND	ND
1,2-Dichlorobenzene	1.1	1.5	ND	1.6	ND	ND	ND	ND	ND
Methyl Tertiary Butyl Ethe	ND	1.3	ND	3.1	ND	ND	ND	3.7	ND
Benzene	ND	0.96	ND	ND	ND	ND	ND	ND	ND
N-Butylbenzene	ND	0.52	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	1.0	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	1.2	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	0.61	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	1.7	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	0.74	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trichlorobenzene	ND	1.8	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	0.55	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.73	ND	ND	ND	0.72	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	0.56	ND	1.2	ND
1,1 Dichloroethane	ND	ND	ND	ND	**0.72**	**0.56**	**2.7**	**4.9**	**ND**
TOTAL:	**4691.73**	**5443.38**	**3.6**	**1647.4**					

Notes:

1. ND - Not Detected
2. NA - Not Analyzed
3. Wells are at estimated depths between 150 to 200 feet in the Brunswick (Passaic) Formation.

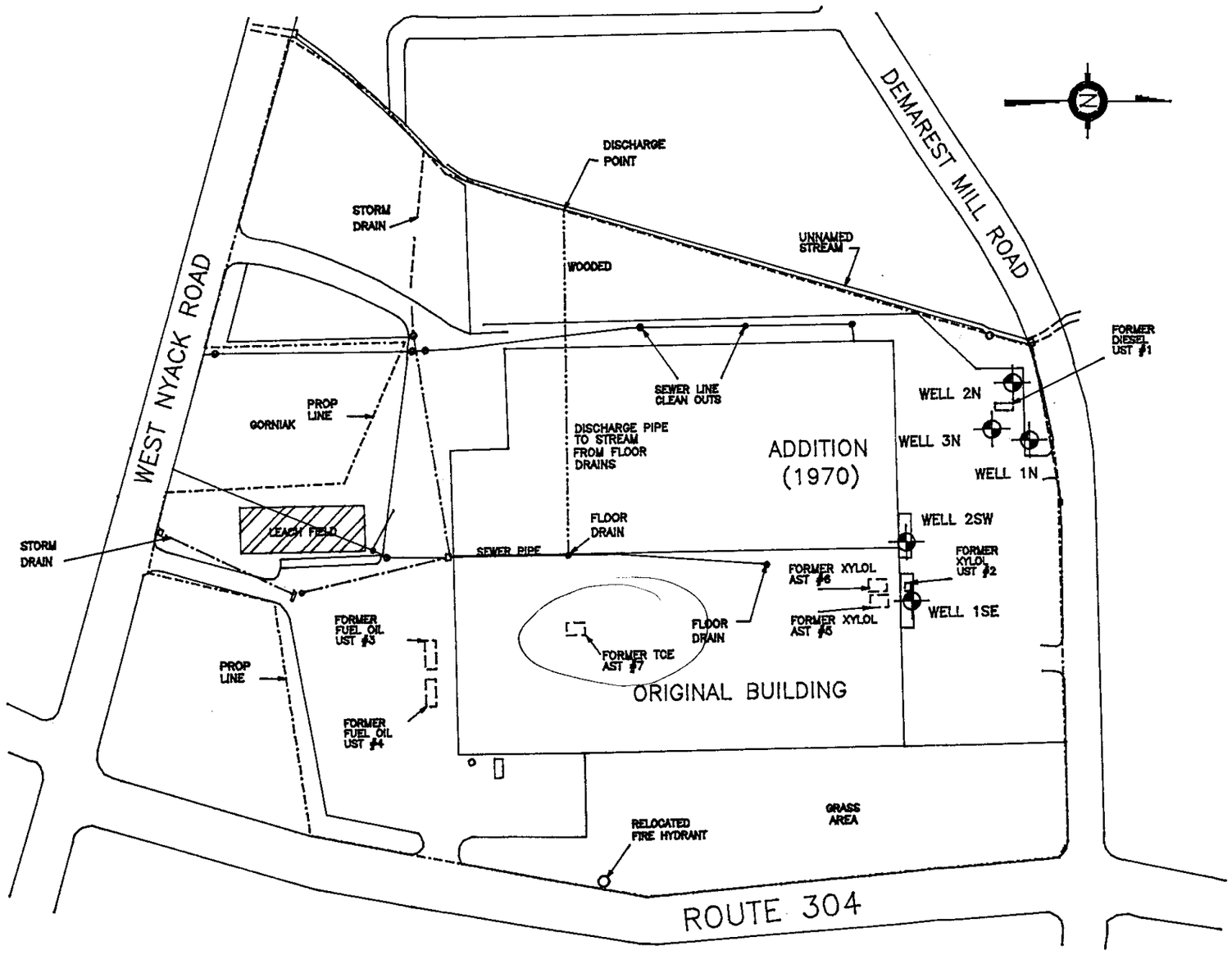
Table 8 (Cont'd)
Summary of Off-Site Potable Well Sampling
Swivelier Company, Inc.
Nanuet, New York 10954

Sample ID:	Culinary Deli	Culinary Deli	Culinary Deli	Mr. Arcade	Mr. Arcade	Mr. Arcade	Sterling Optical	Sterling Optical	Sterling Optical
Date Sampled:	4/4/91	4/8/91	4/17/91	4/4/91	4/8/91	4/17/91	3/5/91	3/28/91	4/18/91
				Results in Micrograms Per Liter (ug/l)					
Compound:									
CIS - 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	9.4	19	12
Tetrachloroethene	ND	ND	ND	ND	ND	ND	1.8	1.3	1.0
Trichloroethene	6.3	6.0	6.4	ND	ND	ND	5.8	700	600
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tertiary Butyl Ether	ND	ND	ND	13	8.2	6.4	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Butylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL:	**6.3**	**6.0**	**6.4**	**13**	**8.2**	**6.4**	**17**	**720.3**	**613**

FIGURE 1
PARK RIDGE & NYACK QUADRANGLE
NEW YORK
7.5 MINUTE U.S.G.S. SERIES

Subsurface Investigations
A Division of The Environmental Group, Inc.

DRAWN BY: R. OSER DATE: 11/12/93
SCALE: 1" = 2000'
JOB: 91059 PAGE 1 OF 1



LEGEND

WELL 1N
EXISTING MONITORING WELL & DESIGNATIONS

SI-SWIV01B

331 Route 9W
Congers, NY 10920
Tel: (914) 268 6660
Fax: (914) 268 2065

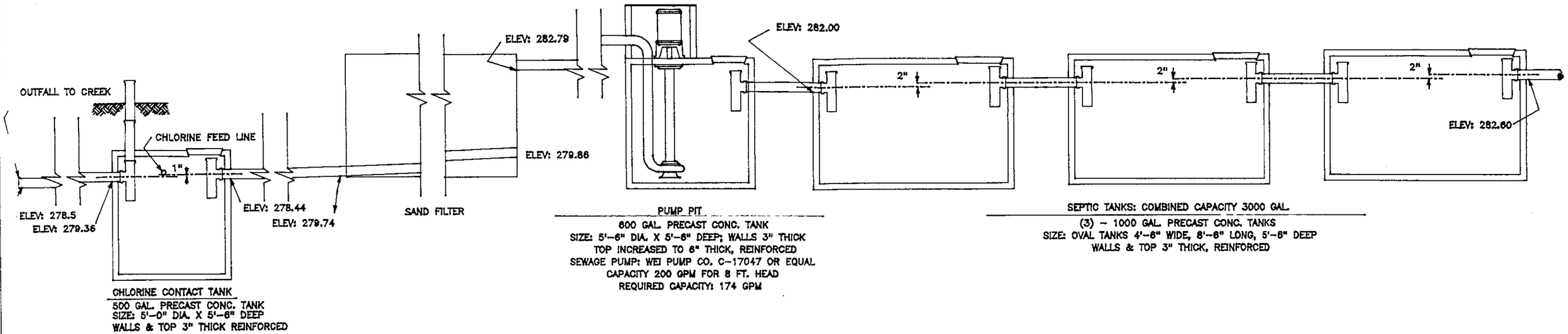
Subsurface Investigations
A Division of The Envirovision Group, Inc.

SWIVELIER COMPANY, INC.
NANUET NY

GENERAL SITE MAP

DRAWN BY: R. B. FINE — DATE: NOVEMBER 11, 1993

SCALE: 1" = 100' — FIGURE: 2



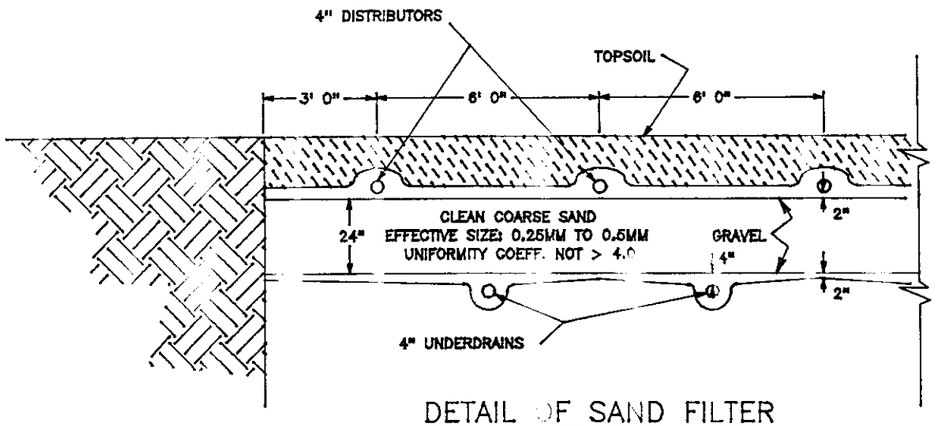
CHLORINE CONTACT TANK
500 GAL. PRECAST CONC. TANK
SIZE: 5'-0" DIA. X 5'-6" DEEP
WALLS & TOP 3" THICK REINFORCED

PUMP PIT
600 GAL. PRECAST CONC. TANK
SIZE: 5'-6" DIA. X 5'-6" DEEP; WALLS 3" THICK
TOP INCREASED TO 6" THICK, REINFORCED
SEWAGE PUMP: WEI PUMP CO. C-17047 OR EQUAL
CAPACITY 200 GPM FOR 8 FT. HEAD
REQUIRED CAPACITY: 174 GPM

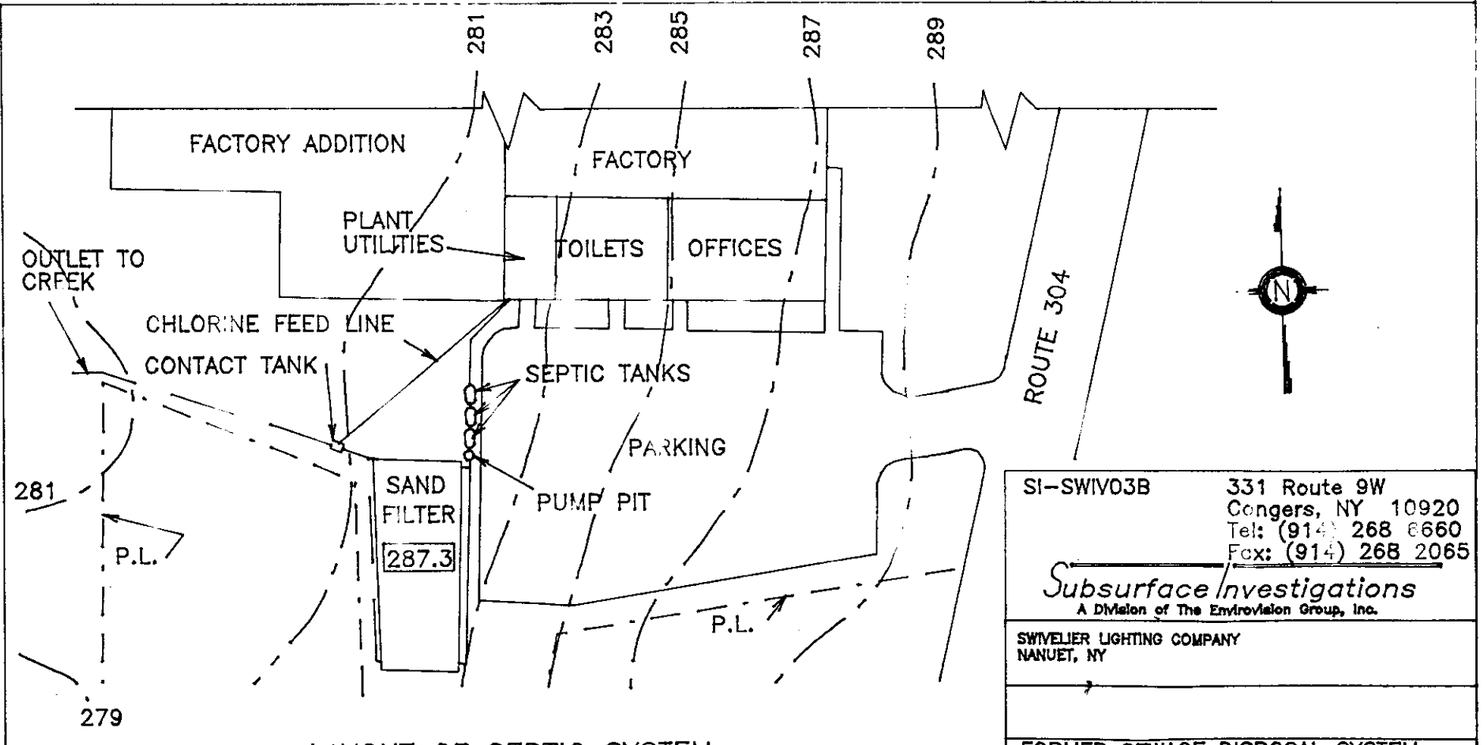
SEPTIC TANKS: COMBINED CAPACITY 3000 GAL.
(3) - 1000 GAL. PRECAST CONC. TANKS
SIZE: OVAL TANKS 4'-6" WIDE, 8'-6" LONG, 5'-6" DEEP
WALLS & TOP 3" THICK, REINFORCED

PROFILE OF INACTIVE ONSITE SEPTIC SYSTEM
AS PER FRED R. HOLT, INC. DATED 12-11-1956
REVISED 02-23-1957 AND 05-27-1957

SCALE: 1" = 8'-0"



DETAIL OF SAND FILTER
NOT TO SCALE



LAYOUT OF SEPTIC SYSTEM
NOT TO SCALE

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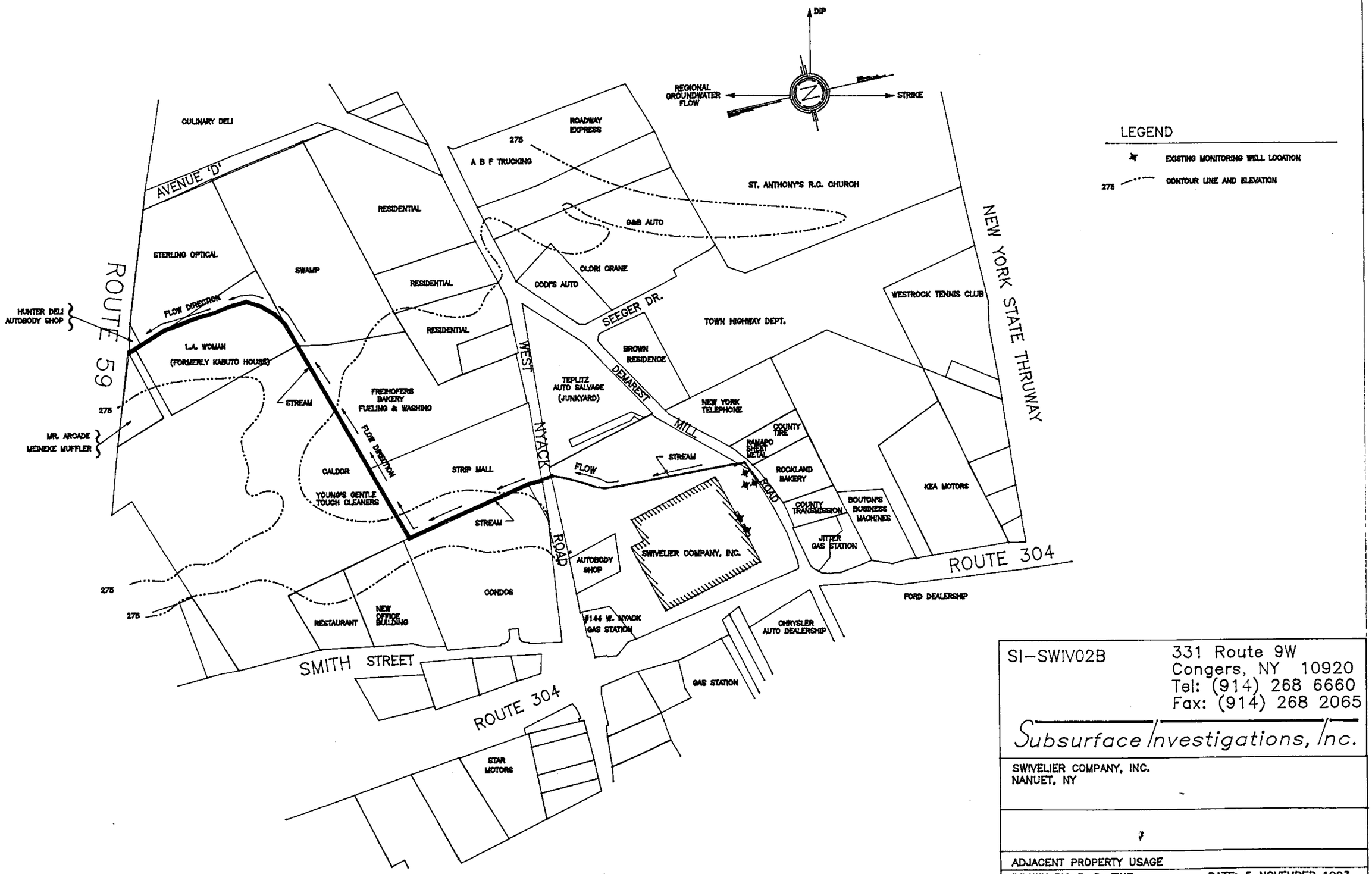
SWIVELIER LIGHTING COMPANY
NANUET, NY

FORMER SEWAGE DISPOSAL SYSTEM

DRAWN BY: R. B. FINE — DATE: 6 MAY 1993
SCALE: AS NOTED — FIGURE: 3



SI-SWIV02B

331 Route 9W
Congers, NY 10920
Tel: (914) 268 6660
Fax: (914) 268 2065

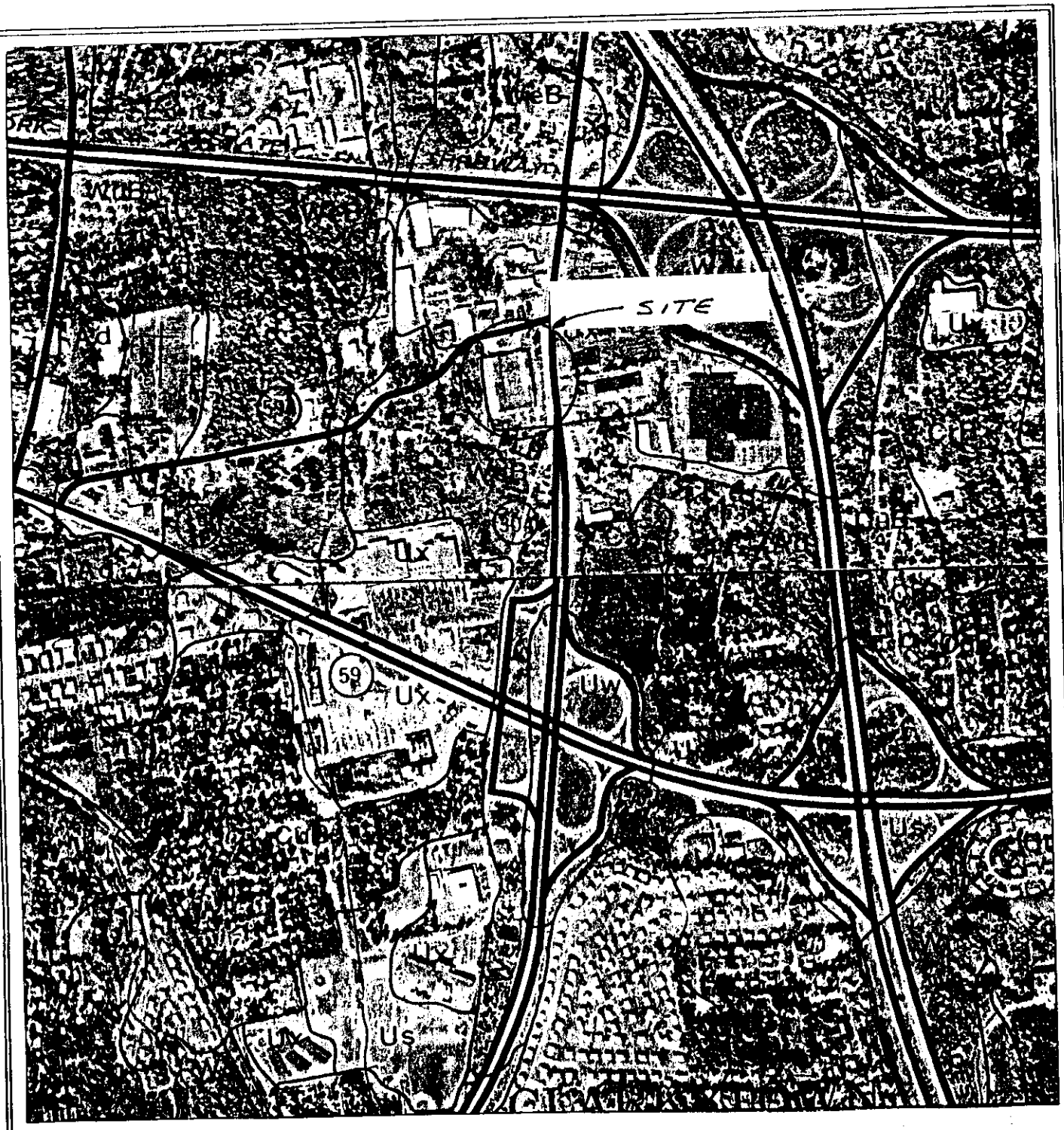
Subsurface Investigations, Inc.

SWIVELIER COMPANY, INC.
NANUET, NY

ADJACENT PROPERTY USAGE

DRAWN BY: R. B. FINE — DATE: 5 NOVEMBER 1993

SCALE: 1" = 300' — FIGURE: 4



SOURCE: US DEPT. OF AGRICULTURAL CLASSIFICATION AND CORRELATION OF SOILS -ROCKLAND COUNTY REVISED 1986.

N

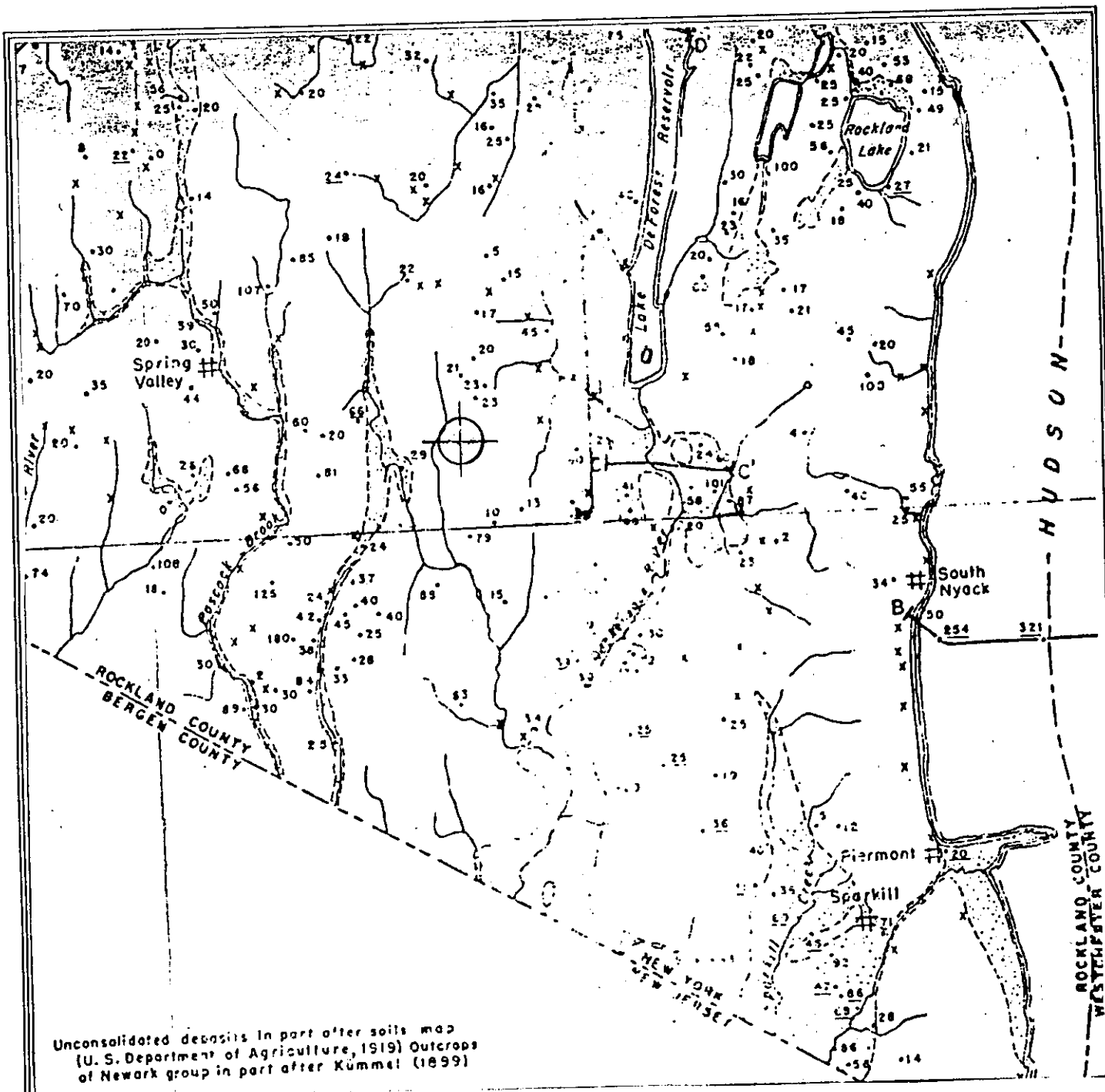
Subsurface Investigations Inc.

SOIL SURVEY MAP

DRAWN BY: BM DATE: 10/92

SCALE: 1"=1320' FIGURE 5

JOB: 91059 PAGE ___ OF ___



SOURCE: BULLETIN GW-42
U.S.G.S. COOPERATIVE GROUNDWATER REPORT, PLATE 1 BY NATHANIEL M. PERLMUTTER (1959).

N

LEGEND

- WELL LOCATION AND DEPTH TO BEDROCK
- 28 DENOTES BEDROCK OUTCROP
- X (NEWARK GROUP)
- STRATIFIED DRIFT &ALLUVIUM.

Subsurface Investigations Inc.

DEPTH TO BEDROCK

DRAWN BY: BM DATE: 3/93
SCALE: 1" 3700' FIGURE: 6
JOB: 91059 PAGE ___ OF ___

NYACK AND PARK RIDGE QUADRANGLES

N

LEGEND

DENOTES DIRECTION OF BEDDING STRIKE AND DIP.

Subsurface Investigations Inc.

APPROXIMATE STRIKES & DIPS

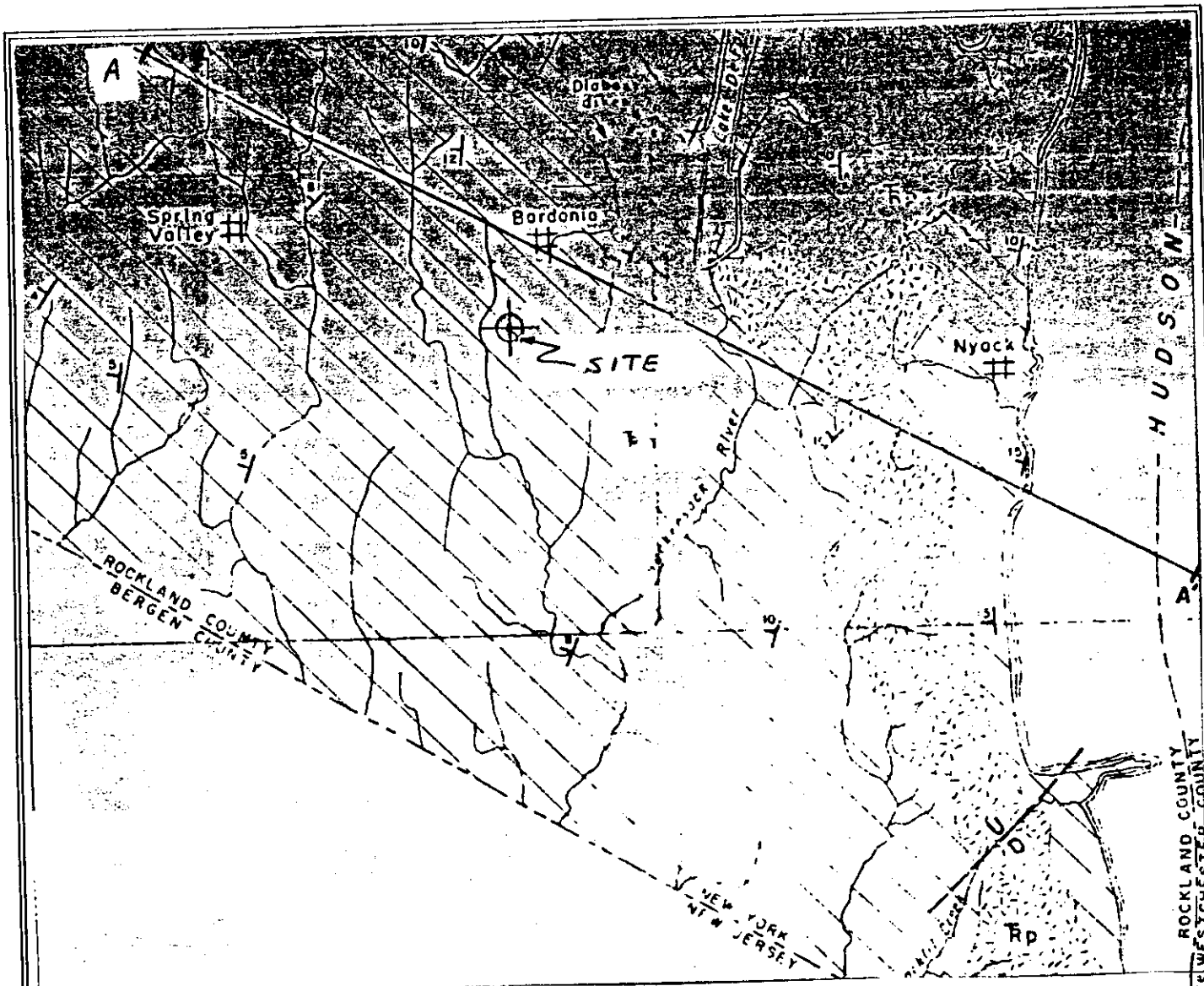
DRAWN BY: BM DATE: 10/92

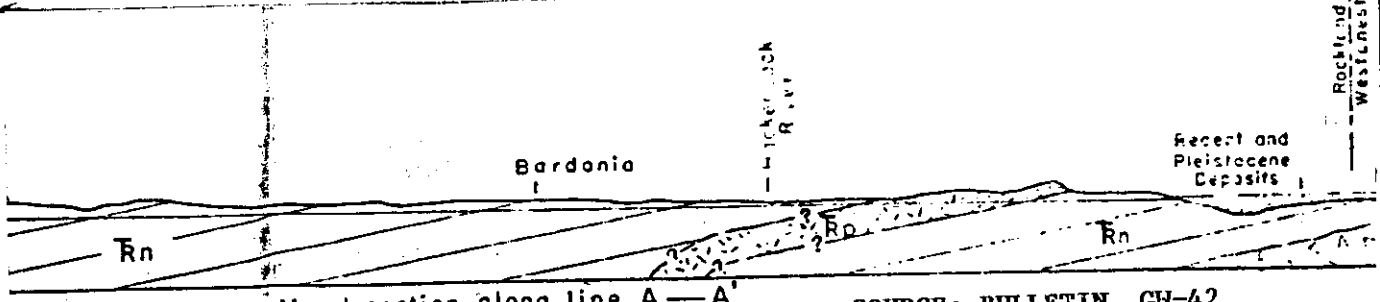
SCALE: 1"=2,000'

JOB: 91059

FIGURE 7

PAGE ___ OF ___





Generalized section along line A — A'

SOURCE: BULLETIN GW-42
U.S.G.S. COOPERATIVE GROUNDWATER REPORT PLATE Z BY NATHANIEL M. PERLMUTTER(1959)

LEGEND

N

10/ - STRIKE AND DIP DENOTING ANGEL OF DIP

u/d - NORMAL FAULT

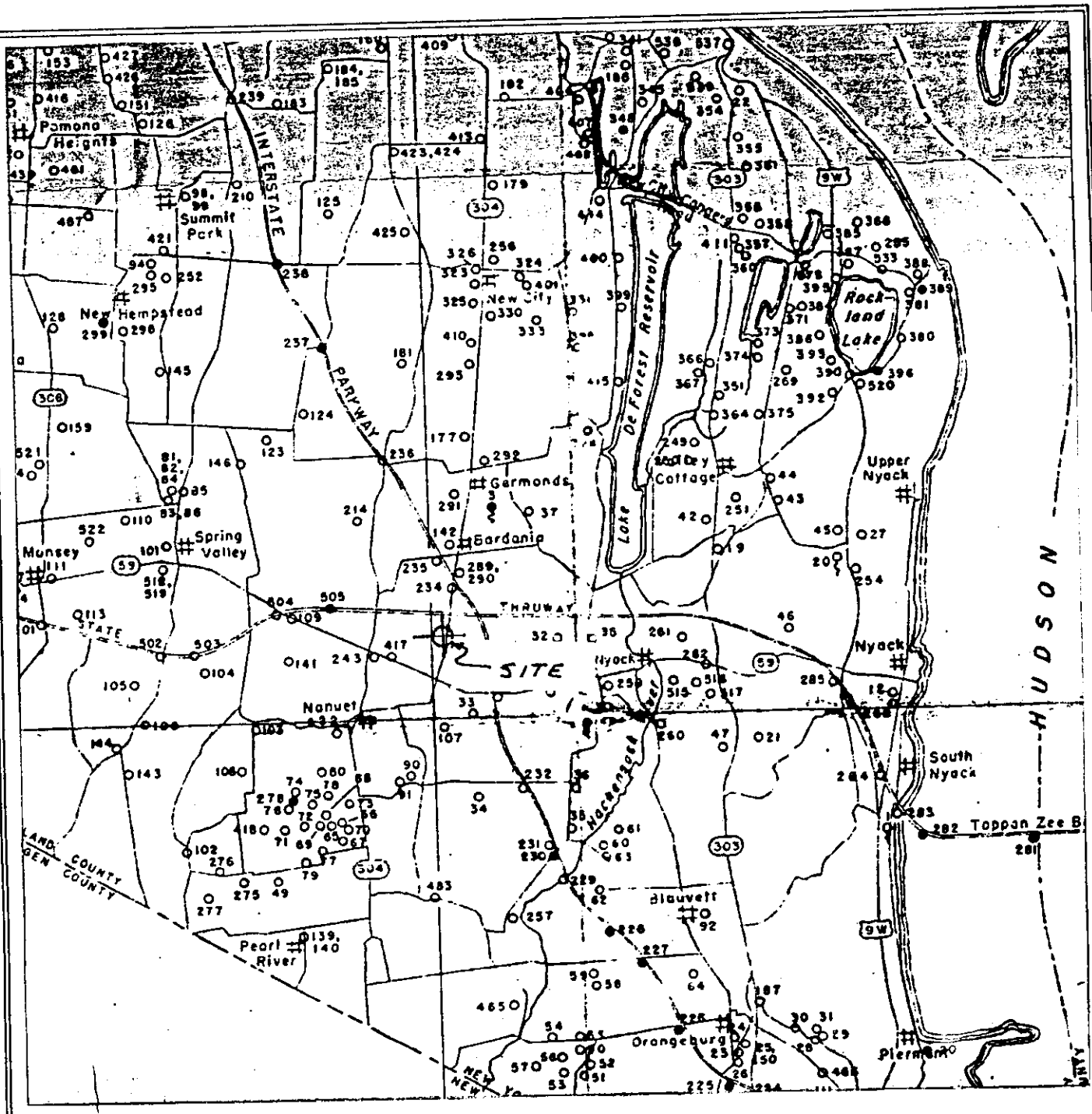
T_{RP} - PALISADES DIABASE &INTRUSIVES

T_{RN} - NEWARK GROUP (SANDSTONE, SHALE, AND CONGLOMERATE)

Subsurface Investigations Inc.

BEDROCK GEOLOGY MAP

DRAWN BY: BM DATE: 3/93
SCALE: 1"=3700' FIGURE: 8
JOB: 91059 PAGE ___ OF ___



SOURCE :BULLETIN GW-42 U.S.G.S.
COOPERATIVE GROUNDWATER REPORT,PLATE 3 BY NATHANIEL M. PERLMUTTER.(1959)

N

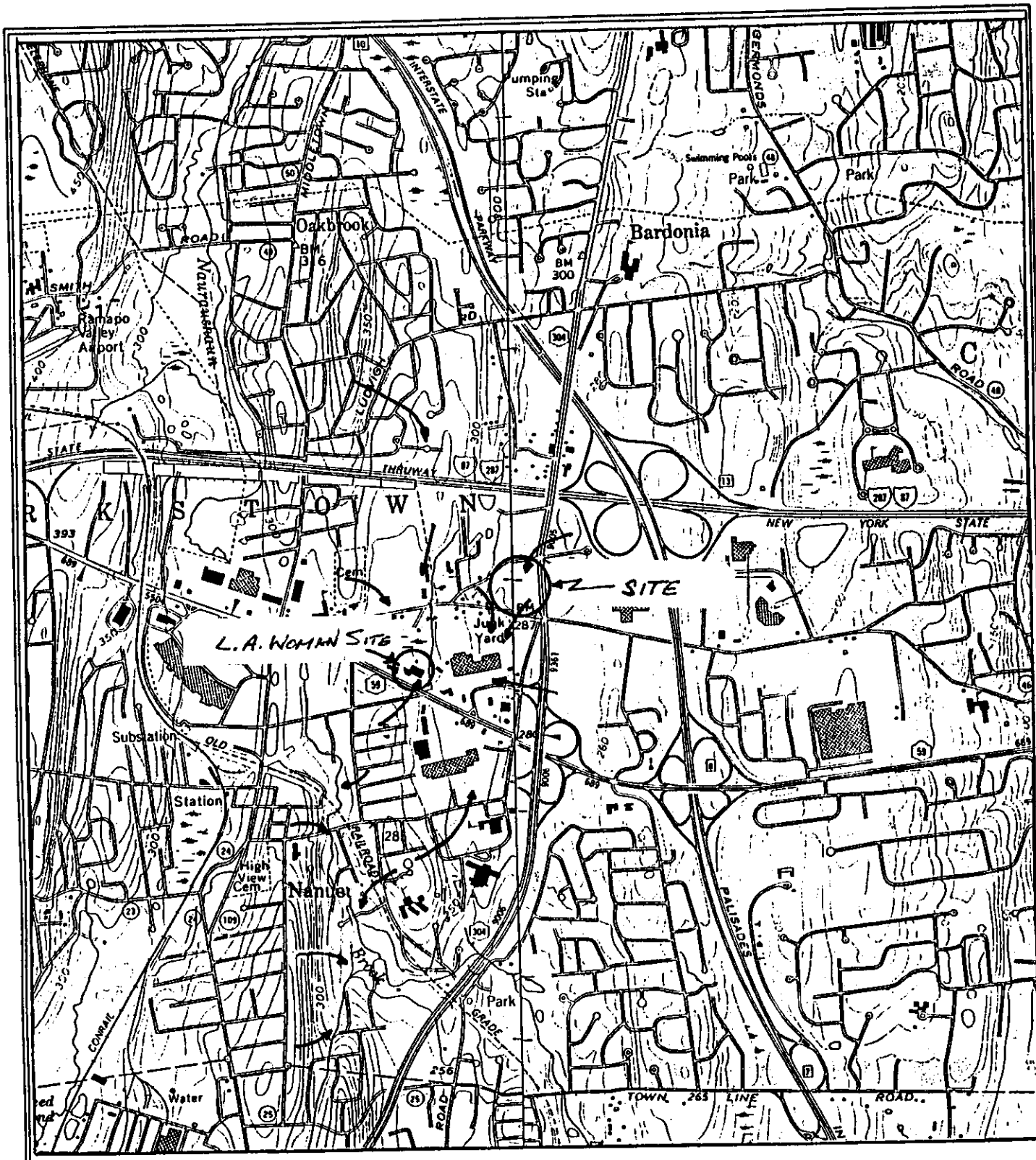
LEGEND

417
O DENOTES WELL OR SOIL BORING LOCATION THAT PENETRATED TO BEDROCK.

Subsurface Investigations Inc.

REGIONAL WELL LOCATIONS

DRAWN BY: BM DATE: 3/93
SCALE: 1" =3700' FIGURE 9
JOB: 91059 PAGE ___ OF ___



NYACK AND PARK RIDGE QUADRANGLES

LEGEND

DENOTES DIRECTION OF REGIONAL GROUNDWATER FLOW.

Subsurface Investigations Inc.

REGIONAL GROUNDWATER FLOW PATTERNS

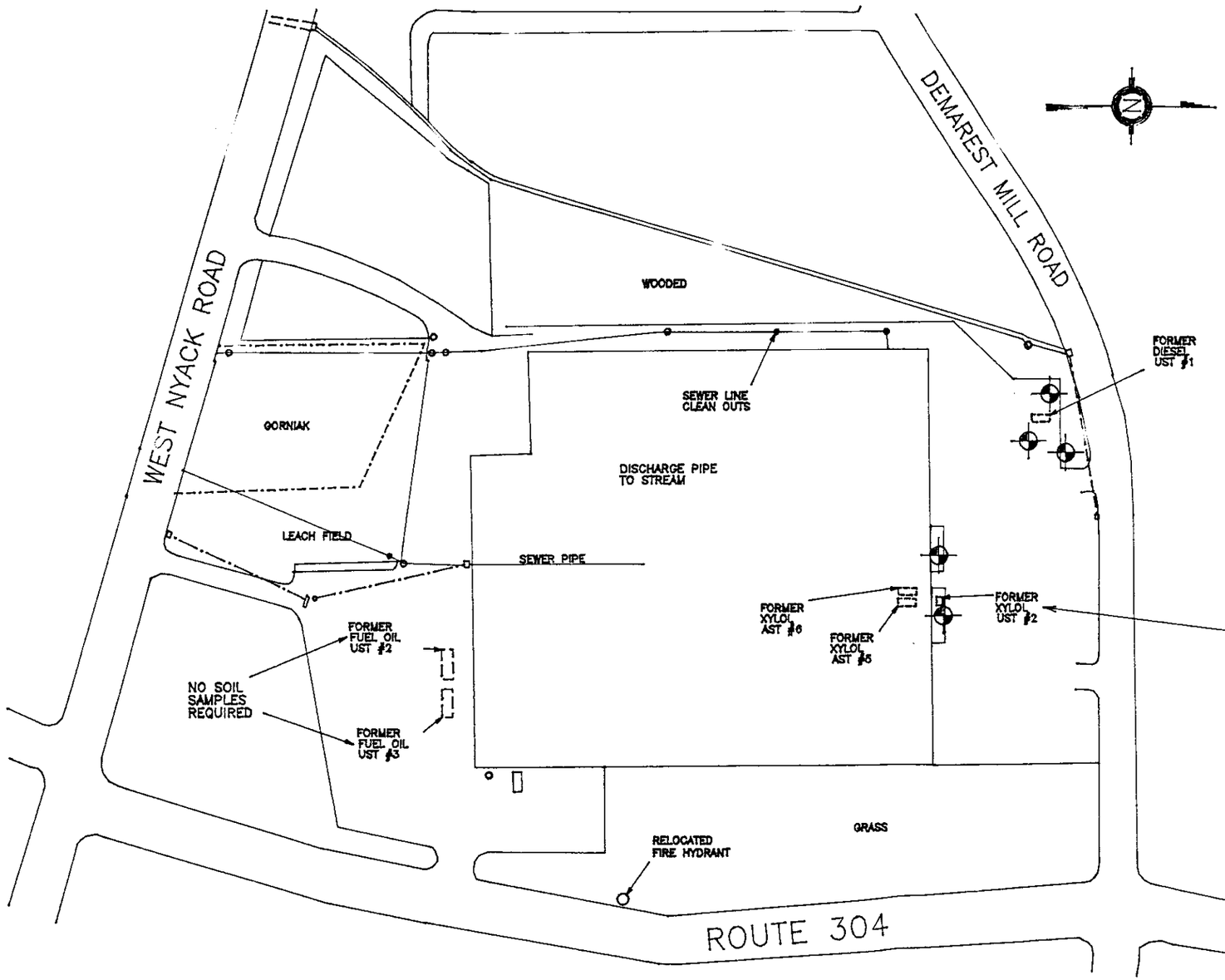
DRAWN BY: BM DATE: 10/92

SCALE: 1=2,000'

JOB: 91059

FIGURE 10

PAGE — OF —



LEGEND

EXISTING MONITORING WELL LOCATION

NP – NOT PRESENT

ND – NOT DETECTED

NOTE: ALL RESULTS IN MILLIGRAMS PER KILOGRAM (MG/KG)

COMPOUND	SAMPLE 1S 11/20/87	SAMPLE 2S 11/20/87	SAMPLE 3S 11/20/87	SAMPLE 5S 11/20/87
GASOLINE	PRESENT	NP	PRESENT	PRESENT
LUBE OILS	NP	NP	NP	NP
FUEL OIL #1	ND	ND	ND	ND
FUEL OIL #2	ND	ND	1500	10.5
FUEL OIL #3	ND	ND	ND	ND
FUEL OIL #4	ND	ND	ND	ND
FUEL OIL #5	ND	ND	NP	ND
FUEL OIL #6	ND	ND	ND	ND

COMPOUND	11/11/86	12/12/86
TOTAL XYLENES	0.027	0.07

SII–SWIV0393
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Subsurface Investigations,
A DIVISION OF THE ENVIROVISION GROUP, INC.

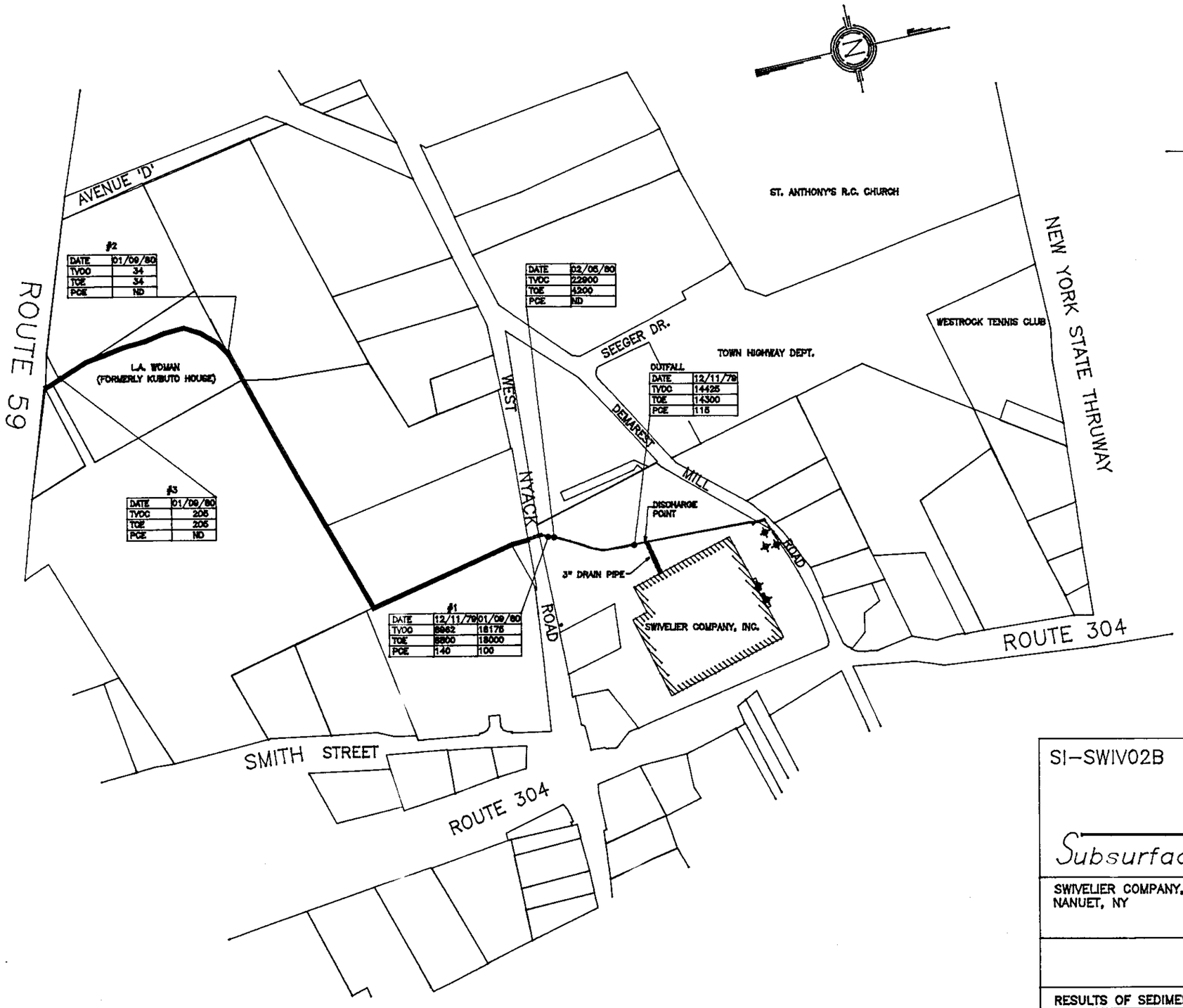
SWIVELIER COMPANY, INC.
NANUET NY

RESULTS OF SOIL SAMPLING
MARCH 30, 1993

SITE PLAN

DRAWN BY: R. FINE — DATE: NOVEMBER 11, 1993

SCALE: 1" = 100' — FIGURE: 11



LEGEND

- ✱ EXISTING MONITORING WELL LOCATION

TVOC TOTAL VOLITILE ORGANIC COMPOUNDS
TCE TRICHLOROETHYLENE
PCE TETRACHLOROETHENE
ND NOT DETECTED

NOTE: RESULTS IN MICROGRAMS PER KILOGRAM(UG/KG)

NOTE:

SAMPLES COLLECTED BY
ROCKLAND COUNTY HEALTH DEPARTMENT

SI-SWIV02B

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Fax: (914) 268 2065

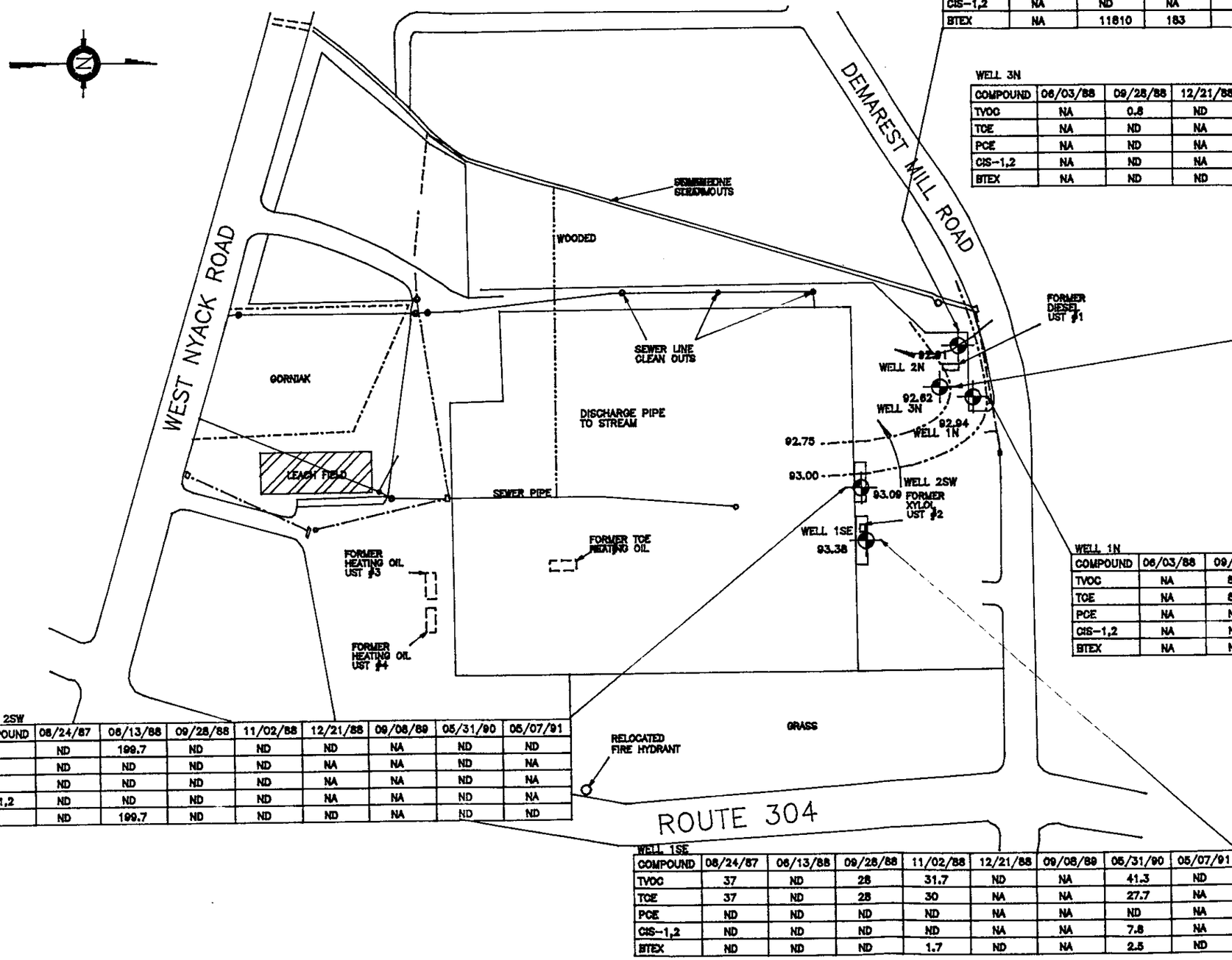
Subsurface Investigations, Inc.

SWIVELIER COMPANY, INC.
NANUET, NY

RESULTS OF SEDIMENT SAMPLING

DRAWN BY: R. B. FINE — DATE: 5 NOVEMBER 1993

SCALE: 1" = 300' — FIGURE: 12



WELL 2N

COMPOUND	06/03/88	09/28/88	12/21/88	09/06/89	05/31/90	05/07/91	10/01/91	12/26/91	04/01/92	07/09/92
TVOC	NA	14387	183	ND	946.6	632.3	ND	1498.9	4401	216.4
TCE	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
PCE	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
CIS-1,2	NA	ND	NA	ND	7.8	NA	NA	NA	NA	NA
BTEX	NA	11810	183	ND	938.8	632.3	ND	1498.9	4401	216.4

WELL 3N

COMPOUND	06/03/88	09/28/88	12/21/88	09/06/89	05/31/90	05/07/91	10/01/91	12/26/91	04/01/92	07/09/92
TVOC	NA	0.8	ND	7758	169.6	124.7	NA	NA	152.1	608.8
TCE	NA	ND	NA	ND	3.0	NA	NA	NA	NA	NA
PCE	NA	ND	NA	ND	ND	NA	NA	NA	NA	NA
CIS-1,2	NA	ND	NA	ND	37.1	NA	NA	NA	NA	NA
BTEX	NA	ND	ND	6158	124.4	124.7	NA	NA	152.1	608.8

LEGEND

WELL 2SW
93.09 — EXISTING MONITORING WELL DESIGNATION, AND GROUNDWATER ELEVATION, 5/1/93

TVOC — TOTAL VOLATILE ORGANIC COMPOUNDS
TCE — TRICHLOROETHENE
PCE — TETRACHLOROETHENE
CIS-1,2 — CIS-1,2-DICHLOROETHENE
BTEX — BENZENE, TOLUENE, ETHYLBENZENE, & XYLENE
NA — NOT ANALYZED
ND — NOT DETECTED
GROUNDWATER FLOW DIRECTION WITH LINES OF EQUAL HEAD

NOTE: RESULTS IN MICROGRAMS PER LITER(MG/L)

WELL 1N

COMPOUND	06/03/88	09/28/88	12/21/88	09/06/89	05/31/90	05/07/91	10/01/91	12/26/91
TVOC	NA	8.3	ND	NA	42.7	ND	ND	2.8
TCE	NA	8.3	NA	NA	ND	NA	NA	NA
PCE	NA	ND	NA	NA	ND	NA	NA	NA
CIS-1,2	NA	ND	NA	NA	42.7	NA	NA	NA
BTEX	NA	ND	ND	NA	ND	ND	ND	2.8

WELL 2SW

COMPOUND	08/24/87	06/13/88	09/28/88	11/02/88	12/21/88	09/06/89	05/31/90	05/07/91
TVOC	ND	199.7	ND	ND	ND	NA	ND	ND
TCE	ND	ND	ND	ND	NA	NA	ND	NA
PCE	ND	ND	ND	ND	NA	NA	ND	NA
CIS-1,2	ND	ND	ND	ND	NA	NA	ND	NA
BTEX	ND	199.7	ND	ND	ND	NA	ND	ND

WELL 1SE

COMPOUND	08/24/87	06/13/88	09/28/88	11/02/88	12/21/88	09/06/89	05/31/90	05/07/91
TVOC	37	ND	28	31.7	ND	NA	41.3	ND
TCE	37	ND	28	30	NA	NA	27.7	NA
PCE	ND	ND	ND	ND	NA	NA	ND	NA
CIS-1,2	ND	ND	ND	ND	NA	NA	7.8	NA
BTEX	ND	ND	ND	1.7	ND	NA	2.5	ND

SI-SWIV01B1
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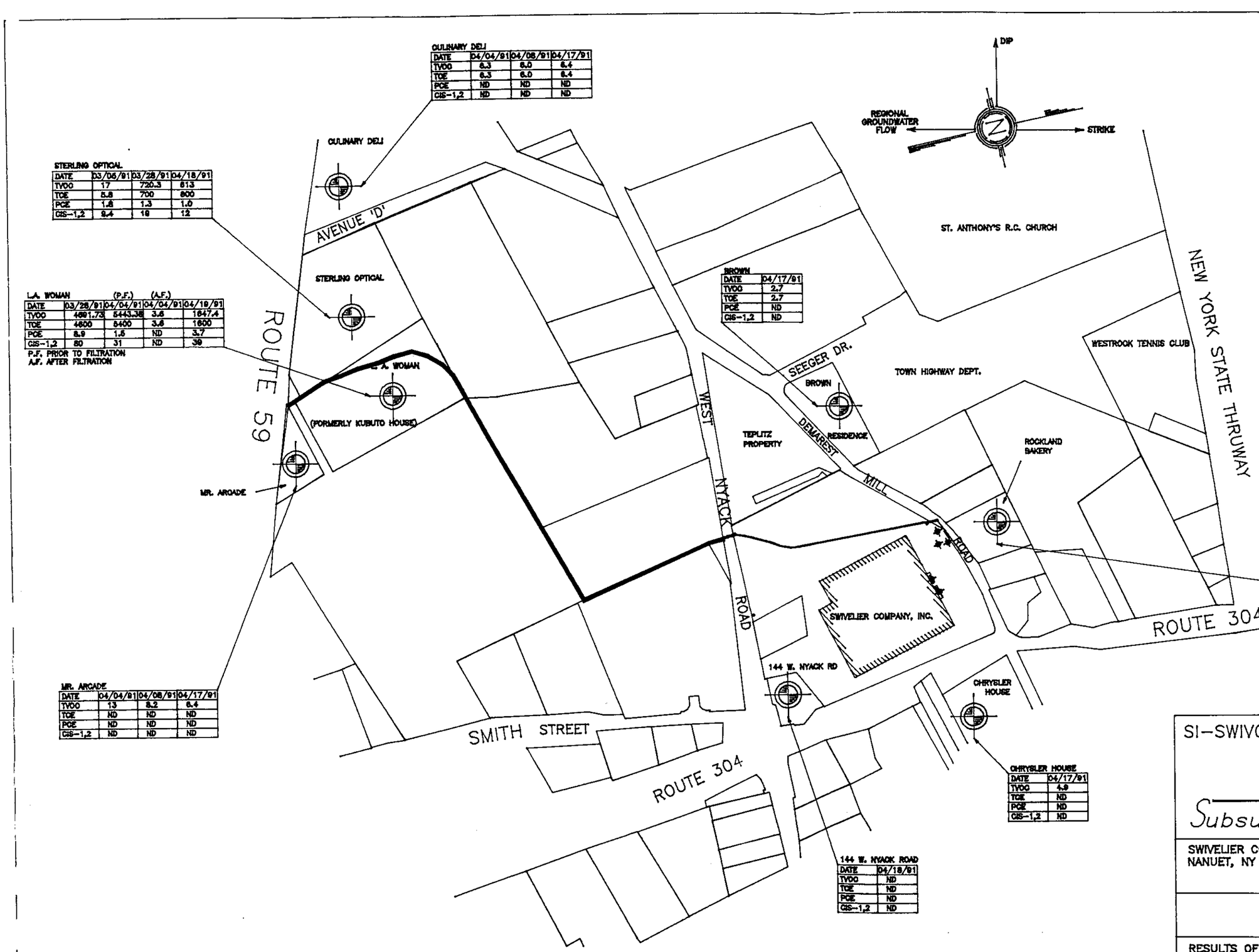
Subsurface Investigations
A Division of The Envirovision Group, Inc.

SWIVELIER COMPANY, INC.
NANUET NY

RESULTS OF ON-SITE GROUNDWATER SAMPLING & GROUNDWATER CONTOUR MAP, 5/1/93

DRAWN BY: R. B. FINE — DATE: 5 NOVEMBER 1993
SCALE: 1" = 100' — FIGURE: 16



CULINARY DELI

DATE	04/04/91	04/08/91	04/17/91
TVOC	6.3	6.0	6.4
TCE	6.3	6.0	6.4
PCE	ND	ND	ND
CIS-1,2	ND	ND	ND

STERLING OPTICAL

DATE	03/05/91	03/28/91	04/18/91
TVOC	17	720.3	813
TCE	5.8	700	800
PCE	1.8	1.3	1.0
CIS-1,2	9.4	19	12

L.A. WOMAN

DATE	03/28/91	(P.F.) 04/04/91	(A.F.) 04/04/91	04/18/91
TVOC	4891.73	5443.38	3.6	1647.4
TCE	4600	5400	3.6	1600
PCE	8.9	1.5	ND	3.7
CIS-1,2	80	31	ND	39

P.F. PRIOR TO FILTRATION
A.F. AFTER FILTRATION

BROWN

DATE	04/17/91
TVOC	2.7
TCE	2.7
PCE	ND
CIS-1,2	ND

ROCKLAND BAKERY

DATE	04/04/91	04/09/91
TVOC	0.72	0.56
TCE	ND	ND
PCE	ND	ND
CIS-1,2	ND	ND

MR. ARCADE

DATE	04/04/91	04/08/91	04/17/91
TVOC	13	8.2	8.4
TCE	ND	ND	ND
PCE	ND	ND	ND
CIS-1,2	ND	ND	ND

144 W. NYACK ROAD

DATE	04/18/91
TVOC	ND
TCE	ND
PCE	ND
CIS-1,2	ND

CHRYSLER HOUSE

DATE	04/17/91
TVOC	4.9
TCE	ND
PCE	ND
CIS-1,2	ND

LEGEND

- EXISTING MONITORING WELL LOCATION
- POTABLE WELL LOCATION & RESULTS OF ANALYSIS

TVOC TOTAL VOLITILE ORGANIC COMPOUNDS
TCE TRICHLOROETHYLENE
PCE TETRACHLOROETHENE
CIS-1,2 CIS-1,2-DICHLOROETHENE
ND NOT DETECTED

NOTE: RESULTS IN MICROGAMS PER LITER(UG/L

SI-SWIV02B

331 Route 9W
Congers, NY 10920
Tel: (914) 268 6660
Fax: (914) 268 2065

Subsurface Investigations, Inc.

SWIVELIER COMPANY, INC.
NANUET, NY

RESULTS OF POTABLE WELL SAMPLING

DRAWN BY: R. B. FINE
DATE: 5 NOVEMBER 1993

SCALE: 1" = 300'
FIGURE: 14

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION
INACTIVE HAZARDOUS WASTE DISPOSAL REPORT

CLASSIFICATION CODE: 2 REGION: 3 SITE CODE: 344036
EPA ID:

NAME OF SITE : Swivelier Company
STREET ADDRESS: 33 Route 304 COUNTY: ZIP:
TOWN/CITY: Rockland 10954
Nanuet

SITE TYPE: Open Dump- Structure- Lagoon- Landfill- Treatment Pond-
ESTIMATED SIZE: 6 Acres

SITE OWNER/OPERATOR INFORMATION:
CURRENT OWNER NAME....: Swivelier Company, Inc.
CURRENT OWNER ADDRESS.: 33 Route 304, Nanuet, NY
OWNER(S) DURING USE...: Swivelier Company, Inc.
OPERATOR DURING USE...: Swivelier Company, Inc.
OPERATOR ADDRESS.....: 33 Route 304, Nanuet, NY
PERIOD ASSOCIATED WITH HAZARDOUS WASTE: From unknown To 1980

SITE DESCRIPTION:
This site is an active industrial facility which has used xylene and trichloroethylene (TCE). As a result of a complaint, the Rockland County Health Department (RCHD) inspected the facility late in 1979 and found a pipe discharging liquid to a stream at the southwest corner of the building. Subsequent sampling showed high levels of TCE in the discharge, downstream surface water, and sediment. RCHD notified Swivelier that they must stop the discharge until a valid SPDES permit was obtained. By April 1980, this waste stream had been diverted to the sanitary sewer and was no longer going to the surface water. Groundwater monitoring wells installed on site following the removal of underground xylene and diesel fuel tanks in 1987 were found to be contaminated with TCE. During early 1991, RCHD discovered a significant TCE contamination problem in numerous drinking water wells downgradient of the site and has identified Swivelier as a likely source.

This site has been referred to the Division of Environmental Enforcement to negotiate a consent order for an RI/FS to determine the extent of TCE contamination and necessary remedial actions.

HAZARDOUS WASTE DISPOSED: TYPE	Confirmed-X	Suspected- QUANTITY (units)
Trichloroethene (TCE) (F001)		unknown

SITE CODE: 344036

ANALYTICAL DATA AVAILABLE:
Air- Surface Water-X Groundwater-X Soil- Sediment-X

CONTRAVENTION OF STANDARDS:
Groundwater-X Drinking Water-X Surface Water- Air-

LEGAL ACTION:

TYPE..: State- Federal-
STATUS: Negotiation in Progress- Order Signed-

REMEDIAL ACTION:

Proposed- Under design- In Progress- Completed-
NATURE OF ACTION:

GEOTECHNICAL INFORMATION:
SOIL TYPE:
GROUNDWATER DEPTH:

ASSESSMENT OF ENVIRONMENTAL PROBLEMS:

A definitive connection has not been established between the on-site disposal of TCE to the surface water and the TCE contamination discovered in downgradient wells during 1991. TCE contamination in the on-site wells can be attributed to the on-site use and disposal of TCE. An RI/FS is required to determine the extent of TCE contamination.

ASSESSMENT OF HEALTH PROBLEMS:

Groundwater is the primary source of drinking water in the area. The on-site groundwater monitoring wells sampling results indicate trichloroethene at levels up to 30 ppb were detected. Recently TCE was detected in a downgradient public supply well at levels up to 5400 ppb. No other media sampling has been taken to date. Therefore, additional monitoring wells should be installed off site to determine the distance of the contaminant plume. A Phase II RI/FS Investigation should be completed to determine the extent of environmental media contamination.

B

Prir

5738SS1 V2R1M1 920306 S1033269 08/11/92 11:26:40

Display Device . . . . . : DSP2030B
User . . . . . : MJC195

COMMERCIAL INQUIRY DATE : 8/11/92
33-B-18

SUBJECT
CLARKSTOWN

SCHWARTZ NATHAN
33 RTE 304 NANUET

TOTAL RES SITES 0
TOTAL COM SITES 1

STATUS
ROLL SEC TAXABLE
LAND $536,800
TOTAL $2,000,000

==========SALES==========COM SITE CO1 ==========BUILDINGS==========
DATE 04/89 PRICE $0 |BUILDING-SECTION 01-1 01-2
==========SITE==========|MODEL 1 STY STOR 1 STY STOR
PROPERTY CLASS >1USE SM B GRADE AVERAGE |FLOOR AREA 12,600 111,412
USE ROW RETAIL CONDITION NORMAL |BUILT 1970 1970
VALUATION DISTRICT 07 DESIRABILITY NORMAL |QUALITY AVERAGE AVERAGE
NEIGHBORHOOD YEAR BUILT 1970 |------ TOTAL BLDG ITEMS 2 -----

==========COMMERCIAL USE DATA==========

DIST	USER	TOT SQ FT	UNIT CODE	TOT UNTS	1BED	2BED	3BED
1	SMALL RETAIL	42,868					
2	LIGHT MFG	81,144					

========IMPROVEMENT DATA=======TOTAL USE ITEMS 2 ======LAND DATA==========

	TYPE	SIZE1	SIZE2	QUAN
1	PAVNG,ASPHL	200000	4	1
2	OVRHDOOR,CO	8	8	4

	TYPE	FRNT	DPTH	ACRES	SQR FT
1.	PRIME SITE			9.94	

==== TOTAL IMPROVEMENT ITEMS 4 |========== TOTAL LAND ITEMS === 1 =======

F1=MORE ITEMS F3=NEXT SITE F6=ASSESSMENT INQUIRY F10=RETURN TO MENU
F4=PRIOR SITE F9=GO TO XREF F11=PREV ITEMS 41.00

5738SS1 V2R1M1 920306 S1033269 08/11/92 11:28:28

Display Device . . . . . : DSP2030B
User . . . . . : MJC195

CLARKSTOWN NYSRPS ASSESSMENT INQUIRY DATE : 8/11/92

33 RTE 304 NANUET

33-B-18 YY ACCT NO 0058721000C

SCHL NANUET UNION FRE HSTD CLASS NON-HSTD PROP CLASS >1USE SM E

= OWNER & MAILING INFORMATION =| MISC =| ====== ASSESSMENT DATA ==========

SCHWARTZ NATHAN | RS - SS | CURRENT RES PERCENT

33 ROUTE 304 | 1 | LAND 536,800 TAXABLE

NANUET NY 10954 | BANK | TOTAL 2,000,000 COUNTY 2,000,000

| | PRIOR TOWN 2,000,000

| | LAND 536,800 SCHOOL 2,000,000

| | TOTAL 2,000,000 VILL (

====== SALES INFORMATION ==========|==========DIMENSIONS ==========

BOOK 352 DATE 05/08/89 |FRFT .00 DEPTH .00

PAGE 2373 |ACRES 9.94

PR OWNER TOMBACK LESTER |====TOTAL SPECIAL DISTRICTS 5 ====

=======TOTAL EXEMPTIONS 0 ======= | CODE UNITS PCT TYPE VALUE

CODE AMOUNT PCT INIT TERM VLG HC | 1 FD016

2 WD011

3 LT001

4 SD012 30.00 U 610.00

5 SR001

F1=XREF F2=NEXT PARCEL F3=NEXT EXEMPT/SPEC F6=GO TO INVENTORY

31.00- 02-011 F4=PREV EXEMPT/SPEC F10=RETURN TO MENU

First American Title Insurance Company of New York

Title No. 201-RO-9106

MORTGAGES:

1)

Mortgagor: Shabran Realty Inc.

Amount: $31,500.00

Dated: 7/16/56

Recorded: 7/19/56

Liber: 598

Mortgagee: Robert J. Maier and
John Maier

Page:525

1-A ASSIGNMENT OF MORTGAGE

Robert J. Maier and
John Maier
to
Shabran Realty Inc.

Dated 6/24/57
Recd 7/15/57
Liber 630 mp 345

1-B ASSIGNMENT OF MORTGAGE

Shabran Realty Inc.
to
The Bowery Savings Bank

Dated 8/22/57
Recd 8/26/57
Liber 634 mp 290

Mortgage affects easterly part of premises

This title report does not show all the terms and provisions of the mortgage(s) set forth herein. Interested parties should contact the holder(s) thereof to ascertain the terms, convenants and conditions contained therein, and to determine if there are any unrecorded amendments or modification thereto.

First American Title Insurance Company of New York

Title No. 201-RO-9106

MORTGAGE

2)

Mortgagor: Shabran Realty Inc.

Amount: $300,000.00

Dated:2/13/57

Recorded:2/20/57

Liber 619

Mortgagee:Kings County Trust Company

Mp 237

2-A ASSIGNMENT OF MORTGAGE

Kings County Trust Company

Dated 8/21/57
Recd 8/26/57
Liber 634 mp 292

to

The Bowery Savings Bank

Mortgage affects easterly part of premises

This title report does not show all the terms and provisions of the mortgage(s) set forth herein. Interested parties should contact the holder(s) thereof to ascertain the terms, covenants and conditions contained therein, and to determine if there are any unrecorded amendments or modifications thereto.

First American Title Insurance Company of New York

Title No. 201-201-RO=9106

MORTGAGE

3)

Mortgagor: Orwin Realty Corp.

Amount: $225,000.00

Dated: 11/4/59

Recorded: 11/9/59

Liber 713

Mp 284

Mortgagee: The Bowery Savings Bank

3-A ASSIGNMENT OF MORTGAGE

The Bowery Savings Bank

Dated 4/29/65
Recd 5/19/65
Liber 844 mp 1120

to

The Dime Savings Bank of Brooklyn

Assigns mortgages recorded in Liber 598 mp 525, Liber 619 mp 237 and Liber 713 mp 284.

Mortgage affects easterly part of premises

This title report does not show all the terms and provisions of the mortgage(s) set forth herein. Interested parties should contact the holder(s) thereof to ascertain the terms, covenants and conditions contained therein, and to determine if there are any unrecorded amendments or modifications thereto.

Title No. 201-RO_9106

MORTGAGE

4)

Mortgagor: Salley Nadel

Amount: $297,593.53

Dated:4/30/65

Recorded:5/19/65

Liber 844

Mortgagee:The Dime Savings Bank of Brooklyn

Mp 1125

Consolidated with mortgages recorded in Liber 598 mp 525, Liber 619 mp 237, Liber 713 mp 284 to form a single lien in the principal amount of $650,000.00

Mortgage affects easterly part of premises.

This title report does not show all the terms and provisions of the mortgage(s) set forth herein. Interested parties should contact the holder(s) thereof to ascertain the terms, covenants and conditions contained therein, and to determine if there are any unrecorded amendments or modifications thereto.

See Amended

First American Title Insurance Company of New York

AMENDED

Title No. 201-RO_9106

MORTGAGE

4)

Mortgagor: Salley Nadel

Amount: $297,593.53

Dated:4/30/65

Recorded:5/19/65

Liber 844

Mortgagee:The Dime Savings Bank of Brooklyn

Mp 1125

Consolidated with mortgages recorded in Liber 598 mp 525, Liber 619 mp 237, Liber 713 mp 284 to form a single lien in the principal amount of $650,000.00

Mortgage affects easterly part of premises.

ASSIGNMENT OF MORTGAGE

The Dime Savings Bank of New York
f/k/a The Dime Savings Bank of Brooklyn

Dated 4/30/85
Recd 5/3/85
Liber: 92 mp 122

to

Narbar Associates

Assigns mortgage Liber 844 mp 1125

This title report does not show all the terms and provisions of the mortgage(s) set forth herein. Interested parties should contact the holder(s) thereof to ascertain the terms, covenants and conditions contained therein, and to determine if there are any unrecorded amendments or modifications thereto.

LIBER 1002 PAGE 564

ROW 91-R1 (1/68)
(Section A)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
REAL PROPERTY DIVISION

9287

332/50

APPROPRIATION OF PROPERTY BY THE PEOPLE OF THE STATE OF NEW YORK

PROJECT: PIN 8155.00-222 PROC. 4876
COYLES CORNERS-SHORT CLOVE
S.H. 9005
ROCKLAND COUNTY
TOWN OF CLARKSTOWN

DESCRIPTIONS AND MAPS	
MAP NOS.	PARCEL NOS.
396	452,453
397	461,467
406	465
407	466

NOTICE OF APPROPRIATION

Pursuant to the statute set forth in the above descriptions and maps

TO: SWIVELIER COMPANY, INC.
ATLANTIC METAL SPINNING COMPANY
A. SKLAR & SONS, INC.
ALLIED PRINTING
CORPORATION

TAKE NOTICE that ~~on~~ the 26 day of November, 1975, there was filed in the office of the Department of State a certified copy of each of the above designated descriptions and maps of property; and that on the 15 day of April, 1976, there was filed in the office of the clerk of the county, in which such property is situated, a copy of each of such descriptions and maps.

TAKE FURTHER NOTICE that title to the property, easements, interests or rights described in said descriptions and maps vested in The People of the State of New York upon such filing in the office of said county clerk.

COMMISSIONER OF TRANSPORTATION
OF THE STATE OF NEW YORK

Dated: December 29, 1976

J.E. Collison

J.E. Collison Director of Real ~~Property~~ Estate 317.

RECORDED JAN 25 1977 1:00 P.M.

August F. Haussler, CLERK

APPROPRIATION OF PROPERTY BY THE PEOPLE OF THE STATE OF NEW YORK

PROJECT:

COYLES CORNERS-SHORT CLOVE
S.H. NO. 9005
ROCKLAND COUNTY
TOWN OF CLARKSTOWN

DESCRIPTIONS AND MAPS

MAP NOS.	PARCEL NOS.
396	452,453
397	461,467
406	465
407	466

NOTICE OF APPROPRIATION

Pursuant to the statute set forth in the above descriptions and maps.

TO: NATHAN R. SCHWARTZ, HAROLD S. SCHAPIRO, HYMAN C. BRANDMAN, LESTER E. TOMBACK, and ALVIN D. SCHWARTZ, D/B/A NARBAR ASSOCIATES — 33 Route 304, Nanuet, New York

DIME SAVINGS BANK OF BROOKLYN

NEW YORK TELEPHONE COMPANY — 140 West Street, New York, New York

TAKE NOTICE that on the 26 day of November, 19 75, there was filed in the office of the Department of State a certified copy of each of the above designated descriptions and maps of property; and that on the _____ day of APR 15 1976, 19____ there was filed in the office of the clerk of the county, in which such property is situated, a copy of each of such descriptions and maps.

TAKE FURTHER NOTICE that title to the property, easements, interests or rights described in said descriptions and maps vested in The People of the State of New York upon such filing in the office of said county clerk.

COMMISSIONER OF TRANSPORTATION
OF THE STATE OF NEW YORK

Dated: APR 15 1976

BY: [redacted]
J.E. Collison, Director
Real Estate Division

Filed
RECORDED APR 15 1976 1:45 P.M.
Augusta H. Hansen, CLERK

Appr

ROW 91-R1 (1/68)
(Section A)

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
REAL PROPERTY DIVISION

9281

APPROPRIATION OF PROPERTY BY THE PEOPLE OF THE STATE OF NEW YORK

PROJECT: PIN 8155.00-222 PROC. 4876
COYLES CORNERS-SHORT CLOVE
S.H. NO. 9005
ROCKLAND COUNTY
TOWN OF CLARKSTOWN

DESCRIPTIONS AND MAPS

MAP NOS.	PARCEL NOS.
409	471
410	472

NOTICE OF APPROPRIATION

Pursuant to the statute set forth in the above descriptions and maps

TO: NARBAR ASSOCIATES.
DIME SAVINGS BANK OF NEW YORK
SWIVELIER COMPANY, INC.
ATLANTIC METAL SPINNING COMPANY

TAKE NOTICE that on the 15 day of June, 19 77, there was filed in the office of the Department of State a certified copy of each of the above designated descriptions and maps of property; and that on the 25 day of JANUARY, 19 78 there was filed in the office of the clerk of the county, in which such property is situated, a copy of each of such descriptions and maps.

TAKE FURTHER NOTICE that title to the property, easements, interests or rights described in said descriptions and maps vested in The People of the State of New York upon such filing in the office of said county clerk.

COMMISSIONER OF TRANSPORTATION
OF THE STATE OF NEW YORK

Dated: 25 JANUARY 1978

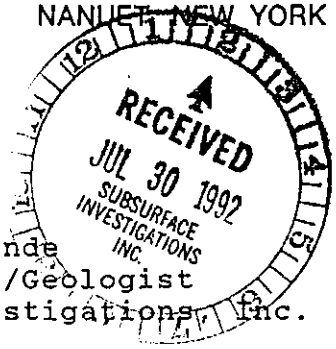
BY: J.E. Collison
J.E. Collison, Director, Real Estate Div.

RECORDED JAN 25 1978 1:00 P.M.
August H. Hansen, CLERK

LIBER 1002 PAGE 563

SWIVELIER
33 ROUTE 304 • NANUET, NEW YORK 10954-2988 • PHONE: 914-623-3471

July 29, 1992



Mr. Brian H. Mende
Project Manager/Geologist
Subsurface Investigations, Inc.
331 Route 9W
Congers, NY 10920

Re: Swivelier Operations.

Dear Brian:

The Swivelier operation consists of mainly the assembly and finishing of parts.

Those parts that are unfinished, are first degreased, then painted and assembled into various electrical fixtures.

We do at times perform minor operations such as drilling, welding, tapping and milling of components, where modifications are required.

The finished assemblies, are then shipped to distributors or directly to job sites.

Sincerely,

SWIVELIER COMPANY, INC.

Michael I. Schwartz
President
/jam

SWIVELIER
33 ROUTE 304 • NANUET, NEW YORK 10954-2988 • PHONE: 914-623-3471

June 16, 1992

Mr. Brian H. Mende
Project Manager/Geologist
Subsurface Investigations, Inc.
331 Route 9W
Congers, NY 10920

Re: Degreaser

Dear Brian:

The terminology "discharging into the creek" is a confusing statement, because the fact is that we have never knowingly directly discharged Trichloroethylene into the creek.

The Trichloroethylene was heated in the degreaser and cooled with a water jacket, which ran around outside the degreaser. Water was not reclaimed and was discharged into a floor drain which in turn was discharged in the creek.

To our knowledge, no floor drains went into the leach fields. All floor drains run east to west and are not connected to any of the north to south sewer lines.

Trichloroethylene was recirculated into an above ground tank, reclaimed and reused.

The Trichloroethylene was delivered to Swivelier by Guard All via tanker truck and was put into an above ground holding tank and re-filled as needed.

Somewhere along the way a microscopic leak developed in the water jacket and some Trichloroethylene was introduced into the cooling water, which surrounds the degreaser, which was transmitted into the creek.

Sincerely,

SWIVELIER COMPANY, ~~INC~~

Michael I. Schwartz
President
/jam

Tek Brooklyn Hauling

THIS MEMORANDUM is an acknowledgment that a Bill of Lading has been issued and is not the Original Bill of Lading, nor a copy or duplicate, covering the property named herein, and is intended solely for filing or record.

Shipper's No._____

(Name of Carrier)

RECEIVED, subject to the classifications and tariffs in effect on the date of receipt by the carrier of the property described in the Original Bill of Lading.

Carrier's No._____

At **South Norwalk, Conn. 06856** RECEIVED 01-17-80, 19--

From **GUARD ALL CHEMICAL CO., INC.**

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

1980 JAN 22 AM 9 18

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

NANUET, N.Y. (Mail or street address of consignee—For purposes of notification only.)

Consigned to Swivilier Co.

Destination Nanuet State N.Y. County_____ Delivery Address ★ 33 Route 304

(★ To be filled in only when shipper desires and governing tariffs provide for delivery thereat.)

Route_____

Delivering Carrier_____ Car or Vehicle Initials_____ No._____

NO PACKAGES	HAZARDOUS MATERIALS	Kind of Package, Description of Articles, Special Marks, and Exceptions	*WEIGHT (SUBJECT TO CORR)	CLASS OR RATE	CHECK COLUMN
394		PICK UP FOR CREDIT			
		*gals. Trichlorethylene			
		925 = 1084			
		12.324# = 1 gallon .275#			
		4855# = #1335.125			
		[illegible]			
TOTAL PIECES					

SHIPPER'S CERTIFICATION. This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. SIGNATURE_____ TITLE_____

* If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

NOTE--Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property. The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding_____ per_____

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivering of this shipment without payment of freight and all other lawful charges.

Per_____
(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $_____ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier.

Per_____
(The signature here acknowledges only the amounts prepaid.)

Charges Advanced:

$_____

(Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Interstate Commerce Commission.)

Shipper, Per_____ Agent, Per_____

Permanent post office address of shipper

PRINTED BY GRAYARC CO., INC., BROOKLYN, N.Y. 11232 (3)

PHONES:
NORWALK: (203) 838-5515
NEW HAVEN ENTERPRISE 5325

GUARD All CHEMICAL Co., Inc.

350 ELY AVENUE • SOUTH NORWALK, CONN. 06856

327000

INVOICE NUMBER
60965
DATE INVOICED & SHIPPED
1/17/80

SOLD TO
SWIVELIER COMPANY
33 ROUTE 304
NANUET NEW YORK 10954

SHIP TO

CUSTOMER ORDER NUMBER	DATE ENTERED	SALESMAN	SHIPPED VIA	F.O.B.		TERMS
	1/15/80	5	OUR TRUCK	PPD		NET 30 DAYS

CODE	CONTAINERS NUMBER	CONTAINERS TYPE	DESCRIPTION		NET WEIGHT OR GALLONS	UNIT PRICE	AMOUNT
01 11	394	GALS T/W/M	RETURNED FOR CREDIT TRICHLORETHYLENE @12.2#/GAL TOTAL		4807 #	.275 #	1,321.9 1,321.9

"GOODS COVERED BY THIS INVOICE WERE PRODUCED UNDER NOT LESS THAN THE MINIMUM CONDITIONS REQUIRED UNDER THE FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED."

PLEASE PAY ON THIS INVOICE.
NO STATEMENT RENDERED

DUPLICATE

To N.R.S.
"comper"
M.S.
2/12/80

This is the "500 gallons" of tank we used for the detox
We had it on loan from Guard All.

GL

file Board of Health

THIS SHIPPING ORDER must be legibly filled in, in ink, in Indelible Pencil, or in Carbon, and retained by the Agent

Shipper's No. ____________

(Name of Carrier)

Carrier's No. ____________

RECEIVE, subject to the classifications and tariffs in effect on the date of issue of this Shipping Order,

At **South Norwalk, Conn. 06858** Feb 12, 1980

From **GUARD ALL CHEMICAL CO., INC.**

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown), marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Official, Southern, Western and Illinois Freight Classifications in effect on the date hereof, if this is a rail or a rail-water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

(Mail or street address of consignee—For purposes of notification only.)

Consigned to Swivilier

Destination Nanuet State NY County ____________ Delivery Address ★ 33 Route 304

(★ To be filled in only when shipper desires and governing tariffs provide for delivery thereat.)

Route ____________

Delivering Carrier ____________ Car or Vehicle Initials ____________ No. ____________

NO PACKAGES	HAZARDOUS MATERIALS	Kind of Package, Description of Articles, Special Marks, and Exceptions	★ WEIGHT (SUBJECT TO CORR.)	CLASS OR RATE	CHECK COLUMN
		PICK UP			
1		500 gal. Tank			
TOTAL PIECES					

Subject to Section 7 of conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement: The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Per ____________
(Signature of Consignor.)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Col

Received $ ____________ to apply in prepayment of the charges on the property described hereon.

Agent or Cashier

Per ____________
(The signature here acknowledges only the amount prepaid.)

Charges Advanced:

$ ____________

†Shipper's imprint in lieu of stamp; not a part of Bill of Lading approved by the Interstate Commerce Commission.

SHIPPERS CERTIFICATION: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. SIGNATURE ____________ TITLE ____________

★ If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is "carrier's or shipper's weight."

NOTE—Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding ____________ per ____________

Shipper, Per ____________

☞ Agent must detach and retain this Shipping Order and must sign the Original Bill of Lading.

Permanent post office address of shipper

GRAYARC CO., INC., BROOKLYN, N.Y. 11232

WATER POLLUTION CONTROL BOARD

PERMIT TO DISCHARGE SEWAGE OR WASTE

INTO THE WATERS OF THE STATE

RECEIVED

AUG 12 1957

ROCKLAND COUNTY DEPARTMENT OF HEALTH

TOXIC MATERIALS STORAGE REGISTRATION FORM

Official Use Only

Fac. Ref. No. 1* [ ][ ][ ][ ][ ]

Receipt No. _____

Amt. of Fee _____

Principal Property Tax Code 14* District	8	*15*Section	33.	*16* Block	B.	*17* Lot	18.

	3 No. *4* Street	*5* Comm.	*6* State	*7* Zip	Phone No.
2*Facility Name SWIVELIER Co., INC.	33 ROUTE 304	NANUET	N.Y.	10954	914/623-3471
32*Facility Owner NARBAR ASSOCIATES	*33*No. *34*Street 33 ROUTE 304	*35*Comm. NANUET	*36*State N.Y.	*37*Zip 10954	Phone No. (914)623-4571
42*Facility Operator + Except for Tank #1 Operated by SWIVELIER Co INC Marico	*43*No. *44*Street Same as above	*45*Comm.	*46*State	*47*Zip	Phone No.
52*Land Owner NARBAR ASSOCIATES	*53*No. *54*Street Same as above	*55*Comm.	*56*State	*57*Zip	Phone No.
62*Tank Owner NARBAR ASSOCIATES	*63*No. *64*Street Same as above	*65*Comm.	*66*State	*67*Zip	Phone No.

70*Are chemical drums or containers stored at this site? Yes X No _____

*71*Empty Drums _____ *72*Full or Part Full X *73*Waste Material _____ *74*New Material _____ *75*Average No. Being Stored _____

*76*Type of Materials: New Oil Products _____ Waste Oil _____ Organic Solvents _____ Other X Paint

702			703		706	707								716	716	717	718							719		720				721			701
																										DISPENSER				FILL			
TANK NO.	ABOVEGROUND	UNDERGROUND	INDOORS	OUTDOORS	CAPACITY (GALLONS)	GASOLINE	NO. 2 FUEL OIL	NO. 6 FUEL OIL	KEROSENE	WASTE OIL	OTHER OIL	ORGANIC SOLVENTS	INDUSTRIAL WASTES	OTHER MATERIALS (SPECIFY)	YEAR INSTALLED AT THIS LOCATION	INSTALLED NEW YES	INSTALLED NEW NO	PLAIN STEEL	FIBERGLASS	BUFFHIDE	STIP-3	DOUBLE WALLED	OTHER	IN USE	ABANDONED	SUBMERSIBLE	SUCTION	GRAVITY	OTHER	PUMPED	GRAVITY	OTHER	OFFICAL USE
1		X		X	5,000						X			Diesel	'74	X		X						X					X*	X			*Pump
2		X		X	7,500			X							'59	X		X						X					X*	X			
3		X		X	7,500			X							'59	X		X						X					X*	X			
4	X		X		275 (Paint Vault)						X			Xylol	'77	X		X						X				X		X				
5	X		X		275 "	"					X			Xylol	'77	X		X						X				X		X				
6		X		X	500						X			Xylol	'59	X		X							X				X*	X			

I certify that information on this application and all attachments have been reviewed and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in this application, I believe that the information is true, accurate, and complete. I understand that false statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Date	Print Name	Signature	Title
4/27/83 +2/20/85 - REVISED	Gerard Phelan	Gerard Phelan	Vice President - Mfg.

HMM 003 4/82

18-262 5/82

LMS DRILLING LOG

Project No: 100-070
Client: SWIVILIER
Drilling Began: 4 AUG 1987 1230
Drilling Completed: 4 AUG 1987 1337
Well Construction Completed: 5 AUG 1987
Development Method/Completed: 6 AUG 1987 / PUMP
Yield: 3 GPM
Total Depth: 12 feet
Depth to Refusal: NA
Screened Interval: 2 - 12 feet
Aquifer: OVERBURDEN

Boring No.: MW-1
Permit No.: NA

SWL (date): 3.52 feet below ground surface
Elevation, Ground Surface:
Elevation, Top of Casing:
Latitude:
Longitude:
Hole Dia.: 8 inch
Monitoring Tube: 4 inch PVC

Depth in feet	Blows on Sampler 0" 6"	6" 12"	12" 18"	18" 24"	Retained Sample	Recovery (ft.)	Sample No.	Instrument Reading (ppm above background)
0	5							
		7						
			11					
				14	✓	1.2	S-1	0.0
2	12							
		14						
			12					
				14	✓	1.4	S-2	0.0
4	17							
		70						
			123					
				8	✓	1.0	S-3	0.0
6	7							
		6						
			5					
				15	✓	2.0	S-4	0.0
8	10							
		14						
			18					
				20	✓	1.8	S-5	0.0
10	37							
		52						
			83					
				66	✓	1.7	S-6	0.0
12								

Stratigraphic Column

Description

Black Asphalt Pavement Top 0.2 ft
Gray to brown Silty SAND, Sand is fine grained, clean, damp, trace fine gravel.

Reddish brown fine to medium SAND, little Silt, wet, clean

Reddish brown fine SAND, some Silt, trace fine gravel, wet, clean

Reddish brown fine SAND, little Silt, top 0.2 ft
Red brown fine SAND and Silt, wet, bottom 1.8 feet

Reddish brown fine to medium SAND, some fine gravel, wet top 1.6 ft
Red brown SILT and CLAY, tight, moist, non-confining bottom 0.2 ft.

Reddish Brown fine to medium SAND and Silt, little clay, wet, clean, no contamination evident.

LMS DRILLING LOG

Project No: 100-070
Client: SWIVELIER
Drilling Began: 5 AUG 1987
Drilling Completed: 5 AUG 1987
Well Construction Completed: 6 AUG 1987
Development Method/Completed: 6 AUG 1987
Yield: 0.5 gpm
Total Depth: 12 feet
Depth to Refusal: NA
Screened Interval: 2-12 feet
Aquifer: OVERBURDEN

Boring No.: MW-2
Permit No.: NA

SWL (date):
Elevation, Ground Surface:
Elevation, Top of Casing:
Latitude:
Longitude:
Hole Dia.: 8 inch
Monitoring Tube: 4 inch PVC

Depth in feet	Blows on Sampler 0"-6"	6"-12"	12"-18"	18"-24"	Retained Sample	Recovery (ft.)	Sample No.	Instrument Reading ppm above background	Stratigraphic Column	Description
0	8									Black Asphalt Pavement, Top 0.2 ft
		3								Brownish Gray Silty SAND, sand is fine grained, damp, trace amounts of clay present. Fill type material
			5							
				4	✓	1.3	S-1	0.0		
2	3									Gray Silty Sand and Clay, some fine gravel, moist, fill type material, top 0.6 ft.
		9								Reddish brown fine SAND, moist to wet at bottom 0.8 ft
			11							
4				20	✓	1.5	S-2	0.0		Reddish Brown fine to coarse SAND, little silt, wet, water table
	11									
		16								
			11							
6				15	✓	1.8	S-3	0.0		Reddish Brown fine to coarse SAND, wet, top 0.9 feet
	15									Reddish brown fine SAND and Silt, some fine gravel bottom 1.2 feet
		17								
			18							
8				21	✓	2.0	S-4	0.5		Gray SILT and CLAY, wet, non confining layer top 0.8 ft
	24									Reddish brown fine to medium SAND, wet, bottom 1.2
		18								
			16							
10				27	✓	1.8	S-5	0.0		Reddish brown fine to medium SAND and Silt, some fine to coarse gravel, wet
	31									
		22								
			26							
12				48	✓	2.0	S-6	0.0		

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

Ro 141; 16X, 10.6S, 1.4W; Robert Faist, Nanuet; drilled by E. Hamilton; altitude of land surface about 400 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Hardpan	25	25
Sand and gravel	56	81
Triassic:		
Newark group:		
Sandstone, red	72	153

Yield: 15 gpm, 1950.

Ro 173: 16X, 3.7S, 1.8E; Simons Building; Haverstraw; drilled by E. Hamilton; altitude of land surface about 25 feet.

	Thickness (feet)	Depth (feet)
Recent and Pleistocene:		
Dirt	25	25
Pleistocene:		
Stratified drift:		
Clay, brick (lake deposits ?)	65	90
Triassic:		
Newark group:		
Sandstone (artesian flow)	260	350

Ro 180; 16X, 4.5S, 1.2W; Fred Camron; Mount Ivy; drilled by E. Hamilton; altitude of land surface about 400 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	3	3
Triassic:		
Newark group:		
Sandstone, red	17	20
Palisade diabase:		
Traprock	32	52

Yield: 20 gpm, 1951.

Ro 186; 16X, 5.2S, 2.0W; Rockland County Storehouse; Short Clove; altitude of land surface about 200 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Till; some thin layers of sand and gravel	60	60
Triassic:		
Newark group:		
Sandstone, red	10	70
Shale, red	30	100

Yield: 40 gpm, with drawdown of 32 feet after 19 hours of pumping, 1948.

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

Ro 231; 16X, 12.6S, 1.0E; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 1; Erie Railroad bridge; drilled by Riley Engineering and Drilling Co.; altitude of land surface 129 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil; cinders	2	2
Pleistocene:		
Till:		
Clay, red; sand; gravel	4	6
Clay, reddish-brown; sand; gravel	5	11
Triassic:		
Newark group:		
Sandstone, red	7	18

Ro 232; 16X, 11.8S, 0.8E; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 1; Townline Road; drilled by Riley Engineering and Drilling Co.; altitude of land surface 232 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	2	2
Pleistocene:		
Till:		
Clay, fine sand; gravel	4	6
Clay, compact; gravel	9	15
Triassic:		
Newark group:		
Sandstone, red	5	20

Ro 233; 16X, 11.0S, 0.7E; New York State Department of Public Works; Route 59 relocation test boring No. B-1; drilled by Riley Engineering and Drilling Co., altitude of land surface about 250 feet.

	Thickness (feet)	Depth (feet)
Recent:		
No record	3	3
Pleistocene:		
Sand, brown; trace of gravel	2	5
Sand, fine, brown; clay; trace of gravel	8	13
Triassic:		
Newark group:		
Sandstone, red; shale	11	24
Nine other borings nearby; depth to bedrock ranges from 12 to 35 feet.		

Ro 234; 16X, 10.0S, 0.2E; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 2; Bardonia; drilled by Riley Engineering and Drilling Co.; altitude of land surface 286 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Sand, coarse, red; gravel; clay	8	8
Sand, medium to coarse, red; gravel; clay	15	23

	Thickness (feet)	Depth (feet)
Triassic:		
Newark group:		
Sandstone, red; calcite veins; clay	6	29

Ro 235; 16X, 9.7S, 0.1E; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 5; Bardonia; drilled by Riley Engineering and Drilling Co.; altitude of land surface 316 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Sand, medium, brown; gravel; trace of clay	9	9
Sand, medium, brown; gravel; clay	6	15
Sand, gray; gravel	6	21
Triassic:		
Newark group:		
Sandstone, fragments	2	23
Sandstone, broken; gravel; medium sand; clay	2	25

Ro 236; 16X, 8.8S, 0.4W; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 4; North Middletown Road; drilled by Riley Engineering and Drilling Co.; altitude of land surface 333 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Stratified drift (?):		
Sand, medium, red; gravel	6	6
Sand, medium, brown; gravel	10	16
Sand, medium, brown; gravel	6	22
Triassic:		
Newark group:		
Sandstone, brown, seamy	14	36

Ro 237; 16X, 7.8S, 1.0W; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 6; New City Park; drilled by Riley Engineering and Drilling Co.; altitude of land surface 447 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Sand, fine, brown; gravel; gray clay	7	7
Sand, fine, brown; gravel; gray clay	6	13
Clay, hard; fine gray sand; gravel; and water	11	24

Ro 238; 16X, 7.0S, 1.3W; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 3; New Hempstead Road, Hempstead; drilled by Riley Engineering and Drilling Co.; altitude of land surface 487 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Stratified drift:		
Sand, fine to medium, brown; gravel	7	7
Sand, medium to coarse, brown; gravel	10	17

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

	Thickness (feet)	Depth (feet)
Till (?):		
Clay, gray; sand; gravel	6	66

Ro 243; 16X, 10.6S, 0.6W: New York State Department of Public Works; test boring; relocation of Route 59, about 500 feet east of Route 304; Nanuet; altitude of land surface about 280 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Stratified drift:		
Silt, organic, black; some fine sand	2	2
Sand, fine, brown; some silt; trace of small gravel	3	5
Sand, coarse, gray; some small gravel	5	10
Sand, fine, brown; some silt and gravel	19	29
Triassic:		
Newark group:		
Sandstone, red	6	35

Ro 244; 16X, 11.0S, 1.1E: New York State Department of Public Works; test boring, relocation of Route 59, about 0.7 mile east of Rose Rd., Clarksville; altitude of land surface about 240 feet.

	Thickness (feet)	Depth (feet)
Recent and Pleistocene:		
Overburden	13	13
Triassic:		
Newark group:		
Shale, red	6	19
Sandstone, red, soft	2	21
Shale, red	2	23
Sandstone, red, soft	3	26
Sandstone, red	17	43
Shale, red	3	46
Sandstone, red	4	50

Ro 247; 16X, 3.3S, 1.9W; New York State Department of Public Works; Palisades Interstate Parkway test boring No. 1; South Branch Minisceongo Creek Bridge; Letchworth Village; altitude of land surface 374 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Muck, silty	1	1
Pleistocene:		
Stratified drift:		
Gravel, coarse; sand; muck	11	12
Gravel, blue; gray silt; some clay	6	18
Sand, gray; silt; fine gravel; some clay	4	22
Silt, gray; some sand and clay	4	26
Silt; some sand; trace of gravel	4	30
Silt, gray; sand; some clay	4	34
Silt, gray; some sand; trace of gravel	3	37
Silt, sand; some clay	3	40

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

	Thickness (feet)	Depth (feet)
Gravel and sand, coarse	5	34
Gravel and sand, very coarse	10	44
Sand, coarse; gravel	8	52
Sand, coarse	9	61
Sand, coarse; gravel	10	71
Triassic:		
Rock, broken, heat contact (rock type reported to be quartzite)	22	93

Production well about 10 feet from this test well; screen setting 52 to 72 feet. Yields about 275 gpm, 1955.

Ro 288; 16X, 15.1S, 3.9E; Spring Valley Water Works and Supply Co.; test well No. 3; Piermont; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface about 22 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	2	2
Pleistocene:		
Clay, brown; rock fragments	5	7
Clay, brown; rock fragments; boulders	2	9
Sand, fine; clay; boulders	10	19
Clay, and fine sand; rock fragments; boulders	4	23
Sand; gravel; boulders	9	32
Sand, fine, gray; angular rock fragments	6	38
Rock fragments, angular	5	43
Clay, gray; fine sand	7	50
Sand, fine; silt; angular rock fragments	3	53
Sand, fine, reddish-gray; angular rock fragments	10	63
Triassic:		
Palisade (?) diabase:		
Rock, gray (trap)	4	67
Newark group:		
Sandstone, decayed, white	10	77

This well about 40 feet southeast of Ro 286.

Ro 289; 16X, 9.8S, 0.3E; Spring Valley Water Works and Supply Co.; well No. 19; Bardonia; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface 286 feet.

	Thickness (feet)	Depth (feet)
Pleistocene:		
Till:		
Gray clay	6	6
Clay, sandy	4	10
Hardpan, red	8	18
Sand, dirty; a little water	5	23
Triassic:		
Newark group:		
Sandstone, red	55	78
Sandstone, muddy; shale	20	98
Sandstone, clean	3	101

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

	Thickness (feet)	Depth (feet)
Sandstone, muddy; shale (static water level, 5.2 feet, at 122 feet, September 29, 1953)	35	136
Sandstone, hard and soft streaks	13	149
Sandstone, hard (static water level, 5.2 feet, at 152 feet, September 30, 1953)	3	152
Sandstone; few streaks of shale	23	175
Sandstone, clean; drills very coarse	15	190
Same as above; few streaks of clay (static water level, 6.9 feet, at 195 feet, September 30, 1953)	10	200
Sandstone, red; streaks of clay	10	210
Sandstone, clean, red	12	222
Sandstone, red; streaks of shale (static water level, 6.9 feet, at 220 feet, October 1, 1953)	40	262
Sandstone, hard, and soft; red shale	16	278
Shale, muddy	14	292
Shale, red; (static water level, 7.5 feet, at 318 feet, October 7, 1953)	30	322
Shale	10	332
Shale, muddy; a few streaks of hard shale	5	337
Sandstone, very hard	10	347
Shale	5	352
Shale, dirty	13	365
Sandstone, red, hard and clean	25	390
Shale, streaks	3	393
Sandstone; streaks of shale	15	408
Shale (static water level, 7.5 feet, at 410 feet, October 19, 1953)	15	423
Shale; streaks of sandstone	5	428
Sandstone; streaks of shale, drills hard	4	432
Shale, muddy	5	437
Shale, muddy; streaks of sandstone	5	442
Shale, streaks of sandstone	5	447
Shale and sandstone, streaky	15	462
Sandstone, clean; drills hard	5	467
Shale, muddy; (static water level, 7.3 feet, at 477 feet, October 23, 1953)	10	477

Yield: 270 gpm, with drawdown of about 195 feet, 1953. Bottom of hole 477 feet.

Ro 291; 16X, 9.1S, 0.3E; Spring Valley Water Works and Supply Co.; well No. 21; Germonds; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface about 300 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Fill	2	2
Pleistocene (?):		
Silt (marsh land)	3	5
Pleistocene:		
Till:		
Clay; and gravel	12	17
Triassic:		
Newark group:		
Ledge, broken	6	23

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

	Thickness (feet)	Depth (feet)
Sandstone, coarse, red (static water level, 11 feet, May 3, 1954; pumped 1,000 gpm for 7 hours with drawdown of 57 feet)	7	332
Sandstone, red; some shale (static water level, 10½ feet at 375 feet, May 13, 1954)	57	389
Sandstone, red; streaks of shale (static water level, 8½ feet at 407 feet, May 17, 1954)	18	407

Yield: 1,515 gpm, with drawdown of 60 feet, after 20 hours of pumping.

Ro 342; 16X, 2.2S, 1.2E; Kaye-Fries Chemicals, Inc.; test well No. 2; Haverstraw; drilled by Layne-New York Co., Inc.; altitude of land surface 35 feet.

	Thickness (feet)	Depth (feet)
Recent and Pleistocene:		
Clay, sandy; few gravel, small boulders	4	4
Sand, muddy; gravel; clay; little water	2	6
Clay, sandy; few gravel; few boulders	9	15
Clay, blue and gray; few gravel, few boulders	14	29
Gravel; boulders; clay; little packed	5	34
Mud: few gravel; few boulders	3	37
Gravel; boulders; clay	10	47
Triassic:		
Newark group:		
Rock, hard	5	52

Ro 422; 16X, 11.3S, 1.0W; Lederle Laboratories; well W; Nanuet; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface about 290 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Fill	2	2
Muck	5	7
Pleistocene:		
Stratified drift:		
Clay, gray (lake deposits ?)	6	13
Clay, red	7	20
Till:		
Hardpan, red	4	24
Triassic:		
Newark group:		
Shale, red; clay	11	35
Sandstone; clay	4	39
Shale, red, hard and soft	28	67
Sandstone, coarse, red; water	10	77
Shale, red; clay seams	12	89
Sandstone, coarse; some clay seams; water	7	96
Sandstone, hard and soft; clay seams	23	119
Sandstone, hard	9	128
Sandstone; clay, soft	14	142
Sandstone, coarse; clay	9	151
Sandstone and clay, soft	13	164

Table 16.—Logs of selected wells and test borings in Rockland County—(Continued)

	Thickness (feet)	Depth (feet)
Sandstone, medium	9	173
Sandstone, coarse; clay	30	203
Sandstone, medium, hard	13	216
Sandstone, soft; clay	5	221
Sandstone, medium to coarse	30	251
Sandstone, soft; clay	9	260
Sandstone, medium, hard	14	274
Clay, streaks	3	277
Sandstone, hard	7	284
Sandstone, medium, hard; some clay	53	337
Shale, red; clay	7	344
Sandstone, hard	7	351
Sandstone, medium; some clay	8	359
Sandstone, medium; clay	15	374
Sandstone, hard	5	379
Sandstone, medium, hard; some clay	22	401

Yield: 465 gpm, with drawdown of about 150 feet after 12 hours of pumping, 1954.

Ro 461; 16X, 6.1S, 3.4W; Hillside Estates; Pomona; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface about 640 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	1	1
Triassic:		
Newark group:		
Sandstone, red	14	15
Sandstone, brown (water coming in at 19 feet)	25	40
Sandstone, coarse, brown (static water level, 18 feet, June 6, 1956)	5	45
Sandstone, hard, red	7	52
Sandstone, brown (hole dry at 65 feet)	13	65
Sandstone, red; some shale	20	85
Sandstone, red (crevice at 93 feet, 1½ feet wide; just enough water to drill with; static water level, 51 feet at 130 feet, June 12, 1956)	45	130
Sandstone, brown	40	170
Sandstone, gray	25	195
Sandstone, red (static water level, 52 feet at 210 feet, June 15, 1956)	15	210
Sandstone, coarse, gray	8	218
Sandstone, red (static water level, 52 feet at 295 feet, June 27, 1956)	77	295

Yield: 80 gpm, with drawdown of 103 feet, after 6 hours of pumping, 1956.

Ro 483; 16X, 12.8S, 0.05W; Spring Valley Water Works and Supply Co.; well No. 22; Pearl River; drilled by Artesian Well and Equipment Co., Inc.; altitude of land surface about 220 feet.

	Thickness (feet)	Depth (feet)
Recent:		
Topsoil	1	1
Pleistocene:		
Till:		
Clay, sandy, yellow	4	5

Hydrogeology of the Brunswick (Passaic) Formation and Implications for Ground Water Monitoring Practice

by Andrew Michalski

Abstract

Fractured shales of the Brunswick Formation provide a major aquifer in the most industrialized region of New Jersey. Numerous cases of ground water contamination have been documented in this formation. However, effectiveness of monitoring and remediation efforts is often hampered by the use of inappropriate concepts regarding ground water flow controls in this complex aquifer system. One such concept presumes that near-vertical fractures parallel to the strike of beds provide principal passages for the flow and produce an anisotropic response to pumping stress. Field evidence presented in this paper confirms that the Brunswick Formation hosts a gently dipping, multiunit, leaky aquifer system that consists of thin water-bearing units and thick intervening aquitards. The water-bearing units are associated with major bedding partings and/or intensely fractured seams. Layered heterogeneity of such a dipping multiunit aquifer system produces an anisotropic flow pattern with preferential flow along the strike of beds. Within the weathered zone, the permeability of the water-bearing units can be greatly reduced. The commonly used hydrogeologic model of the Brunswick as a one-aquifer system, sometimes with vaguely defined "shallow" and "deep" zones, often leads to the development of inadvertent cross-flows within monitoring wells. If undetected, cross-flows may promote contaminant spread into deeper units and impair the quality of hydrogeologic data. Hydrogeologic characterization of the Brunswick shales at any given site should be aimed primarily at identification of the major water-bearing and aquitard units. Recommended techniques for this characterization include fluid logging and other in-well tests.

Introduction

The Brunswick Formation is the thickest (about 10,000 feet) unit of the Newark Group (Kummel 1897) that crops out over a region stretching from southern New York state through northern and central New Jersey into eastern Pennsylvania (Figure 1). Throughout most of its outcrop, the Brunswick Formation provides a principal source of ground water. Numerous domestic, industrial, and municipal wells tap the formation with pumping rates ranging from a few to several hundred gallons per minute. In recent years, many of the water supply wells completed in highly industrialized and urbanized outcrop areas have been found to be contaminated and taken out of service. In the last decade, a dramatic increase in the number of monitoring wells installed in the Brunswick Formation has been observed.

The water-supply aspect of the Brunswick hydrogeology has been dealt with in a number of county-wide reports, which emphasize mostly statistical data on various types of water-supply wells. The issues of ground water distribution, movement, and potential contaminant migration pathways (which are important for proper design of ground water monitoring systems) have received little attention. Moreover, there appears to be a good deal of confusion on these issues in the published literature, which has occasionally led to improper monitoring practices.

Based on a review of the literature and field data from several sites in New Jersey, this paper attempts to reconcile often disparate concepts of ground water occurrence and flow in the Brunswick Formation. A more realistic conceptual flow model is proposed for the formation, together with guidelines for monitoring practices. Though this paper deals only with the Brunswick, much of its content may apply to other bedrock formations of the Newark Basin.

Concepts of Ground Water Occurrence and Movement in the Brunswick Formation

The Brunswick Formation consists of non-marine reddish-brown mudstone, shale, siltstone, and sandstone, which are interbedded with conglomeratic sandstones along basin margins. Three major basalt flows and diabase intrusions are present within a sequence of lenticular strata, which generally strike NE-SW and dip NW at 5 to 25 degrees (Figure 1). Locally, the strata are gently warped and broken by a few large faults and many small ones. Olsen (1980) named the thicker, Triassic (pre-basalt) portion of the Brunswick as the Passaic Formation and further subdivided its post-basalt, Jurassic portion. Although the sites indicated in Figure 1 are located within the Passaic Formation, the older stratigraphic term is retained in this paper because terms like the Brunswick or Triassic "Aquifer" have an established use in the hydrogeologic literature.

Systematic fractures, both near-vertical joints and partings along the bedding, are generally believed to provide the principal passages for ground water flow through the Brunswick Formation. Even in conglomeratic lithofacies developed at the basin margins, the fracture permeability appears to dominate the bulk of formation permeability, despite sandstone matrix porosity values of up to 20 percent (Perlmutter 1959).

Ground water in the formation is said to occur under both water table and confined conditions. Rima (1955) identified the "unconfined" zone in the Lansdale (Pennsylvania) area, based on electric logs and flowmeter logs obtained while injecting water into selected wells. The low resistivity combined with a small but continuous decline in flow of injected water with depth was interpreted as indicative of higher water storage and lower permeability of this zone associated with weathered shales.

According to Rima (1955), the unconfined zone occurs to a maximum depth of about 250 feet, below which one or more artesian or semiartesian aquifers occurs to a maximum depth of about 600 feet. Where the bedrock is mantled by low-permeability drift or alluvium, a confined condition may exist at shallow depth in lowland bedrock areas (Gill and Vecchioli 1965, Nichols 1968, Nemickas 1969).

The notion of a multizone aquifer system within the Brunswick has generally been accepted by other researchers (e.g., Barksdale et al. 1958, Perlmutter 1959, Carswell 1976, Houghton 1986). Although the reported thickness of individual water-bearing zones has varied, it was considered rather small. Rima (1955) and Barksdale et al. (1958) estimated the thickness as generally less than 20 feet, while much smaller values (from a few inches to a few feet, with the average about 2 feet) were given by Longwill and Wood (1965) for beds in which secondary openings are well developed.

Differences in permeability between the layers, resulting either from variation in fracturing, weathering, or a combination of both, have been argued (Nichols 1968, Nemickas 1969) to account for the presence of the many water-bearing units and for substantial head differences often measured between the units (Perlmutter 1959, Carswell 1976). Because their relation to lithology is not clear, and strata are commonly lenticular, the individual water-bearing units have been difficult to define and to correlate. This has often led to a haphazard development of ground water supplies (e.g., Carswell 1976) and improper installation of monitoring systems (e.g., case described by Stothoff, 1990).

The directional, anisotropic response to pumping stresses is a well-documented feature of the Brunswick Formation in the region. In most cases, observation wells aligned along the strike of the formation react faster and show much greater drawdown than observation wells situated perpendicular to the strike (Herpers and Barksdale 1968, Vecchioli et al. 1969). However, some confusion exists as to possible causes of the observed anisotropic response of the formation. Is this behavior caused by an alignment of the principal set of near-vertical fractures subparallel to the strike? Is it that the observed anisotropic response is due to the fact that wells located perpendicular to the strike of a dipping set of heterogeneous strata may penetrate different aquifer zones than the pumped well? Or is it some combination of both causes?

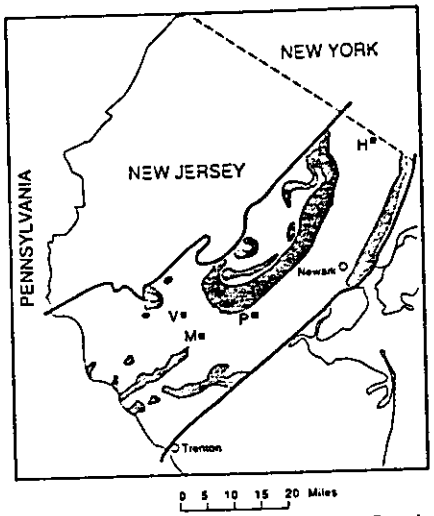


Figure 1. Map showing outcrop area of the Newark Group in New Jersey (between the heavy lines), igneous rocks (shaded areas), and locations of sites referenced in the text.

The first concept can be traced back to a paper by Herpers and Barksdale (1951) which discussed results of a pumping test in Newark, New Jersey. The authors argued that, with increasing depth, the weight of overlying materials would tend to close near-horizontal bedding fractures which tend to distribute water uniformly in all directions, while the near-vertical fractures would be less affected at depth, accentuating the tendency of water to flow in the direction of prevailing vertical cracks along the strike. They envisioned that individual vertical fractures might transmit water for distances of up to 2 or 3 miles without interruption, and that locally the fractures would extend to the top of bedrock, providing the hydraulic contact to the ground surface.

The concept that anisotropic behavior of the Brunswick strata is controlled by the alignment of vertical fractures along the strike of strata has been echoed in many later publications and reports (e.g., Vecchioli 1967, Nichols 1968, Spayd 1985).

On the other hand, there have been reports of sub-

stantial permeability variations in vertical profiles of wells, occurrences of discrete productive zones in association with bedding, and internal flows in wells in Pennsylvania (Rima 1955, Longwill and Wood 1965), southern New York state (Perlmutter 1959), and in New Jersey. At a site near Trenton, Vecchioli et al. (1969) documented the occurrence of ground water mainly in discrete zones controlled by bedding. The effect of tapping different producing zones on drawdowns measured during pumping was also evident at that site. Carswell (1976) characterized the ground water system in the Brunswick of northern New Jersey as consisting of a series of alternating tabular aquifers and aquicludes several tens of feet thick, which extended downdip for a few hundred feet and were continuous for thousands of feet along strike.

Field Evidence

Internal Aquifer Structure

Although any combination of the two presented concepts on control of fracture flow in the Brunswick shales can be envisioned, this author's data from a number of sites fit the latter concept. A conceptual model of the Brunswick Formation proposed herein embodies a "leaky," multiunit aquifer system, which consists of thin water-bearing units and much thicker, strata-bound, intervening aquitards. Both the water-bearing units and the aquitards are part of a homoclinal structure with a typical dip in the range of 5° to 25°. On the whole, such a structure is inherently anisotropic with the least permeability axis oriented perpendicular to bedding. The structure is capped by a weathered zone of lower permeability.

Figure 2 provides an example of the internal structure of the Brunswick Aquifer system at Site "P," where the formation is made up predominantly of mudstones. Three major discrete water-bearing units (designated on Figure 2 with letters A, B, and C) have been distinguished based on observations made during well drilling, temperature and electrical conductivity logging, in-well flow tracing, and slug testing. These major water-bearing units as well as several minor units are thin and separated by much thicker aquitards. In the construction of the cross section in Figure 2, information from some wells was projected over distances of several hundred feet (See map in Figure 2).

Despite such a distant projection, a consistent arrangement of the units parallel to the bedding is evident, implying a significant lateral extent for these major water-bearing units at Site P.

Ground water flow appears to be primarily influenced by partings along bedding and by the contrast in degree of fracturing.

Regarding their nature, the discrete water-bearing units in Figure 2 may represent larger bedding plane partings or seams of densely fractured rocks. The bedding partings provide a special class of fracture passages, not only because of their different origin, but also due to their consistent orientation and greater extent than any other fracture type. The greater extent of bedding discontinuities also tends to reinforce the effect of permeability anisotropy resulting from variations in fracturing and permeability between individual beds.

An earlier belief that bedding partings in the Brunswick play a minor hydraulic role because of their closure under increased vertical stress with depth (Herpers and Barksdale 1951) needs to be revised. The in situ stress distribution is often more complex than predicted from a simple model of gravitational stresses. The vertical stress at shallow depth may be less than horizontal stresses due to stress release in overconsolidated and partially eroded formations such as the Brunswick. Consequently, some bedding partings may become more open than vertical fractures. Besides, the flow within a bedding fissure should be visualized as occurring through channels meandering in between asperities that transmit load across the fissure walls.

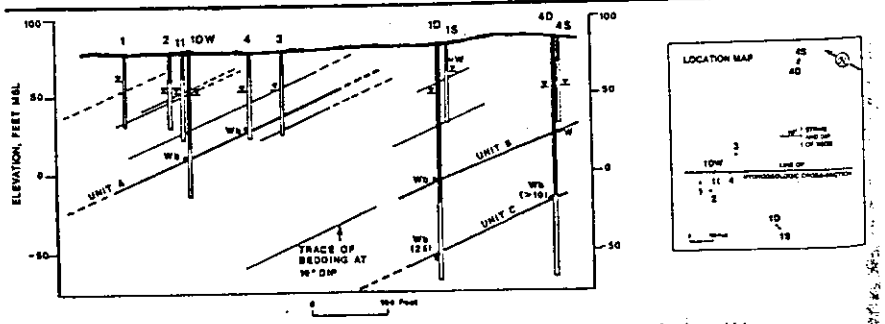


Figure 2. Hydrogeologic cross section and location map for Site P. Letter W at well bores indicates depth at which water was encountered during drilling by air-rotary method, Wb indicates water flowing from the hole, and number in parentheses gives flow-rate in gallons per minute.

Michalski and Klepp (1990) documented a case in northern New Jersey in which substantial flows occurred through discrete bedding partings in a sequence of predominantly thick sandstone beds of the Brunswick Formation. This site is designated as Site H on Figure 1. The significant role of bedding planes in controlling ground water flow is reported from other sedimentary basins (e.g., Trainer 1968).

Contrast in bed fracturing within the vertical profile of strata is the other major factor capable of producing discrete aquifer zones. Trends governing differential fracturing of beds need to be discussed. It has been known from fracture measurements in other sedimentary basins (e.g., Harris et al. 1960) and from theoretical considerations (Price 1966) that the frequency of systematic fractures/joints within individual units of a heterogeneous sequence is mostly controlled by the lithology ("competence") of each unit, its thickness, and the degree of tectonic deformation experienced by the sequence. A more competent bed tends to exhibit lower fracture frequency than a less competent one. For a given lithology and local tectonic history, the frequency should be inversely proportional to bed thickness (Price 1966).

Based on these rules, one can expect that thicker units of stiffer and stronger beds will exhibit fewer fractures than intervening thin beds of weaker lithologic types. In the case of the Brunswick sequence shown in Photo 1, fewer vertical fractures can be seen in thicker and more resistant mudstone beds than in shale seams. Conceivably, in such a sequence, the massive mudstone would act as an aquitard while the shale seams could furnish the production or water-bearing zones. The cyclic character of deposition of the Triassic formations (Van Houten 1969) has resulted in multiple repetitions of similar sequences at consistent intervals. The occurrence of multiple aquifer/aquitard sequences can thus be anticipated in these formations.

In addition to the most numerous, strata-bound fractures (to which the earlier discussion applies), several widely spaced, near-vertical fractures run across the sequence (Photo 1). These pervasive fractures impart a leaky character to the entire sequence. Due to the large apertures commonly found in these fractures, considerable leakage may be sustained at favorable in situ stress conditions in the absence of fracture infillings.

Distributions of Hydraulic Heads and Permeability

Apparent irregularities of the potentiometric surface are common at many monitored sites in the region. Water-level elevations in wells 1 and 1S on Figure 2 provide examples of such apparent anomalies: elevations observed in these wells are substantially higher than water-level elevations in nearby wells of similar

Photo 1. Fragment of exposure of partially weathered Brunswick Formation at Route 18 in New Brunswick, New Jersey. A thick mud-stone bed (indicated by the hammer and light color) shows few fractures, while intervening shales are densely fractured and water-bearing (dark color).

depth. In this particular case, the differences appear to result from positioning of open well intervals within different units of the formation. Wells 1 and 1S are open into aquitard units while other wells intersect intervening water-bearing units. Significant head differences can exist between individual units. Unless the structure of a multiunit aquifer is defined and the position of open well intervals with respect to the structure is accounted for, erroneous conclusions may be drawn from water-level data regarding the ground water flow direction and hydraulic gradients.

Wells in which significant cross-flows occur should be considered to be improperly installed.

Figure 3 shows a composite plot of depths to static water level vs. depth of wells for a total of 37 wells from three sites in the Brunswick Formation. A trend of an increasing depth to water level with increasing well depths is evident at sites M and V. This trend indicates the presence of strong downward gradients at both sites, which is a typical feature of recharge zones. The topography of sites M and V implies the occurrence of a recharging regime in the local shallow flow systems. The trend is not seen in wells installed at Site P, but a gentle topographic slope across the site and its position with respect to the nearest streams suggest that the site may be situated in a transition zone between recharging and discharging flow regimes.

In addition to the structure and topography, the observed distribution of hydraulic heads is largely influenced by weathering-related permeability changes with depth. In general, the weathering processes in shales result in the reduction of the primary fracture permeability by clogging the more conductive fractures with clay. The changes appear to be superimposed on the permeability variation inherent in the structure of multiunit bedrock aquifer system.

Figure 4 presents trends in distribution of the bulk hydraulic conductivity values (obtained from routine slug tests) vs. depth of open intervals in monitoring wells at two sites. The values obtained range over four orders of magnitude, from 10^{-6} to 10^{-2} cm/s. The lowest hydraulic conductivity values came from shallow wells that were completed within aquitard units, and higher values for shallow wells were associated with wells intersecting near-surface reaches of identified major water-bearing units (Figure 2). Wells open below a depth of 50 to 60 feet appear to intercept a transition from an intensely weathered shallow zone to an unweathered zone. Deep monitoring wells provided higher values of the bulk hydraulic conductivity and a lower variability of this parameter (Figure 4B).

Although weathering tends to reduce the permeability, numerous secondary fractures formed in the process

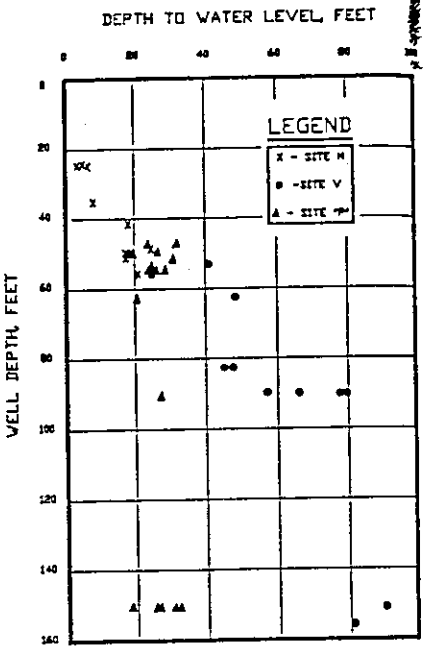


Figure 3. Relation of depth to water level with well depth for 37 monitoring wells at three sites in the Brunswick Formation.

may augment the storage potential of the weathered zone. As a result, pockets of perched water often form within and above the zone.

Preferential Flow in Undisturbed Aquifer System

The occurrence of a stratigraphy-controlled, multiunit aquifer system within the dipping bed setting tends to produce an anisotropic pattern of ground water flow.

In the saturated zone, primary flow is generally restricted to bedding fissures and fractured beds along strike. Usually, only minor deflections from that direction are attributable to the topography, flow boundaries and transient effects. However, the vertical flows may prevail across aquitards separating the aquifer units and in the weathered zone. These general principles can be useful in assessing the contaminant migration pathways within the Brunswick Formation provided that major aquifer and aquitard units beneath a site are located and sufficiently characterized.

Suggested Monitoring Practice

Contaminant investigations at sites located above the Brunswick Formation commonly involve installation of two sets of monitoring wells. The sets are usually referred to as the shallow and the deep wells, and are intended to monitor vaguely defined "shallow" and "deep" zones of the aquifer system.

The shallow wells are usually installed to span the first water-bearing zone noticed during installation of these wells. Completion depth of deep monitoring wells is sometimes determined by a typical depth of water-supply wells in the area. In other cases, the deep wells are drilled to an arbitrarily pre-selected depth (such as 100 or 150 feet). There is a tendency to complete all monitoring wells of a given set to a similar depth. Usually, the monitoring wells are 6-inch holes with open interval length ranging between 20 feet and several hundred feet.

The observed distribution of hydraulic heads is largely influenced by permeability changes.

Installation of 6-inch diameter wells in low-permeability portions of the Brunswick Formation can lead to significant errors in head measurements, which stems from large well storage and time lags in response to water-level changes in wells of larger diameters (Freeze and Cherry 1979). Time lags of up to two weeks were observed in some wells open to aquitard units and the weathered zone, while in wells open to major water-bearing zones the observed time lags were very short. Where permeability values obtained from wells at a site differ by four orders of magnitude (as depicted in Figure 4B), the variability of the response time among wells is yet another factor complicating interpretations of water-level measurements and pump-test data. Because the time lag is directly proportional to the square of the well radius, the use of smaller diameter holes is recommended for monitoring wells in the weathered zone.

The practice of well installation to an arbitrary target depth and of treating the Brunswick Formation as if it were one aquifer (or a two-zone aquifer) may be convenient for the design of ground water monitoring systems and for logistics of well drilling. However, the lack of consideration of the not-so-apparent internal structure of the aquifer system and of the 3-D nature of transport can bring about inadvertent detrimental side effects.

Of most concern is the chance of triggering cross-flows within open segments of wells caused by inadvertent bridging of aquifer units with different heads and/or transmissivities. Because of the trend of increasing hydraulic conductivity with depth of weathered zone (Figure 4), the chance of cross-flows is high for wells with longer intervals open across this zone, particularly for sites in recharge areas. If present, such cross-flows may affect or alter a pre-existing pattern of ground water flow, possibly inducing contaminant migration through the well into deeper bedrock units (e.g., Michalski and Klepp 1990). The potentiometric and chemical data obtained under such circumstances would be ambiguous, misguiding the development of remedial measures.

Wells in which significant cross-flows occur should

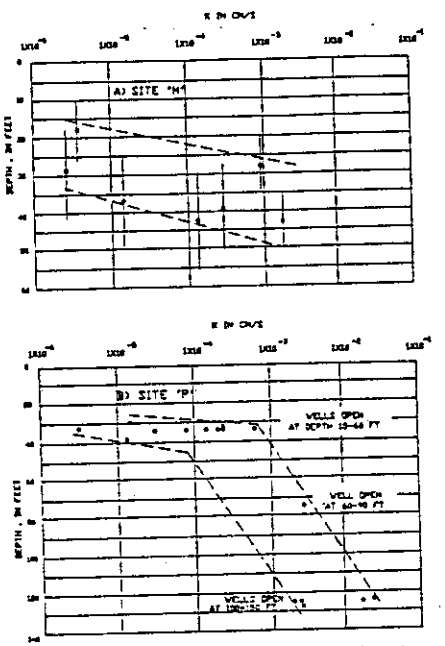


Figure 4. Distribution of vertically averaged hydraulic conductivity values vs. depth of open intervals of monitoring wells at sites M and P. Mid-points of open intervals are denoted by points, and vertical segments on the upper plot (Site M) represent the intervals.

be considered improperly installed monitoring wells. The use of short open intervals (generally less than 20 feet) helps to reduce the possibility of creating cross-flows. On the other hand, the placement of wells with shorter open intervals is not an easy task in situations in which a thick and apparently monotonous formation provides few clues on the location of potentially important water-bearing and aquitard units. Therefore, a trial-and-error approach to well placement in the Brunswick may be justified if inadvertent placement errors are rectified in a timely manner.

To this end, there is a need to employ investigation techniques capable of locating major aquifer units and detecting internal leaks in wells. These techniques are outlined in following text. If a significant leak is detected in an existing well, such a well should be retrofitted to stop the leak. At new sites, pilot test wells may be drilled first, tested for internal leaks, and then retrofitted if needed. Retrofitting can be accomplished either by grouting a length of open interval from the well bottom, or by equipping the well with a permanent multipacker monitoring system. Cherry and Johnson (1982) and Black et al. (1987) provided descriptions of such multilevel systems. From the cost-effectiveness standpoint, the use of commercially available devices for multilevel

TABLE 1
Advantages and Limitations of Hydrogeologic Characterization Techniques Applicable to the Brunswick Formation

Technique	Information sought, advantages, and limitations
Surface Techniques	
Hydrogeologic Mapping	Bedrock lithology and structure, soil types, hydrologic features and flow boundaries. Less effective in the presence of thick soil mantle.
Test Pits/ Trenches	Thickness and character of soil/weathered zone, lithology, dip and strike of bedrock, orientation, spacing and character of fracture systems, presence of shallow water zones. Can be combined with soil sampling and the use of contaminant-sensing devices. Experienced geologist needed to obtain quality data.
Drilling Techniques	
Drilling/Logging and Well Installation	Air-rotary is preferred drilling method. Lithologic variations determined from cuttings and drilling rates ("hard" and "soft" zones). Position of major producing zones can be ascertained, and inflows associated with each zone can be estimated/measured. Wet zones above the standing water level can also be located.
Coring	Lithology and fracture characteristics can be evaluated, and formation samples can be taken for lab analysis. Some fractures can be induced by drilling. Generally expensive. Core recovery and quality dependent on geology and drillers performance, usually poor in fracture zones.
Intra-Well Techniques	
Downhole Video Survey	Fracture traces, apertures, and frequency, lithologic contacts, borehole wall profile, water seeps from fractures above the standing water level can be viewed in an open-hole TV survey. Watertightness of casing joints and grouting can be ascertained. Requires clean well water. (Acoustic televiewer was developed for mud-filled wells).
Temperature and Electrical Conductivity Logging	Locations of major transmissive fractures, possible vertical flows in a well, and water quality can be inferred from inflections of the logs. Qualitative. Inexpensive downhole probes are available and the logging is fast.
Other Geophysical Logs	Caliper, natural gamma, SP, and electric logs may provide information on lithology and in situ water quality. Specialized logging (such as acoustic wave form logging to infer fracture permeability) is still experimental.
Flowmeters	Velocity and vertical flows (either spontaneous or induced by pumping) within a well can be measured. Impeller-type meters stall at velocities less than 5 ft/min. More sensitive thermal flowmeters are not readily available.
In-Well Flow Tracing	Locations of transmissive fractures or fracture zones, occurrences of internal flows in wells, and relative hydraulic heads between the fractures or zones can be determined by repeated logging of electrical conductivity following an injection of a small-volume saline slug. Inexpensive and sensitive for slow flow velocities. Density effects may need to be considered.
Slug Testing	Vertically averaged hydraulic conductivity value (K) for the tested well segment can be obtained. Variability of (K) over the study area is quantified if tests are performed in many monitoring wells. Limited to settings with low and moderate permeability.
Straddle Packer Testing	Injectivity/hydraulic conductivity for packed-off intervals, and conductivity profiles with depth. Test intervals are usually larger (at least 5 feet) than individual fracture zones.
Inter-Well Techniques	
Water Level/Potentiometric Surface Mapping	Distribution of heads, apparent flow direction and hydraulic gradient are usually determined from water-level measurements in monitoring wells. In multiunit aquifers, validity of such determinations depends on penetration of various units by individual wells. Apparent potentiometric anomalies can provide valuable information on the aquifer system.
Pumping Tests, Pulse Interference Tests	Typical objectives of these tests include determination of the degree of hydraulic connection between monitoring wells and aquifer/aquitard zones they penetrate, determination of apparent hydraulic parameters of the aquifer system or individual fracture zones, and demonstration of hydraulic control over a contaminated area.
Tracer Tests	Inter-well tracing under natural gradient is generally not feasible, but contaminants themselves can be viewed as tracers. Forced-gradient tracer tests can be performed in several configurations.

TABLE 1 (continued)
Advantages and Limitations of Hydrogeologic Characterization Techniques Applicable to the Brunswick Formation

monitoring can be justified for larger projects.

Table 1 provides a survey of techniques of hydrogeologic characterization that may be used for the Brunswick Formation (and for similar settings with fracture-dominated permeability). For application in routine contamination investigations, only a few of these techniques are of interest.

Surface techniques, such as hydrogeologic mapping and test pits/trenches (Table 1), can be of considerable value in preliminary investigations. Because ground water occurrence and flow in the Brunswick are known to be strongly influenced by a homoclinal dip, lithologic variations, weathering, and hydrologic boundaries, knowledge of these characteristics at an early stage would aid in selecting locations for and placement of open intervals of monitoring wells. Air-rotary drilling is preferred as a well installation method, because it allows for observations and tentative identifications of major water-bearing zones. Downhole video surveys may offer a less expensive and often better alternative to coring.

In-well techniques, particularly those aimed at determination of intra-well fluid flow, are important tools for checking proper completion of individual monitoring wells, and for aiding in hydrogeologic characterization of the entire aquifer system. Temperature and electrical conductivity logging, flowmeter tests, and in-well flow tracing are included in this category (Table 1). These techniques are described by Keys (1989). The use of readily available electrical conductivity probes to track the movement and dilution of a small-volume saline slug injected into well makes a valuable and inexpensive testing method for monitoring wells installed in the Brunswick Formation (Carswell 1976, Michalski 1989, Michalski and Klepp 1990). Because of interpretation problems, routine pumping test analyses (Table 1) can be inadequate or misleading without a prior understanding of placement of the open intervals of pumping and observation wells with respect to the structure of a multiunit aquifer.

Conclusions

1. Ground water flow in the Brunswick Formation appears to be influenced primarily by partings along bedding and by the contrast in degree of fracturing between beds. A lingering belief that near-vertical fractures oriented parallel to the strike of beds dominate the flow is not supported by field data.
2. On a scale typical of most ground water contamination studies, the Brunswick Formation hosts a multiunit, leaky ground water system in which individual water-bearing units are relatively thin and parallel to the bedding. A large-scale anisotropic flow pattern results from inherent heterogeneity of the multiunit system. Along-strike flow direction is favored within the saturated reaches of individual water-bearing units, and vertical flow across intervening aquitards is produced by head differences in the water-bearing units.
3. Weathering of shales has further complicated the system by reducing the permeability of water-bearing units within the weathered zone and by increasing storage of the zone. Strong vertical gradients can

develop across the weathered zone, particularly in recharge areas. This promotes the downward flow and contaminant migration through wells open across the zone and/or leaks developed behind casing. Special attention should be given to installation and testing of monitoring wells that intersect the weathered zone near known sources of contamination.

Differences in permeability have been argued to account for the substantial head differences.

4. Current practice of treating the Brunswick Formation as a one-aquifer system, sometimes with vaguely defined "shallow" and "deep" zones, often leads to the development of inadvertent cross-flows in monitoring wells. Undetected cross-flow may promote the spread of contamination through the wells, seriously impair the quality of hydrogeologic data obtained, and misguide the development of remedial measures.
5. Initial hydrogeologic characterization of the Brunswick Formation should be aimed at identification of the major water-bearing and aquitard units making up the aquifer system at a site. Fluid-movement measurements in existing wells or pilot holes, and other in-well testing techniques are feasible tools for such characterization.
6. In general, open intervals in monitoring wells should not exceed about 20 feet for the water-bearing units. Installation of wells open entirely to aquitard units should be avoided. The use of small-diameter holes is recommended for monitoring wells open to the weathered zone. For larger projects, the use of a multiple-packer monitoring system may offer a viable alternative to open holes.

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Biographical Sketch

Andrew Michalski is director of hydrogeology with Whitman Companies Inc. (385 Highway 18, East Brunswick, NJ 08816). He received an M.Sc. and Ph.D. in hydrogeology and engineering geology from Mining Academy in Cracow, Poland. He is a professional geologist and a certified ground water professional. Over the 20-year course of his career, he has worked on hot-water sulphur mining, radioactive waste isolation, hydrogeologic assessments, and aquifer cleanup projects at numerous sites. He was a senior hydrogeologist with TRC Environmental Consultants and The Earth Technology Corp., and has taught at universities in Poland, Nigeria, and at Rutgers University in New Jersey.

P.O. 34624

Laboratory Resources, Inc.

363 Old Hook Road Westwood, New Jersey 07675 201/666-8644

CHAIN OF CUSTODY RECORD

Organization	Date Collected	Collected By
SWIVELIER 33 Route 304 Nanuet, N.Y. 10954	9/19/86	G. Phelan
Sample Container/Preservation *(Circle one for each category)* GLASS, PLASTIC // 4°C, pH<2--H_2SO_4, HNO_3		Method of Shipment *(Circle one)* HAND-DELIVERED, CARRIER

Lab No.	Sample I.D.	Time Collected	Analyses Required
4403	TANK	8:15	XYLENE (PARA, META, + ORTHO report as total xylene (per Mike Mahoney, Health Dept.)

Relinquished By	Received By	Date/Time
[signature]	V. Johnson	9/19 9:20
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Remarks		

HLA 3094

LABORATORY RESOURCES, INC.
363 OLD HOOK Rd.
WESTWOOD, NJ 07675
(201) 666-6644
Lab Certification No. 02046

Date of Report: Sept. 24, 1986
Date Sample Collected: Sept. 19, 1986
Date Sample Received: Sept. 19, 1986
Date of Analysis: Sept. 23, 1986
Lab. # 4403

Client: Swivelier
33 Route 304
Nanuet, NY 10954

Parameter	Sample ID > Tank	Analysed by
Total Xylene's	65.62 ppm	J.W.H.

All results expressed in mg/l
Method 602

Carol A. Price
Manager/Laboratory Services

LABORATORY RESOURCES, INC.
363 OLD HOOK Rd.
WESTWOOD, NJ 07675
(201) 666-6644
Lab Certification No. 02046

Date of Report: Dec. 18, 1986
Date Sample Collected: Dec. 12, 1986
Date Sample Received: Dec. 12, 1986
Date of Analysis: Dec. 15, 1986
Lab. #5935

Client: Swivelier
33 Route 304
Nanuet, NY 10954

Analysed by

J.W.H.

Parameter		Sample ID > Soil	
Total Xylenes	*	0.070	ppm

* Results expressed mg/kg - dry weight basis

All results expressed in mg/l
Method 602

Carol A. Price
Manager/Laboratory Services

2/9/07 [illegible]

LABORATORY RESOURCES, INC.
363 OLD HOOK Rd.
WESTWOOD, NJ 07675
(201) 666-6644
Lab Certification No. 02046

Date of Report: Dec. 18, 1986
Date Sample Collected: Dec. 12, 1986
Date Sample Received: Dec. 12, 1986
Date of Analysis: Dec. 15, 1986
Lab. #5935

Client: Swivelier
33 Route 304
Nanuet, NY 10954

Analysed by

J.W.H.

Parameter	Sample ID > Soil		
Total Xylenes	*	0.070	ppm

* Results expressed mg/kg - dry weight basis

All results expressed in mg/l
Method 602

Carol A. Price
Manager/Laboratory Services

Laboratory Resources Inc

363 Old Hook Road Westwood, New Jersey 07675 201/666-8644

CHAIN OF CUSTODY RECORD

Organization	Date Collected	Collected By
SWIVELTECH CO. INC.	12/16/86	GERARD PHELAN
Sample Container/Preservation *(Circle one for each category)* GLASS, PLASTIC // 4°C, pH<2--H_2SO_4, HNO_3		Method of Shipment *(Circle one)* HAND-DELIVERED, CARRIER

Lab No.	Sample I.D.	Time Collected	Analyses Required
V931	soil sample		XYLENE

Relinquished By	Received By	Date/Time
Gerard Phelan		12/17/86 9

Lab No.

Analyses

Relinquished By	Received By	Date/Time

Lab No.

Analyses

Relinquished By	Received By	Date/Time

Lab No.

Analyses

Relinquished By	Received By	Date/Time

Remarks

HLA 3094

Laboratory Resources, Inc.

363 Old Hook Road, Westwood, New Jersey 07675, 201/666-0544

CHAIN OF CUSTODY RECORD

Organization	Date Collected	Collected By
Swindler	11/3/86	Gerard Phelan

Sample Container/Preservation *(Circle one for each category)*

(GLASS) PLASTIC // 4°C, pH<2--H_2SO_4, HNO_3

Method of Shipment *(Circle one)*

(HAND-DELIVERED) CARRIER

Lab No.	Sample I.D.	Time Collected	Analyses Required
	Bottom of Excavation Hole (4 sites) comp	10:40am	Xylene
	(4 sites) comp water at bottom of excavation	10:40am	Xylene

Relinquished By	Received By	Date/Time
Gerard Phelan	PNLP	11/12/86 12:10p
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Lab No.		
Analyses		
Relinquished By	Received By	Date/Time
Remarks		

HLA 3094

LABORATORY RESOURCES, INC.
363 OLD HOOK Rd.
WESTWOOD, NJ 07675
(201) 666-6644
Lab Certification No. 02046

Date of Report: Nov. 17, 1986
Date Sample Collected: Nov. 11, 1986
Date Sample Received: Nov. 03, 1986
Date of Analysis: Nov. 14, 1986
Lab. #5265-66

Client: Swivelier
33 Route 304
Nanuet, NY 10954

Parameter	Sample ID >	Soil Bottom of Excavation Hole		Water Bottom of Excavation Hole		Analysed by
Total Xylenes	*	0.027	ppm	7.390	ppm	J.W.H.

* Results expressed mg/kg - dry weight basis

All results expressed in mg/l
Method 602

Carol A. Price
Manager/Laboratory Services

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

A[illegible]: 59836-003 DATE REC'D: 87/11/23 DATE COLL'D: 87/11/20 STATUS: closed
[illegible]: Tank Tech
STREET: CITY: STATE: ZIP:
PI LOCATION: #18 Soil Sample From Sandy Clay About Tank Top -3' From Grade
EPORT TO: same
IL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	:	Present
LUBE OILS	:	Not Present
FUEL OIL #1	:	<20 mg/kg dry
FUEL OIL #2	:	<20 mg/kg dry
FUEL OIL #3	:	<20 mg/kg dry
FUEL OIL #4	:	<20 mg/kg dry
FUEL OIL #5	:	<20 mg/kg dry
FUEL OIL #6	:	<20 mg/kg dry

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

EMARKS:

Ronald A. Bayer
Laboratory Director 12/11/87

EnviroTest Laboratories Inc.
315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

3#: 59836-002 DATE REC'D: 87/11/23 DATE COLL'D: 87/11/20 STATUS: closed
1E: Tank Teck
STREET: CITY: STATE: ZIP:
TL LOCATION: Sample in pit #55

EPORT TO: same
ILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Present
LUBE OILS	: Not Present
FUEL OIL #1	: <7,000 ul/l
FUEL OIL #2	: 10,500 ul/l
FUEL OIL #3	: <7,000 ul/l
FUEL OIL #4	: <7,000 ul/l
FUEL OIL #5	: <7,000 ul/l
FUEL OIL #6	: <7,000 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director 12/11/87

EnviroTest Laboratories Inc.
315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

B#: 59836-001 DATE REC'D: 87/11/23 DATE COLL'D: 87/11/20 STATUS: closed
ME: Tank Tech
STREET: CITY: STATE: ZIP:
OIL LOCATION: #45 Inside Tank diesel

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Not Present
LUBE OILS	: Not Present
FUEL OIL #1	:
FUEL OIL #2	: 100%
FUEL OIL #3	:
FUEL OIL #4	:
FUEL OIL #5	:
FUEL OIL #6	:

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director 12/11/87

EnviroTest Laboratories Inc.
315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0390

3#: 59836-004 DATE REC'D: 87/11/23 DATE COLL'D: 87/11/20 STATUS: closed
1E: Tank Teck
STREET: CITY: STATE: ZIP:
OIL LOCATION: #2S Soil Samples From Side of Tank in Sandy Clay 4'6" From Grade
REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	:	Not Present
LUBE OILS	:	Not Present
FUEL OIL #1	:	<20 mg/kg dry
FUEL OIL #2	:	<20 mg/kg dry
FUEL OIL #3	:	<20 mg/kg dry
FUEL OIL #4	:	<20 mg/kg dry
FUEL OIL #5	:	<20 mg/kg dry
FUEL OIL #6	:	<20 mg/kg dry

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Mayer
Laboratory Director 12/11/87

EnviroTest Laboratories Inc.
315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0390

AB#: 59836-005 DATE REC'D: 87/11/23 DATE COLL'D: 87/11/20 STATUS: closed
ME: Tank Tech
REET: CITY: STATE: ZIP:
PE LOCATION: #3S Soil Samples Removed From Bottom of Pit

PORT TO: same
L TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Present
LUBE OILS	: Not Present
FUEL OIL #1	: <120 mg/kg dry
FUEL OIL #2	: 1,500 mg/kg dry
FUEL OIL #3	: <120 mg/kg dry
FUEL OIL #4	: <120 mg/kg dry
FUEL OIL #5	: <120 mg/kg dry
FUEL OIL #6	: <120 mg/kg dry

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 12/11/87

SVC-16

Spring Valley Water Company INCORPORATED
360 West Nyack Road
West Nyack, N.Y. 10994
914-623-1500

January 10, 1980

Mr. Robert Mansfield, P.E.
Rockland County Health Dept.
Sanatorium Road
Pomona, NY 10970

Dear Mr. Mansfield:

This will confirm our recent discussions regarding the contamination of a tributory of Nauraushaun Brook which drains the Swivelier property.

The results of our samples collected on December 11, 1979 are as follows:

Outfall - Swivelier 3-inch drain, located on w/s of the building

TCE	14,300 ppb
PCE	10 ppb
Methylene Chloride	115 ppb

At the brook on the n/s of West Nyack Road, approximately 700 feet west of Route 304, also collected on December 11, 1979

TCE	8,800 ppb
PCE	22 ppb
Methylene Chloride	140 ppb

Attached you will find the analytical sheets for the samples collected on January 4 and 9. We trust the data will be helpful in resolving this contamination problem.

Very truly yours,

Leonard W. Miller
Sanitary Engineer

LWM:leg
Encl.
cc: Peter Doshna, P.E.
NYSDEC, White Plains

Swivelier Co., Inc.

January 9, 1980

Sampling Nauraushaun Brook tributary at the following locations:

9:50 a.m.	#1	North side of West Nyack Road the the Nauraushaun Brook tributary, approximately 700 feet west of Route 304
10:30 a.m.	#2	At the Nauraushaun Brook, north of the rear of Kabuto Japanese Steak House, north of Route 59
10:45 a.m.	#3	Nauraushaun Brook and Route 59. Sample taken 35 feet north of culvert, 100 feet west of west curb line of Kabuto's driveway
11:05 a.m.	#4	Nauraushaun Brook, south side of Townline Road, 25 feet west of west curb line of Argow Place

John Murray

HACKENSACK WATER COMPANY
ANALYTICAL LABORATORIES
NEW MILFORD, NEW JERSEY

VOLATILE ORGANIC ANALYSIS

See Attached Sheet for Detail

Date Collection: January 9, 1980 — Summary — Date: January 9, 1980

Parameters	Sample Identification and Concentration				
	#1	#2	#3	#4	
Methylene Chloride	75	ND	ND	ND	
Chloroform	ND	↓	↓	↓	
1,2-Dichloroethane	ND				
1,1,1-Trichloroethane	ND				
Carbon Tetrachloride	ND	ND	ND		
1,1,2-Trichloroethylene	18,000	39	205		
Dichlorobromomethane	ND	ND	ND		
1,2-Dibromoethane	ND	↓	↓	↓	
Perchloroethylene (tetra)	100				
Bromoform	ND				
1,1,2,2-Tetrachloroethane	ND				
Diiodomethane	ND				
Dibromochloromethane	ND				
1,1,2-Trichloroethane	ND				
Dichlorobenzene, Mixed Isomers	ND	ND	ND	ND	

Results expressed in parts per billion unless otherwise stated.

N.D. - Not detectable

Leo C. Fung

Leo C. Fung, Chief Chemist

Hackensack Water Company

Analytical Laboratories

Oradell, New Jersey

Date: April 25, 1980

Volatile Organic Analysis

Date Collected: 2-5-80

Collected By: Bob Mansfield, Rockland County Health Department

Sample Type: Soil

Sample Location: Soil sample from stream bed, 1 foot below surface, 50 feet North of West Nyack Road, in the vicinity of Swivelier Corp.

H.W.C. Lab No.: 164

Results

Parameters	*Concentration (ppb)
1, 1 - Dichloroethane	5,300
1,.2 - Dichloroethane	8,700
1,1, 1-Trichloroethane	790
Carbon Tetrachloride	2,900
Trichloroethylene	4,200
Ethylbenzene	1,100

*Note: Sample was analyzed as is.

Leo C. Fung
Chief Chemist

LCF:me

ANALYTICAL LABORATORIES
NEW MILFORD, NEW JERSEY

VOLATILE ORGANIC ANALYSIS

Swivelier, 3" Diam Pipe Outfall

Date Collection: January 4, 1980 Summary Date: January 8, 1980

Parameters	Sample Identification and Concentration				
	Drain Pipe Outfall				
Methylene Chloride	ND				
Chloroform	ND				
1,2-Dichloroethane	ND				
1,1,1-Trichloroethane	ND				
Carbon Tetrachloride	ND				
1,1,2-Trichloroethylene	3.200				
Dichlorobromomethane	ND				
1,2-Dibromoethane	ND				
Perchloroethylene (tetra)	ND				
Bromoform	ND				
1,1,2,2-Tetrachloroethane	ND				
Diiodomethane	ND				
Dibromochloromethane	ND				
1,1,2-Trichloroethane	ND				
Dichlorobenzene, Mixed Isomers	N.D				

Results expressed in parts per billion unless otherwise stated.

N.D. - Not detectable

Leo C. Fung, Chief Chemist

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORIES AND RESEARCH
ENVIRONMENTAL HEALTH CENTER

RESULTS OF EXAMINATION
(PAGE 1 OF 1)

LAB ACCESSION NO: 80031 YR/MO/DAY/HR SAMPLE REC'D: 80/01/09/13

REPORTING LAB: 17 EHC ALBANY
PROGRAM: 520 INDUSTRIAL WASTES
STATION (SOURCE) NO:
DRAINAGE BASIN: 15 NY GAZETTEER NO: 4350 COUNTY: ROCKLAND
COORDINATES: 41 DEG 05' 55"N, 73 DEG 59' 55"W
COMMON NAME INCL SUBW'SHED: SWIVERLIER CO INC TRIB TO NAURAUSHAUN BROOK NJ1-4-3A(0.5MI)
EXACT SAMPLING POINT: PIPE DISCHARGING TO CREEK
TYPE OF SAMPLE: 34 IND. WASTE, UNCHLOR.
MO/DAY/HR OF SAMPLING: FROM 00/00 TO 01/07/09
REPORT SENT TO: CO (1) RO (1) LPHE (2) LHO (0) FED (0) CHEM (1)

PARAMETER		UNIT	RESULT	NOTATION
34506	1,1,1-TRICHLOROETHANE	MCG/L	150.	LT
36609	CARBON TETRACHLORIDE	MCG/L	150.	LT
32101	BROMODICHLOROMETHANE	MCG/L	60.	LT
32106	CHLOROFORM	MCG/L	150.	LT
34475	TRICHLOROETHYLENE	MCG/L	1600.	
34488	TETRACHLOROETHYLENE	MCG/L	60.	LT
32104	BROMOFORM	MCG/L	150.	LT
32105	DIBROMOCHLOROMETHANE	MCG/L	60.	LT

DATE COMPLETED: 3/14/80

RECEIVED
MAR 26 1980
ROCKLAND COUNTY
DEPARTMENT OF HEALTH

DIRECTOR OF ENVIRONMENTAL HEALTH
ROCKLAND COUNTY HEALTH DEPARTMENT
SANITORIUM ROAD
POMONA, N.Y. 10970

SUBMITTED BY: MANSFIELD

Lawler, Matusky & Skelly Engineers

Environmental Science & Engineering Consultants

JOHN P. LAWLER, P. E.
FELIX E. MATUSKY, P. E.
MICHAEL J. SKELLY, P. E.
KARIM A. ABOOD, P. E.
PATRICK J. LAWLER, P. E.
FRANCIS M. McGOWAN, P. E.
THOMAS L. ENGLERT, P. E.

ONE BLUE HILL PLAZA
P.O. BOX 1509
PEARL RIVER, NEW YORK 10965
(914) 735-8300
TWX: LMSE PERL 710-577-2782

22 July 1987
File No. 100-070

RECEIVED
JUL 24 1987
ROCKLAND COUNTY
DEPARTMENT OF HEALTH

Rockland County Health Department
Sanatorium Road
Pomona, NY 10970

Attn: Ms. Cathy Quinn

Re: Swivelier

RE: xylene tank removal

Dear Cathy:

At your request, this letter is forwarded to describe the field procedures contemplated at the above-referenced site. As agreed between Tom Micelli and Felix Matusky, one upgradient and one down gradient well will be constructed about 10 ft. from the excavation. However, the downgradient location will have to be moved slightly west to avoid the steps leading to the auto parts store.

Drilling will start with continuous split spoon sampling without augering accompanied by screening of vapors emanating from the soil with an HNu photoionization detector equipped with a 10.2eV lamp. This sampling will continue until spoon hole collapse is encountered (hopefully not until at least the water table is reached). Thereafter, split spoon samples will be collected at minimum 5 ft. intervals through the auger stem. The augers will have 4-in. hollow stems and 8-in. flights.

Wells will be constructed with 10 ft. of 2-in. PVC 20 slot screen, extending at least 1 to 2 ft. above the water table to ensure that any floating product is intercepted. The 2-in. PVC riser will be protected with 4-in. steel casing fitted with a locking cap and set in cement. Screen caps, well sand and bentonite seals will be installed according to NYSDEC monitoring well construction requirements. The drilling equipment will be steam cleaned between holes to eliminate cross contamination. The wells will be developed with a suction lift pump.

The well driller will be Kendrick Drilling, who will be supervised by a qualified LMS geologist. Drill logs will be prepared.

Sampling will be performed at least a week after drilling pursuant to NYSDEC procedures approved for similar LMS work. Samples will be analyzed with a BTX scan by CAMO Laboratories for xylenes.

Drilling is scheduled for the week of 3 August. Please let me know beforehand if you have any comments.

Yours very truly,

Stuart E. Bassell, P.E.
Project Manager

SEB:jms

cc: Mr. Gerard Phelan

NOTE: SEE MAP FOR LOCATION OF MON. WELLS @ XYLENE TANK EXCAVATION.

roTest
Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

SWIVELDER

A#: 61934-002 DATE REC'D: 88/2/11 DATE COLL: 88/2/11 STATUS: closed
AME: Tank Tech
T: ET: CITY: STATE: ZIP:
PL LOCATION: well #2 east COLL'D BY:
WHICH WELL IS IN DOUBT

EPORT TO: same
I . TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

ENZENE	: 1.7	ETHYLBENZENE	:
RO IOBENZENE	:	HEXACHLOROBUTADIENE	:
-B ITYLBENZENE	:	CUMENE	:
EC-BUTYLBENZENE	:	P-CYMEME	:
HL OROBENZENE	:	NAPHTHALENE	:
-C LOROBENZENE	:	N-PROPYLBENZENE	:
-CHLOROBENZENE	:	STYRENE	:
,2-DICHLOROBENZENE	:	TETRACHLOROETHENE	:
,3 DICHLOROBENZENE	:	TOLUENE	:
,4 DICHLOROBENZENE	:	1,2,3-TRICHLOROBENZENE	:
,2 4-TRICHLOROBENZENE	:	O-XYLENE	:
RI HLOROETHENE	: 30	M-XYLENE	:
,2,4-TRIMETHYLBENZENE	:	P-XYLENE	:
,3 5-TRIMETHYLBENZENE	:	CYCLOPROPYLBENZENE	:
-B OMOFLUOROBENZENE	:	1-CHLOROCYCLOHEXENE-1	:
3-BENZOFURAN	:	M-CHLOROTOLUENE	:

.1 results are in ug/l.

:m rks: All other EPA 503.1 <1.0 ug/l.

Ronald A. Bayer
Laboratory Director: 2/22/88

roTest
aboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

SWIVELIER

A.. #: 68924-002 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
AME: Tank Tech Corp.
T EET: CITY: STATE: ZIP:
.P.. LOCATION: Swivelier Monitor Wells COLL'D BY:
#1 Southeast

:E ORT TO: same
)I _ TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	:	4-Isopropyltoluene	:
Br mobenzene	:	Naphthalene	:
n-utylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
te t-Butylbenzene	:	Tetrachloroethene	:
Ch orobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1, -Dichlorobenzene	:	Trichloroethene	: 28 ug/l
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1, -Dichlorobenzene	:	1,3,5-Trimethylbenzene	:
Et. ylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Is propylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Re arks: All other EPA 503.1 <0.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

viroTest
aboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

received 1/23/89

LAB#: 68924-001 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp. CITY: STATE: ZIP:
STREET:
S - LOCATION: Swivelier Monitor Wells "#1 North" COLL'D BY:
NOT THE XYLENE TANK EXCAVATION WELL
REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

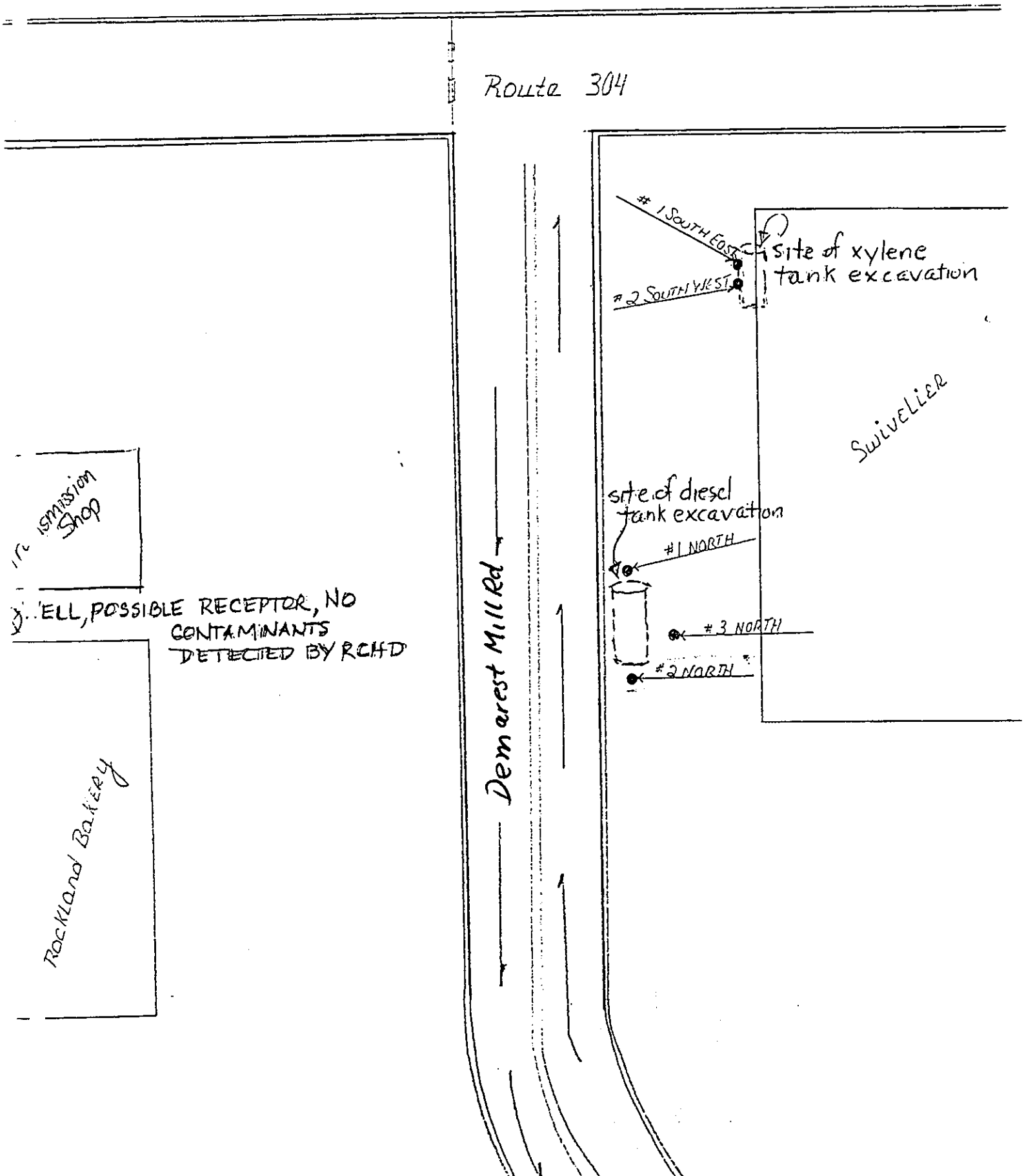
Benzene	:	4-Isopropyltoluene	:
Bromobenzene	:	Naphthalene	:
n-Butylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
tert-Butylbenzene	:	Tetrachloroethene	:
Chlorobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1,2-Dichlorobenzene	:	Trichloroethene	: 8.3 ug/l
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1,4-Dichlorobenzene	:	1,3,5-Trimethylbenzene	:
Ethylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Isopropylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Remarks: All other EPA 503.1 <0.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

Cathy Quinn


Route 304
Demarest Mill Rd
1 SOUTH EAST
2 SOUTH WEST
site of xylene tank excavation
SWIVELLER
site of diesel tank excavation
1 NORTH
3 NORTH
2 NORTH
ROCKLAND BAKERY
WELL, POSSIBLE RECEPTOR, NO CONTAMINANTS DETECTED BY RCHD

SUBSURFACE INVESTIGATIONS INC.
365 Route 9W
CONGERS, NEW YORK 10920
(914) 268-6660

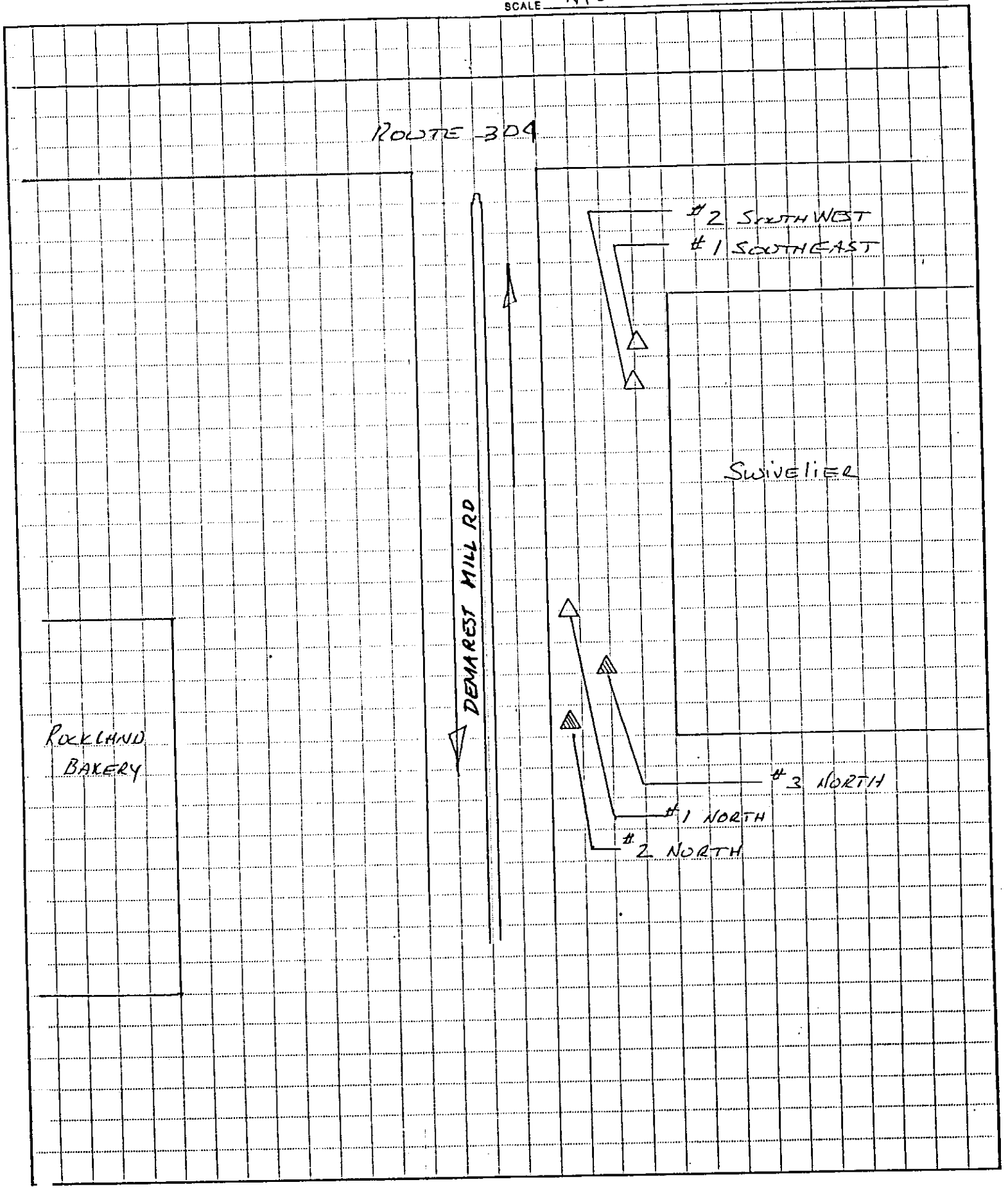
JOB Swivelear

SHEET NO. _____ OF _____

CALCULATED BY EMH DATE 2/7/90

CHECKED BY _____ DATE _____

SCALE NTS



CHAIN LAB NO.: 87-6-5140

VOLATILES

METHOD 503.

PARAMETERS	SAMPLE IDENTIFICATIONS A MW-1	B MW-2
Benzene	<1	<1
Trichloroethylene	37	<1
Toluene	<1	<1
Tetrachloroethylene	<1	<1
Ethylbenzene	<1	<1
1-Chlorocyclohexane-1 *	<1	<1
p-Xylene *	<1	<1
Chlorobenzene *	<1	<1
m-Xylene *	<1	<1
o-Xylene	<1	<1
Iso-propylbenzene	<1	<1
Styrene	<1	<1
p-Bromofluorobenzene	<1	<1
n-propylbenzene	<1	<1
tert-Butylbenzene	<1	<1

NOTE: All results expressed in ug/L unless noted otherwise.

* Coelution Compounds.

CHMG LOG NO.: 37-6-7460

VOLATILES

METHOD 503.1

PARAMETERS	SAMPLE IDENTIFICATION A MW-1	B MW-2
o-Chlorotoluene *	<1	<1
p-Chlorotoluene *	<1	<1
Dreabenzene *	<1	<1
sec-Butylbenzene	<1	<1
1,3,5-Trimethylbenzene	<1	<1
p-Cymene *	1	<1
1,2,4-Trimethylbenzene *	<1	<1
p-Dichlorobenzene	<3	<3
m-Dichlorobenzene *	<3	<3
Cyclopropylbenzene *	<1	<1
n-Butylbenzene *	<1	<1
2,3-Benzofuran	<1	<1
o-Dichlorobenzene	<3	<3
Hexachlorobutadiene	<5	<5
1,2,4-Trichlorobenzene	<5	<5
Naphthalene	<5	<5
1,2,3-Trichlorobenzene	<5	<5

NOTE: All results expressed in ug/L unless noted otherwise.

* Coelution Compounds.

CHAD LAB NO.: 87-5-3480

VOLATILES

METHOD 503.1

PARAMETERS	SAMPLE IDENTIFICATIONS MW-1 Spike
Benzene	--
Trichloroethylene	57%
Toluene	86%
Tetrachloroethylene	--
Ethylbenzene	65%
1-Chloropropylbenzene *	--
p-Xylene *	87%
Chlorobenzene *	--
m-Xylene *	87%
o-Xylene	--
Iso-propylbenzene	84%
Styrene	--
p-Bromofluorobenzene	91%
n-propylbenzene	--
tert-Butylbenzene	--

NOTE: All results expressed in ug/L unless noted otherwise.

* Coelution Compounds.

CARD LOG NO.: 87-2-3483

VOLATILES

METHOD 503.1

PARAMETERS	SAMPLE IDENTIFICATIONS
	MW-1 Spike
o-Chlorotoluene *	--
p-Chlorotoluene *	--
Bromobenzene *	--
sec-Butylbenzene	--
1,3,5-Trimethylbenzene	118%
p-Cymene *	--
1,2,4-Trimethylbenzene *	--
p-Dichlorobenzene	88%
m-Dichlorobenzene *	--
Cyclopropylbenzene *	--
n-Butylbenzene *	83%
2,3-Benzofuran	--
o-Dichlorobenzene	--
Hexachlorobutadiene	72%
1,2,4-Trichlorobenzene	--
Naphthalene	--
1,2,3-Trichlorobenzene	--

NOTE: All results expressed in ug/L unless noted otherwise.

* Coelution Compounds.

T CAMO Labs

Chain-of-Custody #: 100-1

LAWLER, MATUSKY & SKELLY ENGINEERS
CHAIN OF CUSTODY RECORD

PROJECT NUMBER: 100-070

PROJECT TITLE: Swivelier / Nanuet, NY.

LMS FACILITY: Nyack

FIELD PERSONNEL: JMG DK

SAMPLE TYPE (Circle): Drinking Water, Industrial Waste, Bottom Sediment, River/Ocean, Other _____, Soil, (Monitoring Wells), Treatment Facility, Leachate, Stream/Pond

SAMPLE ID NUMBER	DATE	TIME	STATION	PARAMETERS	REMARKS
64443	8-12-87	1120	MW-1	VOC's V_1 / BTX Analysis	
64444	↓	↓	MW-1	VOC's V_2 / BTX Analysis	
64445		1220	MW-2	VOC's V_1 / BTX Analysis	
64446		↓	MW-2	VOC's V_2 / BTX Analysis	
30294		—	Trip Blank	VOC's V_1 / BTX Analysis	Hold analysis of Trip Blanks until the results from the wells are given verbally to Jim Russell
30295	↓	—	Trip Blank	VOC's V_2 / BTX Analysis	

Relinquished By: John M Gruenwald	Date/Time: 8-12-87 / 1330	Received By: Cara Caldwell	Comments:
Relinquished By: Cara Caldwell	Date/Time: 8/13/87 / at	Received By:	Comments: To CAMO Labs
Relinquished By:	Date/Time:	Received By:	Comments:
Method of Shipment:	Shipped By:	Received By:	
Received at Laboratory By:		Date/Time:	Comments:

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 61516-001 DATE REC'D: 88/01/27 DATE COLL'D: 88/01/27 STATUS: CLOSED
NAME: Tank Tech Corp. CITY: STATE: ZIP:
STREET:
PROJ LOCATION: Swivelier #1

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Not Present
LUBE OILS	: Not Present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 1/29/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

Lab#: 61516-002 DATE REC'D: 88/01/27 DATE COLL'D: 88/01/27 STATUS: CLOSED
NAME: Tank Tech Corp. CITY: STATE: ZIP:
STREET:
JOB LOCATION: Swivelier #2

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Present
LUBE OILS	: Not Present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 1/29/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

AB#: 61516-003 DATE REC'D: 88/01/27 DATE COLL'D: 88/01/27 STATUS: CLOSED
AME: Tank Tech Corp. CITY: STATE: ZIP:
T EET:
PL LOCATION: Swivelier #3

E ORT TO: same
I L TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Present
LUBE OILS	: Not Present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 1/29/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 61934-001 DATE REC'D: 88/2/11 DATE COLL: 88/2/11 STATUS: closed
NAME: Tank Tech
STREET: CITY: STATE: ZIP:
SPL LOCATION: well #1 west COLL'D BY:

REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

BENZENE	:	ETHYLBENZENE	:
BROMOBENZENE	:	HEXACHLOROBUTADIENE	:
N-BUTYLBENZENE	:	CUMENE	:
SEC-BUTYLBENZENE	:	P-CYMENE	:
CHLOROBENZENE	:	NAPHTHALENE	:
2-CHLOROBENZENE	:	N-PROPYLBENZENE	:
4-CHLOROBENZENE	:	STYRENE	:
1,2-DICHLOROBENZENE	:	TETRACHLOROETHENE	:
1,3-DICHLOROBENZENE	:	TOLUENE	:
1,4-DICHLOROBENZENE	:	1,2,3-TRICHLOROBENZENE	:
1,2,4-TRICHLOROBENZENE	:	O-XYLENE	:
TRICHLOROETHENE	:	M-XYLENE	:
1,2,4-TRIMETHYLBENZENE	:	P-XYLENE	:
1,3,5-TRIMETHYLBENZENE	:	CYCLOPROPYLBENZENE	:
4-BROMOFLUOROBENZENE	:	1-CHLOROCYCLOHEXENE-1	:
2,3-BENZOFURAN	:	M-CHLOROTOLUENE	:

All results are in ug/l.

Remarks: All EPA 503.1 <1.0 ug/l.

Ronald A. Bayer
Laboratory Director: 2/22/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 61934-002 DATE REC'D: 88/2/11 DATE COLL: 88/2/11 STATUS: closed
NAME: Tank Tech
TREET: CITY: STATE: ZIP:
SPL LOCATION: well #2 east COLL'D BY:

EPORT TO: same
ILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

RENZENE	1.7	ETHYLBENZENE	
ROMOBENZENE		HEXACHLOROBUTADIENE	
N-BUTYLBENZENE		CUMENE	
SEC-BUTYLBENZENE		P-CYMEME	
HLOROBENZENE		NAPHTHALENE	
-CHLOROBENZENE		N-PROPYLBENZENE	
4-CHLOROBENZENE		STYRENE	
',2-DICHLOROBENZENE		TETRACHLOROETHENE	
,3-DICHLOROBENZENE		TOLUENE	
1,4-DICHLOROBENZENE		1,2,3-TRICHLOROBENZENE	
,2,4-TRICHLOROBENZENE		O-XYLENE	
RICHLOROETHENE	30	M-XYLENE	
1,2,4-TRIMETHYLBENZENE		P-XYLENE	
,3,5-TRIMETHYLBENZENE		CYCLOPROPYLBENZENE	
-BROMOFLUOROBENZENE		1-CHLOROCYCLOHEXENE-1	
2,3-BENZOFURAN		M-CHLOROTOLUENE	

All results are in ug/l.

emarks: All other EPA 503.1 <1.0 ug/l.

Ronald A. Bayer
Laboratory Director: 2/22/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 65478-003 DATE REC'D: 6/13/88 DATE COLL'D: 6/13/88 STATUS: closed
NAME: Swyvelier
STREET: CITY: STATE: ZIP:
SPL LOCATION: S. East COLL'D BY:

REPORT TO: same
BILL TO: same

VOLATILE ORGANICS ANALYSIS

Bromodichloromethane	:	Tetrachloroethylene	:
Bromoform	:	Trans-1,3-dichloropropene	:
Bromomethane	:	Trans-1,2-dichloroethylene	:
Carbon tetrachloride	:	1,1,1-trichloroethane	:
Chlorobenzene	:	1,1,2-trichloroethane	:
Chloroethane	:	Trichloroethylene	:
2-chloroethylvinyl ether	:	Trichlorofluoromethane	:
Chloroform	:	1,1,2-trichloro-1,2,2-trifluoroethane	:
Chloromethane	:	Vinyl chloride	:
Cis-1,3-dichloropropene	:		
Dibromochloromethane	:		
1,1-dichloroethane	:	Benzene	:
1,2-dichloroethane	:	1,2-dichlorobenzene	:
1,1-dichloroethylene	:	1,3-dichlorobenzene	:
1,2-dichloropropane	:	1,4-dichlorobenzene	:
Methylene chloride	:	Ethylbenzene	:
1,1,2,2-tetrachloroethane	:	Toluene	:
		Total Xylenes	:

All results in ug/l.

Remarks: All BTX's <1.0 ug/l

Ronald A. Bayer
Laboratory Director 6/24/88

EnviroTest

315 Fullerton Avenue
Newburgh, NY 12550

EnviroTest
Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 65478-001 DATE REC'D: 6/13/88 DATE COLL'D: 6/13/88 STATUS: close
NAME: Swyvelier
STREET: CITY: STATE: ZIP:
SPL LOCATION: Tank Tech 2 North COLL'D BY:

REPORT TO: same
BILL TO: same

VOLATILE ORGANICS ANALYSIS

Bromodichloromethane	:	Tetrachloroethylene	:
Bromoform	:	Trans-1,3-dichloropropene	:
Bromomethane	:	Trans-1,2-dichloroethylene	:
Carbon tetrachloride	:	1,1,1-trichloroethane	:
Chlorobenzene	:	1,1,2-trichloroethane	:
Chloroethane	:	Trichloroethylene	:
2-chloroethylvinyl ether	:	Trichlorofluoromethane	:
Chloroform	:	1,1,2-trichloro-1,2,2-trifluoroethane	:
Chloromethane	:	Vinyl chloride	:
Cis-1,3-dichloropropene	:		
Dibromochloromethane	:		
1,1-dichloroethane	:	Benzene	: 140 ug/l
1,2-dichloroethane	:	1,2-dichlorobenzene	:
1,1-dichloroethylene	:	1,3-dichlorobenzene	:
1,2-dichloropropane	:	1,4-dichlorobenzene	:
Methylene chloride	:	Ethylbenzene	: 28 ug/l
1,1,2,2-tetrachloroethane	:	Toluene	: 3.7 ug/l
		Total Xylenes	: 28 ug/l

All results in ug/l.

Remarks: All other BTX's <1.0 ug/l

Ronald A. Beyer
Laboratory Director 6/24/88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

January 7, 1988

Tank Tech. Corp.
365 Route 9W
Congers, NY 10920

SUBJECT: RESULTS OF VOLATILES, SAMPLE
RECEIVED 12/21/88, LAB NUMBER 71507.

Dear Gentlemen:

Enclosed please find the subject data for your review. All analyses were performed according to EPA accepted methodologies.

If there are any questions regarding this data, please do not hesitate to contact my office.

Very truly yours,

ENVIROTEST LABORATORIES, INC.

Ronald A. Bayer
President

RAB/kak

ENVIROTEST LABORATORIES, INC.

Sample Disposition Policy

It is the policy of EnviroTest Laboratories, and the responsibility of EnviroTest and its clients, to handle, transport, and dispose of unused portions of analytical samples in an environmentally sound manner which complies fully with federal, state, and local regulations.

Unused portions of soil and waste samples will be returned to the client at no charge. Aqueous samples determined to be non-hazardous will be disposed of by EnviroTest; aqueous samples determined to be potentially hazardous will be returned to the client.

DATA REPORTING QUALIFIERS

VALUE - A value is reported if the result is greater than or equal to the detection limit.

U - Indicates that the compound was analyzed for but not detected. The value followed by the U (e.g. 10U) is the minimum detection limit for the sample based on necessary concentration or dilution action. This is not necessarily the instrument detection limit.

J - Indicates an estimated value. This qualifier is used when mass spectral data indicates the presence of a compound that meets the identification criteria and the result is < than the specified detection limit but > than zero.

B - This qualifier is used when the analyte is found in the blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

C - This qualifier applies to pesticide parameters where the identification has been confirmed by gas chromatography/mass spectrometry.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech. Corp.

Project Name: Swivelier

Sample Location: #1 North

Matrix: G. H20

Method: EPA 602

Lab Number: 71507-001

Date Collected: 12/21/88

Date Received: 12/21/88

Date Analyzed: 12/27/88

Report Date: 1/7/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	1.0		U
108-88-3	Toluene	1.0		U
108-90-7	Chlorobenzene	1.0		U
100-41-4	Ethylbenzene	1.0		U
541-73-1	1,3-Dichlorobenzene	1.0		U
95-50-1	1,2-Dichlorobenzene	1.0		U
106-46-7	1,4-Dichlorobenzene	1.0		U

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech. Corp.

Project Name: Swivelier

Sample Location: #2 North

Matrix: G. H20

Method: EPA 602

Lab Number: 71507-002

Date Collected: 12/21/88

Date Received: 12/21/88

Date Analyzed: 12/27/88

Report Date: 1/7/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	1.0	6.0	
108-88-3	Toluene	1.0	67	
108-90-7	Chlorobenzene	1.0		U
100-41-4	Ethylbenzene	1.0	110	
541-73-1	1,3-Dichlorobenzene	1.0		U
95-50-1	1,2-Dichlorobenzene	1.0		U
106-46-7	1,4-Dichlorobenzene	1.0		U

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech. Corp.

Project Name: Swivelier

Sample Location: #3 North

Matrix: G. H20

Method: EPA 602

Lab Number: 71507-003

Date Collected: 12/21/88

Date Received: 12/21/88

Date Analyzed: 12/27/88

Report Date: 1/7/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	1.0		U
108-88-3	Toluene	1.0		U
108-90-7	Chlorobenzene	1.0		U
100-41-4	Ethylbenzene	1.0		U
541-73-1	1,3-Dichlorobenzene	1.0		U
95-50-1	1,2-Dichlorobenzene	1.0		U
106-46-7	1,4-Dichlorobenzene	1.0		U

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech. Corp.

Project Name: Swivelier

Sample Location: #1 SOutheast

Matrix: G. H20

Method: EPA 602

Lab Number: 71507-004

Date Collected: 12/21/88

Date Received: 12/21/88

Date Analyzed: 12/27/88

Report Date: 1/7/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	1.0		U
108-88-3	Toluene	1.0		U
108-90-7	Chlorobenzene	1.0		U
100-41-4	Ethylbenzene	1.0		U
541-73-1	1,3-Dichlorobenzene	1.0		U
95-50-1	1,2-Dichlorobenzene	1.0		U
106-46-7	1,4-Dichlorobenzene	1.0		U

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech. Corp.

Project Name: Swivelier

Sample Location: #2 Southeast

Matrix: G. H20

Method: EPA 602

Lab Number: 71507-005

Date Collected: 12/21/88

Date Received: 12/21/88

Date Analyzed: 12/27/88

Report Date: 1/7/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	1.0		U
108-88-3	Toluene	1.0		U
108-90-7	Chlorobenzene	1.0		U
100-41-4	Ethylbenzene	1.0		U
541-73-1	1,3-Dichlorobenzene	1.0		U
95-50-1	1,2-Dichlorobenzene	1.0		U
106-46-7	1,4-Dichlorobenzene	1.0		U

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 64453-001 DATE REC'D: 5-9-88 DATE COLL'D: 5-9-88 STATUS: closed
NAME: Tank Tech CITY: STATE: ZIP:
STREET:
SPL LOCATION: MW #1 North

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Not present
LUBE OILS	: Not present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 5-24-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

L B#: 64453-002 DATE REC'D: 5-9-88 DATE COLL'D: 5-9-88 STATUS: closed
NAME: Tank Tech CITY: STATE: ZIP:
STREET:
S L LOCATION: MW #2 North

REPORT TO: same
B LL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	:	Present
LUBE OILS	:	Not present
FUEL OIL #1	:	<0.1 ul/l
FUEL OIL #2	:	<0.1 ul/l
FUEL OIL #3	:	<0.1 ul/l
FUEL OIL #4	:	<0.1 ul/l
FUEL OIL #5	:	<0.1 ul/l
FUEL OIL #6	:	<0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director 5-24-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

LAB#: 64453-004 DATE REC'D: 5-9-08 DATE COLL'D: 5-9-08 STATUS: closed
NAME: Tank Tech CITY: STATE: ZIP:
STREET:
PL LOCATION: MW #3 North

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Present
LUBE OILS	: Not present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

Ronald A. Bayer
Laboratory Director: 5-24-08

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

AB#: 64453-005 DATE REC'D: 5-9-88 DATE COLL'D: 5-9-88 STATUS: closed
NAME: Tank Tech CITY: STATE: ZIP:
STREET:
PL LOCATION: MW #2 Southwest

REPORT TO: same
BILL TO: same

TOTAL PETROLEUM HYDROCARBON - NYSDOH METHOD 310.13

GASOLINE	: Not present
LUBE OILS	: Not present
FUEL OIL #1	: <0.1 ul/l
FUEL OIL #2	: <0.1 ul/l
FUEL OIL #3	: <0.1 ul/l
FUEL OIL #4	: <0.1 ul/l
FUEL OIL #5	: <0.1 ul/l
FUEL OIL #6	: <0.1 ul/l

TOTAL PETROLEUM HYDROCARBON - EPA METHOD 418.1

RESULT :

REMARKS:

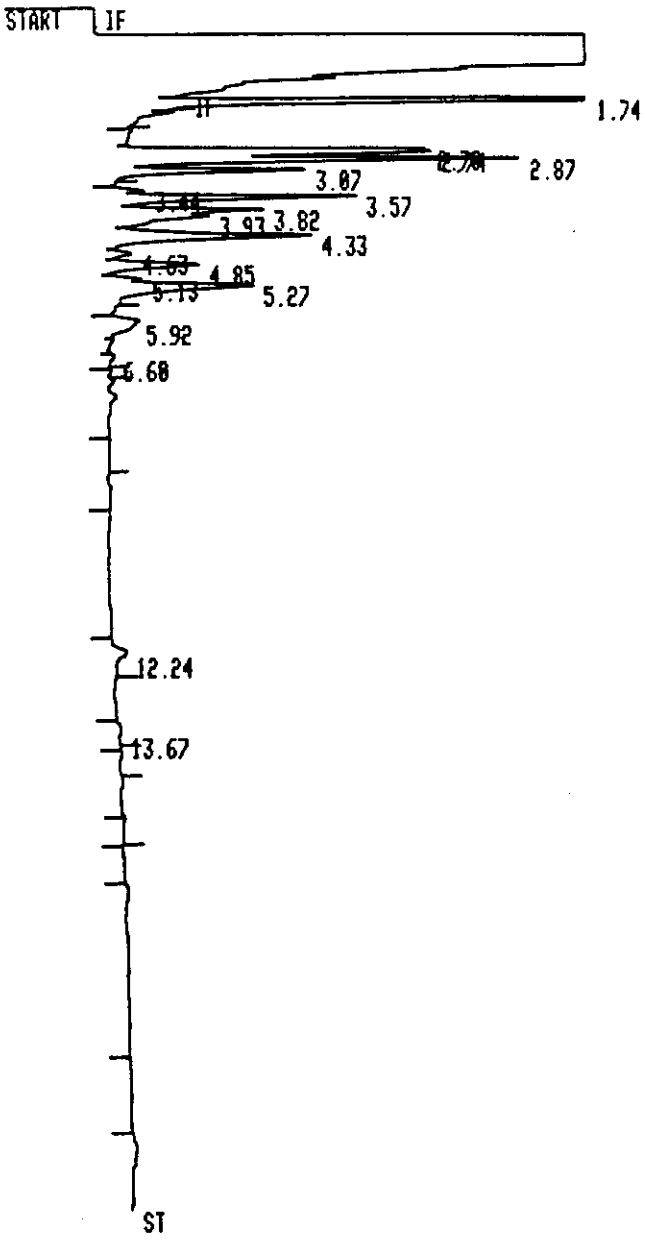
Ronald A. Mayer
Laboratory Director 5-24-88

LIST: ZERO = 10,-0.3

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.2
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 1
AR REJ = 4500

64453-002
1.0 ml INS
R=10"
PROGRAM



RUN # 14 MAY/20/88 15:40:38

AREA%

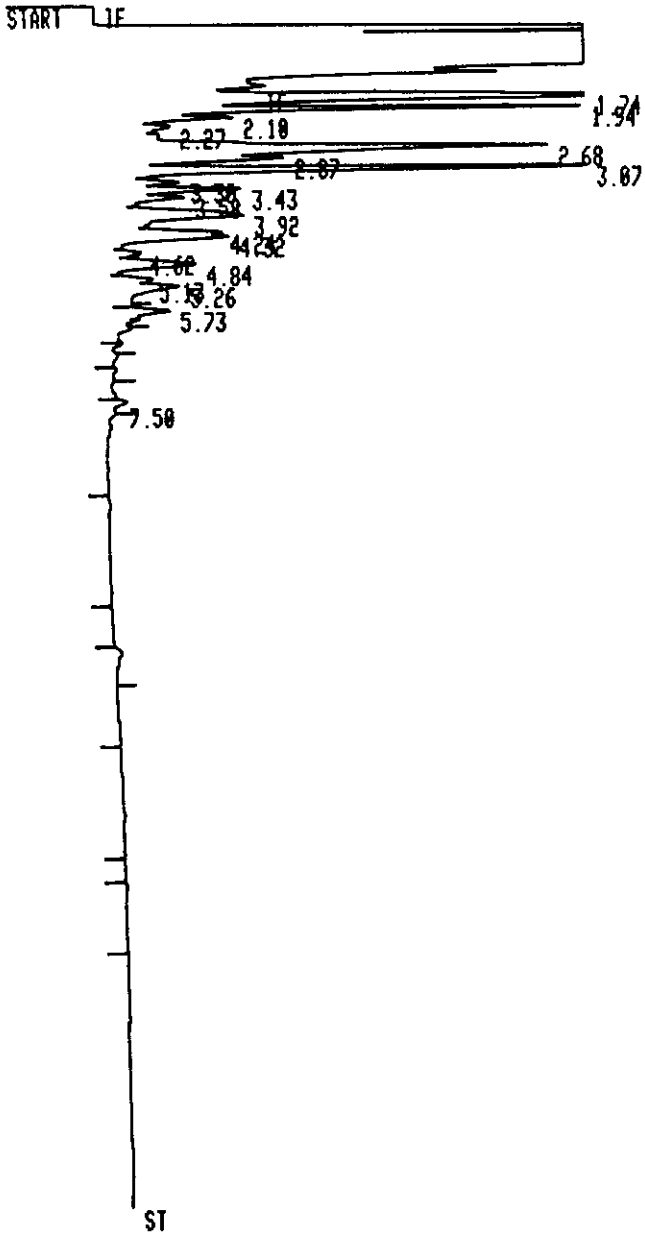
RT	AREA	TYPE	AR/HT	AREA%
1.74	267220	BB	0.064	24.906
2.70	71620	VV	0.067	6.675
2.74	82872	D VV	0.076	7.724
2.87	128140	VV	0.091	11.942
3.07	59716	VB	0.092	5.566
3.44	8800	BV	0.082	0.820

LIST: ZERO = 10,-0.4

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.4
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 2
AR REJ = 4500

Glucose
10 ml/ml
1.0 ml INS
R=10"
Program



RUN # 13 MAY/23/88 16:16:34

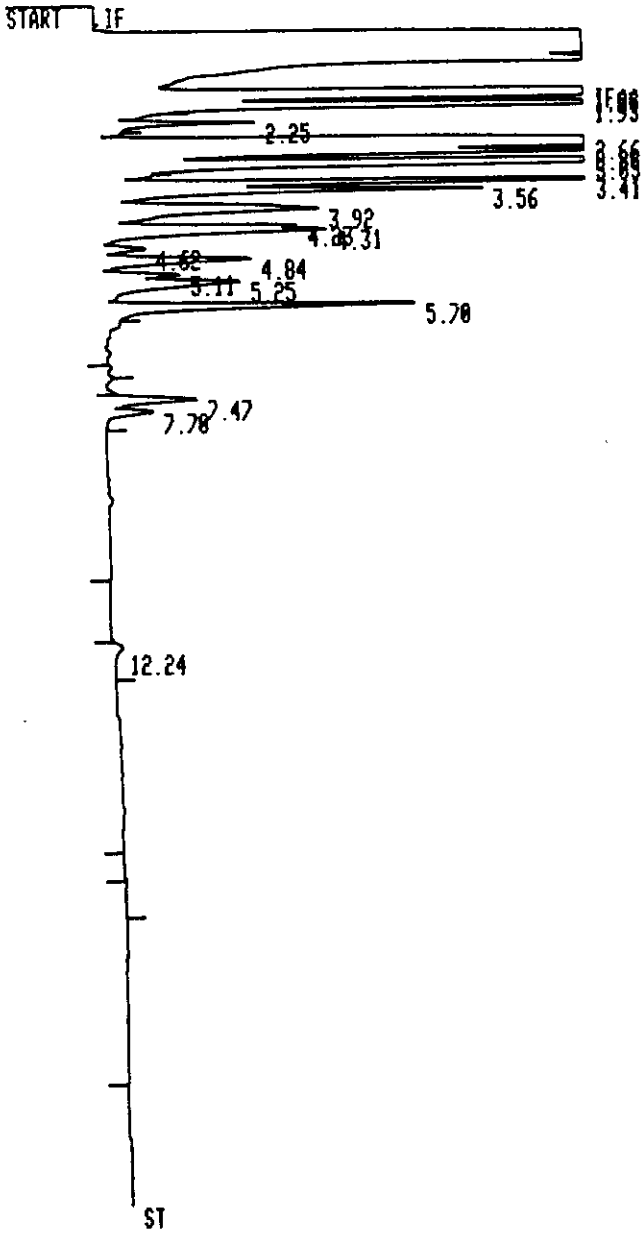
AREA%

RT	AREA	TYPE	AR/HT	AREA%
1.74	250750	BP	0.073	23.277
1.94	85525	PV	0.066	7.940
2.10	12207	VP	0.063	1.133
2.27	5492	PV	0.080	0.510
2.68	204480	VV	0.143	18.982
2.87	50514	VV	0.102	4.689
3.07	151370	VV	0.088	14.052

LIST: ZERO = 10,-0.5

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.3
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 2
AR REJ = 4500



RUN # 2 MAY/23/88 09:50:09

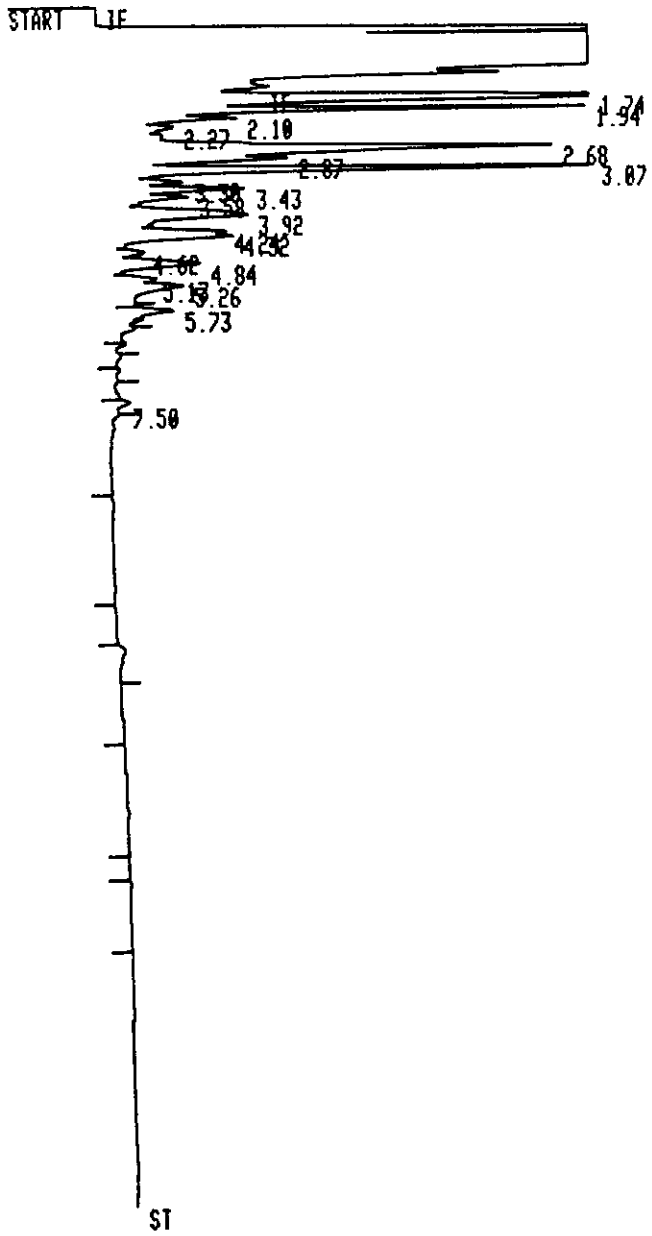
AREA%

RT	AREA	TYPE	AR/HT	AREA%
1.66	31141	BV	0.019	0.579
1.73	1529200	VP	0.057	28.446
1.93	752640	PB	0.067	14.000
2.25	32669	BB	0.075	0.608
2.66	1042900	PV	0.127	19.399
2.86	200270	VV	0.086	3.725
3.05	863730	VB	0.087	16.067

LIST: ZERO = 10,-0.4

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.4
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 2
AR REJ = 4500



RUN # 13 MAY/23/88 16:16:34

AREA%

RT	AREA	TYPE	AR/HT	AREA%
1.74	250750	BP	0.073	23.277
1.94	85525	PV	0.066	7.940
2.10	12207	VP	0.063	1.133
2.27	5492	PV	0.080	0.510
2.68	204480	VV	0.143	18.982
2.87	50514	VV	0.102	4.689
3.07	151370	VV	0.088	14.052

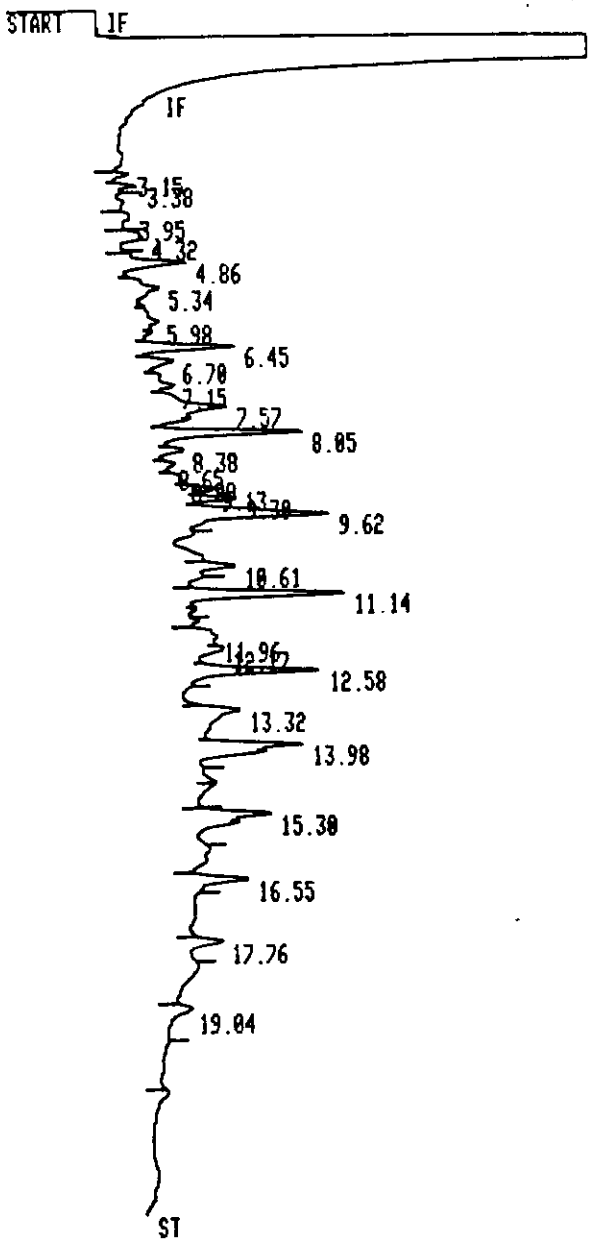
LIST: ZERO = 10,-0.5

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.5
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 2
AR REJ = 4500

64453-006
1.0 ml FID
R = 10^{-11}
PROGRAM

LIST: ZERO = 10,-0.3



RUN # 5 MAY/23/88 11:27:52

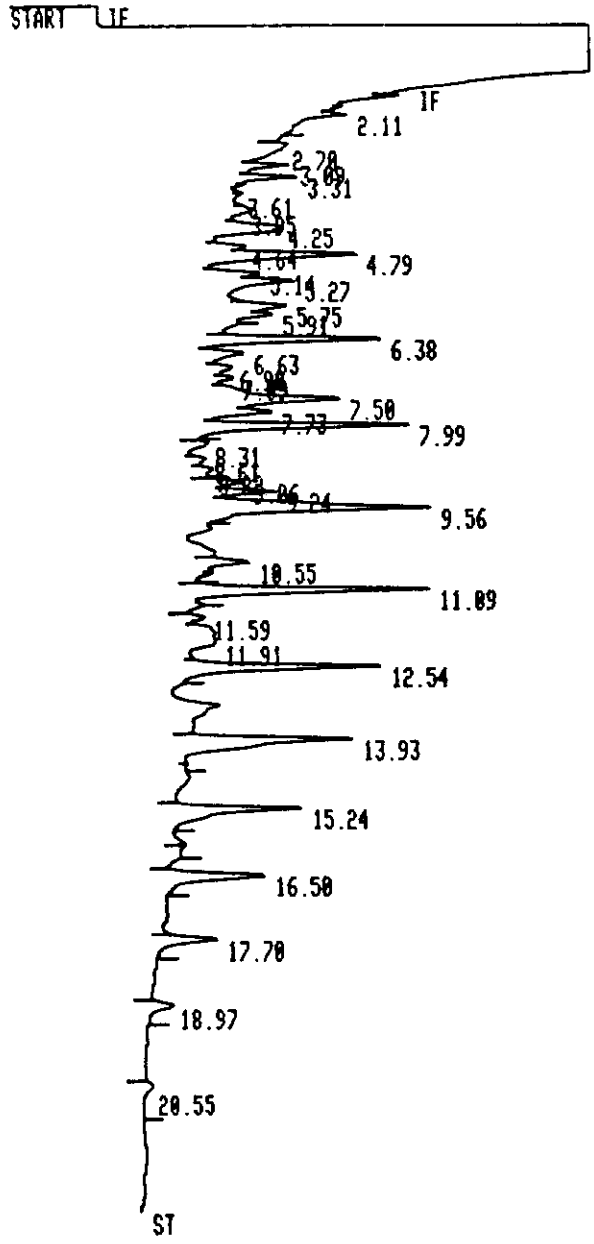
AREA% RT	AREA	TYPE	AR/HT	AREA%
3.15	4688	BP	0.088	0.532
3.38	4988	PB	0.073	0.566
4.32	12653	BB	0.190	1.437
4.86	32775	BP	0.150	3.721
5.34	31883	PV	0.266	3.620

LIST: ZERO = 10,-0.5

LIST: LIST
PEAK CAPACITY: 1158

ZERO = 10,-0.3
ATT 2↑ = 2
CHT SP = 0.7
PK WD = 0.04
THRSH = 2
AR REJ = 4500

IF2 Fuel 1.0 ml/min
60 mV
R20 → 1
PROGRAM



RUN # 12 MAY/23/88 15:48:48

AREA% RT	AREA	TYPE	AR/HT	AREA%
2.70	15060	BP	0.265	1.127
3.09	13129	PV	0.091	0.982
3.31	18493	VV	0.093	1.384
3.61	6899	PV	0.146	0.516
3.95	21058	VV	0.204	1.576
4.25	22685	VV	0.107	1.697
4.64	11793	PV	0.098	0.882

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

September 18, 1989

Tank Tech
365 Route 9 W
Congers, NY 10920

SUBJECT: LAB NUMBER 79709, SAMPLE RECEIVED 9/8/89.

Dear Gentlemen:

Enclosed please find the subject data for your review. All analyses were performed according to EPA accepted methodologies.

If there are any questions regarding this data, please do not hesitate to contact my office.

Very truly yours,

ENVIROTEST LABORATORIES, INC.

Ronald A. Bayer
President

RAB/kak

ENVIROTEST LABORATORIES, INC.

Sample Disposal Policy

It is the policy of EnviroTest Laboratories, and the responsibility of EnviroTest and its clients, to handle, transport, and dispose of unused portions of analytical samples in an environmentally sound manner which complies fully with federal, state, and local regulations.

Unused portions of soil and waste samples will be returned to the client at no charge. Aqueous samples determined to be non-hazardous will be disposed of by EnviroTest; aqueous samples determined to be potentially hazardous will be returned to the client.

DATA REPORTING QUALIFIERS

VALUE - A value is reported if the result is greater than or equal to the detection limit.

U - Indicates that the compound was analyzed for but not detected. The value followed by the U (e.g. 10U) is the minimum detection limit for the sample based on necessary concentration or dilution action. This is not necessarily the instrument detection limit.

J - Indicates an estimated value. This qualifier is used when mass spectral data indicates the presence of a compound that meets the identification criteria and the result is < than the specified detection limit but > than zero.

B - This qualifier is used when the analyte is found in the blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

C - This qualifier applies to pesticide parameters where the identification has been confirmed by gas chromatography/mass spectrometry.

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech

Project Name:

Sample Location: #2 North

Matrix: G. Water

Method: EPA 503.1

Lab Number: 79709-001

Date Collected: 9/8/89

Date Received: 9/8/89

Date Analyzed: 9/13/89

Report Date: 9/18/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	0.5		U
79-01-6	Trichloroethene	0.5		U
108-88-3	Toluene	0.5		U
127-18-4	Tetrachloroethene	0.5		U
108-90-7	Chlorobenzene	0.5		U
100-41-4	Ethylbenzene	0.5		U
106-42-3	p-Xylene	0.5		U
108-38-3	m-Xylene	0.5		U
95-47-6	o-Xylene	0.5		U
98-82-8	Isopropylbenzene	0.5		U
100-42-5	Styrene	0.5		U
103-65-1	n-Propylbenzene	0.5		U
98-06-6	tert-Butylbenzene	0.5		U
95-49-8	2-Chlorotoluene	0.5		U
106-43-4	4-Chlorotoluene	0.5		U
108-86-1	Bromobenzene	0.5		U
135-98-8	sec-Butylbenzene	0.5		U
108-67-8	1,3,5-Trimethylbenzene	0.5		U
99-87-6	4-Isopropyltoluene	0.5		U
95-63-6	1,2,4-Trimethylbenzene	0.5		U
106-46-7	1,4-Dichlorobenzene	0.5		U
541-73-1	1,3-Dichlorobenzene	0.5		U
104-51-8	n-Butylbenzene	0.5		U
95-50-1	1,2-Dichlorobenzene	0.5		U
87-68-3	Hexachlorobutadiene	0.5		U
120-82-1	1,2,4-Trichlorobenzene	0.5		U
91-20-3	Naphthalene	0.5		U
87-61-6	1,2,3-Trichlorobenzene	0.5		U

VOLATILE ORGANICS ANALYSIS DATA SHEET

Client Name: Tank Tech

Project Name:

Sample Location: #3 North

Matrix: G. Water

Method: EPA 503.1

Lab Number: 79709-002

Date Collected: 9/8/89

Date Received: 9/8/89

Date Analyzed: 9/13/89

Report Date: 9/18/89

CAS NO.	COMPOUND	Detection Limit ug/l	Conc. ug/l	Data Qualifier
71-43-2	Benzene	5.0	68	
79-01-6	Trichloroethene	5.0		U
108-88-3	Toluene	5.0	1,600	
127-18-4	Tetrachloroethene	5.0		U
108-90-7	Chlorobenzene	5.0		U
100-41-4	Ethylbenzene	5.0	750	
106-42-3	p-Xylene	5.0	840	
108-38-3	m-Xylene	5.0	1,700	
95-47-6	o-Xylene	5.0	1,200	
98-82-8	Isopropylbenzene	5.0		U
100-42-5	Styrene	5.0		U
103-65-1	n-Propylbenzene	5.0	100	
98-06-6	tert-Butylbenzene	5.0		U
95-49-8	2-Chlorotoluene	5.0		U
106-43-4	4-Chlorotoluene	5.0		U
108-86-1	Bromobenzene	5.0		U
135-98-8	sec-Butylbenzene	5.0		U
108-67-8	1,3,5-Trimethylbenzene	5.0	330	
99-87-6	4-Isopropyltoluene	5.0		U
95-63-6	1,2,4-Trimethylbenzene	5.0	980	
106-46-7	1,4-Dichlorobenzene	5.0		U
541-73-1	1,3-Dichlorobenzene	5.0		U
104-51-8	n-Butylbenzene	5.0		U
95-50-1	1,2-Dichlorobenzene	5.0		U
87-68-3	Hexachlorobutadiene	5.0		U
120-82-1	1,2,4-Trichlorobenzene	5.0		U
91-20-3	Naphthalene	5.0	190	
87-61-6	1,2,3-Trichlorobenzene	5.0		U

68924/001-005

INVOICE

DATE 10-19-88

ACCOUNT NUMBER 68924/001-005

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890

Swivelier

Tank Tech
365 Route 9W
Congers, NY 10920
Attn: Accounts Payable

Net 30 days

AMOUNT ENCLOSED $ _____

RETURN THIS PORTION WITH PAYMENT

DATE	DESCRIPTION	AMOUNT
9-28-88	5 503.1 @ $90	$450.00
	Total	$450.00

SWIVELIER

NEED TO BILL

EnviroTest Laboratories Inc.

PAY LAST AMOUNT IN THIS COLUMN

Thank You

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

LAB#: 68924-002 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp.
STREET: CITY: STATE: ZIP:
SPL LOCATION: Swivelier Monitor Wells COLL'D BY:
#1 Southeast

REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	:	4-Isopropyltoluene	:
Bromobenzene	:	Naphthalene	:
n-Butylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
tert-Butylbenzene	:	Tetrachloroethene	:
Chlorobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1,2-Dichlorobenzene	:	Trichloroethene	: 28 ug/l
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1,4-Dichlorobenzene	:	1,3,5-Trimethylbenzene	:
Ethylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Isopropylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Remarks: All other EPA 503.1 <0.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

LAB#: 68924-004 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp.
STREET: CITY: STATE: ZIP:
SPL LOCATION: Swivelier Monitor Wells COLL'D BY:
#2 Southwest

REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	:	4-Isopropyltoluene	:
Bromobenzene	:	Naphthalene	:
n-Butylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
tert-Butylbenzene	:	Tetrachloroethene	:
Chlorobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1,2-Dichlorobenzene	:	Trichloroethene	:
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1,4-Dichlorobenzene	:	1,3,5-Trimethylbenzene	:
Ethylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Isopropylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Remarks: All EPA 503.1 <0.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

LAB#: 68924-005 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp.
STREET: CITY: STATE: ZIP:
SPL LOCATION: Swivelier Monitor Wells #3 North #2 COLL'D BY:
REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	150 ug/l	4-Isopropyltoluene	
Bromobenzene		Naphthalene	260 ug/l
n-Butylbenzene		n-Propylbenzene	43 ug/l
sec-Butylbenzene		Styrene	
tert-Butylbenzene		Tetrachloroethene	
Chlorobenzene		Toluene	3,800 ug/l
2-Chlorotoluene		1,2,3-Trichlorobenzene	
4-Chlorotoluene		1,2,4-Trichlorobenzene	34 ug/l
1,2-Dichlorobenzene		Trichloroethene	
1,3-Dichlorobenzene		1,2,4-Trimethylbenzene	1,800 ug/l
1,4-Dichlorobenzene		1,3,5-Trimethylbenzene	440 ug/l
Ethylbenzene	730 ug/l	o-Xylene	2,240 ug/l
Hexachlorobutadiene		m-Xylene	3,340 ug/l
Isopropylbenzene		p-Xylene	1,550 ug/l

All results are in ug/l unless otherwise indicated.

Remarks: All other EPA 503.1 <2.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

LAB#: 68924-003 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp.
STREET: CITY: STATE: ZIP:
SPL LOCATION: Swivelier Monitor Wells #2 North #3 COLL'D BY:

REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	:	4-Isopropyltoluene	:
Bromobenzene	:	Naphthalene	:
n-Butylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
tert-Butylbenzene	:	Tetrachloroethene	:
Chlorobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1,2-Dichlorobenzene	:	Trichloroethene	:
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1,4-Dichlorobenzene	:	1,3,5-Trimethylbenzene	: 0.8 ug/l
Ethylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Isopropylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Remarks: All other EPA 503.1 <0.5 ug/l

Ronald A. Bayer
Laboratory Director 10-20-88

EnviroTest Laboratories Inc.

315 Fullerton Avenue
Newburgh, NY 12550
(914) 562-0890
Fax (914) 562-0841

LAB#: 68924-001 DATE REC'D: 9/28/88 DATE COLL: 9/28/88 STATUS: closed
NAME: Tank Tech Corp.
STREET: CITY: STATE: ZIP:
SPL LOCATION: Swivelier Monitor Wells #1 North COLL'D BY:

REPORT TO: same
BILL TO: same

EPA METHOD 503.1 VOLATILE ORGANICS ANALYSIS

Benzene	:	4-Isopropyltoluene	:
Bromobenzene	:	Naphthalene	:
n-Butylbenzene	:	n-Propylbenzene	:
sec-Butylbenzene	:	Styrene	:
tert-Butylbenzene	:	Tetrachloroethene	:
Chlorobenzene	:	Toluene	:
2-Chlorotoluene	:	1,2,3-Trichlorobenzene	:
4-Chlorotoluene	:	1,2,4-Trichlorobenzene	:
1,2-Dichlorobenzene	:	Trichloroethene	: 8.3 ug/l
1,3-Dichlorobenzene	:	1,2,4-Trimethylbenzene	:
1,4-Dichlorobenzene	:	1,3,5-Trimethylbenzene	:
Ethylbenzene	:	o-Xylene	:
Hexachlorobutadiene	:	m-Xylene	:
Isopropylbenzene	:	p-Xylene	:

All results are in ug/l unless otherwise indicated.

Remarks: All other EPA 503.1 <0.5 ug/l

Ronald A. Mayer
Laboratory Director 10-20-88

TANK TECH CORP
SUBSURFACE INVESTIGATIONS
CHAIN OF CUSTODY RECORD

PROJECT: SWIVELIER

PROJECT TITLE: _____

TTC FACILITY: CONGERS

FIELD PERSONNEL: STEVE McGUIRE

SAMPLE TYPE (circle): Drinking Water
Industrial Waste
Bottom Sediment
River/Ocean
Other _____

(Monitoring Wells)
Treatment Facility
Leachate
Stream/Pond
Soil

SAMPLE ID NUMBER	DATE	TIME	STATION	PARAMETERS	REMARKS
#1 SOUTHEAST	28 SEPT	0930	—	EPA METHOD 503.1	
#2 SOUTHEAST	28 SEPT	0935	—	"	
#1 NORTH	28 SEPT	0938	—	"	
#2 NORTH	28 SEPT	0940	—	"	
#3 NORTH	28 SEPT	0945	—	"	

RELINQUISHED BY: Steven Hagerth	DATE/TIME: 28 Sept 88 1220	RECEIVED BY: ENVIROTEST	COMMENTS: LABS
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
METHOD OF SHIPMENT:	SHIPPED BY:	RECEIVED BY:	
RECEIVED AT LABORATORY BY: Karen Kronsberg		DATE/TIME: 9/28/88 12:25	COMMENTS:

TANK TECH CORP
SUBSURFACE INVESTIGATIONS
CHAIN OF CUSTODY RECORD

PROJECT: SWINE CIER

PROJECT TITLE: CONTINUING SAMPLE PROGRAM

TTC FACILITY: CONGERS

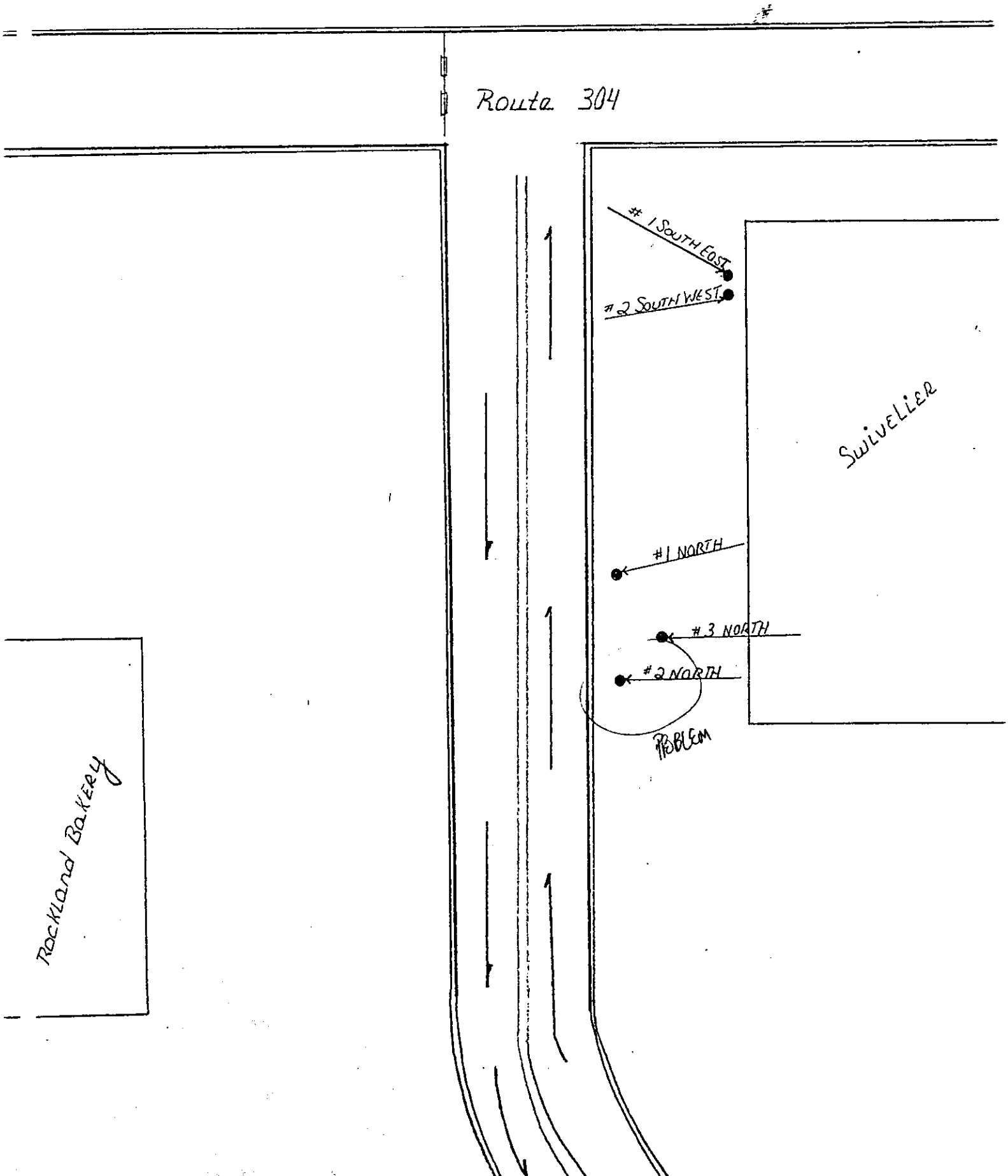
FIELD PERSONNEL: CARLOS GUERRERO

SAMPLE TYPE (circle): Drinking Water, Industrial Waste, Bottom Sediment, River/Ocean, Other _____, Monitoring Wells, Treatment Facility, Leachate, Stream/Pond, Soil

SAMPLE ID NUMBER	DATE	TIME	STATION	PARAMETERS	REMARKS
#1 NORTH	21 DEC 88	3:13		EPA METHOD	602
#2 NORTH	21 DEC 88	3:17		↓	
#3 NORTH	21 DEC 88	3:21			
#1 SOUTHEAST	21 DEC 88	3:24			
#2 SOUTHWEST	21 DEC 88	3:27	1 OF 2		
#2 SOUTHWEST	21 DEC 88	3:29	2 OF 2		

RELINQUISHED BY: Carlos Guerrero	DATE/TIME: 12/21/88 4:30	RECEIVED BY: [signature]	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
METHOD OF SHIPMENT:	SHIPPED BY:	RECEIVED BY:	
RECEIVED AT LABORATORY BY:		DATE/TIME:	COMMENTS:

Cathy Quinn


Route 304
1 South East
2 South West
Swivelier
1 North
3 North
2 North
Rockland Bakery

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

Subsurface Investigations
365 Rte. 9W
Congers, NY 10920

Date of Report: 06/19/90
Work Order #: 90-06-015
Date Received: 06/01/90
Client #: 001093
P.O. #: Swivelier

ATTACHED ARE THE ANALYSES YOU REQUESTED

Laboratory Manager

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90

DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	SAMPLE ID > BLANK	MDL
BENZENE	ND	0.0004
BROMOBENZENE	ND	0.0002
BROMOCHLOROMETHANE	ND	0.0001
BROMODICHLOROMETHANE	ND	0.0002
BROMOFORM	ND	0.0001
BROMOMETHANE	ND	0.0010
N-BUTYLBENZENE	ND	0.0001
SEC-BUTYLBENZENE	ND	0.0005
TERT-BUTYLBENZENE	ND	0.0001
CARBON TETRACHLORIDE	ND	0.0001
CHLOROBENZENE	ND	0.0001
CHLOROETHANE	ND	0.0003
CHLOROFORM	ND	0.0003
CHLOROMETHANE	ND	0.0005
2-CHLOROTOLUENE	ND	0.0002
4-CHLOROTOLUENE	ND	0.0002
DIBROMOCHLOROMETHANE	ND	0.0002
1,2-DIBROMO-3-CHLOROPROPANE	ND	0.0003
DIBROMOMETHANE	ND	0.0002
1,2-DIBROMOETHANE	ND	0.0002
1,2-DICHLOROBENZENE	ND	0.0002
1,3-DICHLOROBENZENE	ND	0.0002
1,4-DICHLOROBENZENE	ND	0.0001
DICHLORODIFLUOROMETHANE	ND	0.0004
1,1-DICHLOROETHANE	ND	0.0002
1,2-DICHLOROETHANE	ND	0.0001
1,1-DICHLOROETHENE	ND	0.0002
CIS-1,2-DICHLOROETHENE	ND	0.0001
TRANS-1,2-DICHLOROETHENE	ND	0.0001
1,2-DICHLOROPROPANE	ND	0.0002
1,3-DICHLOROPROPANE	ND	0.0005
2,2-DICHLOROPROPANE	ND	0.0001
1,1-DICHLOROPROPENE	ND	0.0001
1,3-DICHLOROPROPENE (TOTAL)	ND	0.0005
ETHYLBENZENE	ND	0.0002
HEXACHLOROBUTADIENE	ND	0.0003
ISOPROPYLBENZENE	ND	0.0002
P-ISOPROPYLTOLUENE	ND	0.0002
METHYLENE CHLORIDE	ND	0.0004

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

PARAMETER	SAMPLE ID > BLANK	MDL
NAPTHALENE	ND	0.0003
N-PROPYLBENZENE	ND	0.0002
STYRENE	ND	0.0003
1,1,1,2-TETRACHLOROETHANE	ND	0.0002
1,1,2,2-TETRACHLOROETHANE	ND	0.0002
TETRACHLOROETHENE	ND	0.0001
TOLUENE	ND	0.0002
1,2,3-TRICHLOROBENZENE	ND	0.0002
1,2,4-TRICHLOROBENZENE	ND	0.0001
1,1,1-TRICHLOROETHANE	ND	0.0005
1,1,2-TRICHLOROETHANE	ND	0.0002
TRICHLOROETHENE	ND	0.0001
TRICHLOROFLUOROMETHANE	ND	0.0004
1,2,3-TRICHLOROPROPANE	ND	0.0002
1,2,4-TRIMETHYLBENZENE	ND	0.0002
1,3,5-TRIMETHYLBENZENE	ND	0.0003
VINYL CHLORIDE	ND	0.0002
M,P-XYLENE	ND	0.0003
O-XYLENE	ND	0.0002

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 1 SE SAMPLE ID > 01	2 SW 02	MDL
BENZENE	0.0006	ND	0.0004
BROMOBENZENE	ND	ND	0.0002
BROMOCHLOROMETHANE	ND	ND	0.0001
BROMODICHLOROMETHANE	ND	ND	0.0002
BROMOFORM	ND	ND	0.0001
BROMOMETHANE	ND	ND	0.0010
N-BUTYLBENZENE	ND	ND	0.0001
SEC-BUTYLBENZENE	ND	ND	0.0005
TERT-BUTYLBENZENE	ND	ND	0.0001
CARBON TETRACHLORIDE	ND	ND	0.0001
CHLOROBENZENE	ND	ND	0.0001
CHLOROETHANE	ND	ND	0.0003
CHLOROFORM	ND	ND	0.0003
CHLOROMETHANE	ND	ND	0.0005
2-CHLOROTOLUENE	ND	ND	0.0002
4-CHLOROTOLUENE	ND	ND	0.0002
DIBROMOCHLOROMETHANE	ND	ND	0.0002
1,2-DIBROMO-3-CHLOROPROPANE	ND	ND	0.0003
DIBROMOMETHANE	ND	ND	0.0002
1,2-DIBROMOETHANE	ND	ND	0.0002
1,2-DICHLOROBENZENE	ND	ND	0.0002
1,3-DICHLOROBENZENE	ND	ND	0.0002
1,4-DICHLOROBENZENE	ND	ND	0.0001
DICHLORODIFLUOROMETHANE	ND	ND	0.0004
1,1-DICHLOROETHANE	ND	ND	0.0002
1,2-DICHLOROETHANE	ND	ND	0.0001
1,1-DICHLOROETHENE	ND	ND	0.0002
CIS-1,2-DICHLOROETHENE	0.0078	ND	0.0001
TRANS-1,2-DICHLOROETHENE	ND	ND	0.0001
1,2-DICHLOROPROPANE	ND	ND	0.0002
1,3-DICHLOROPROPANE	ND	ND	0.0005
2,2-DICHLOROPROPANE	ND	ND	0.0001
1,1-DICHLOROPROPENE	ND	ND	0.0001
1,3-DICHLOROPROPENE (TOTAL)	ND	ND	0.0005
ETHYLBENZENE	ND	ND	0.0002
HEXACHLOROBUTADIENE	ND	ND	0.0003
ISOPROPYLBENZENE	ND	ND	0.0002
P-ISOPROPYLTOLUENE	ND	ND	0.0002
METHYLENE CHLORIDE	ND	ND	0.0004

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 1 SE SAMPLE ID > 01	2 SW 02	MDL
NAPTHALENE	ND	ND	0.0003
N-PROPYLBENZENE	ND	ND	0.0002
STYRENE	ND	ND	0.0003
1,1,1,2-TETRACHLOROETHANE	ND	ND	0.0002
1,1,2,2-TETRACHLOROETHANE	ND	ND	0.0002
TETRACHLOROETHENE	ND	ND	0.0001
TOLUENE	0.0019	ND	0.0002
1,2,3-TRICHLOROBENZENE	ND	ND	0.0002
1,2,4-TRICHLOROBENZENE	ND	ND	0.0001
1,1,1-TRICHLOROETHANE	ND	ND	0.0005
1,1,2-TRICHLOROETHANE	ND	ND	0.0002
TRICHLOROETHENE	0.0277	ND	0.0001
TRICHLOROFLUOROMETHANE	0.0020	ND	0.0004
1,2,3-TRICHLOROPROPANE	ND	ND	0.0002
1,2,4-TRIMETHYLBENZENE	ND	ND	0.0002
1,3,5-TRIMETHYLBENZENE	ND	ND	0.0003
VINYL CHLORIDE	0.0013	ND	0.0002
M,P-XYLENE	ND	ND	0.0003
O-XYLENE	ND	ND	0.0002

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Laboratory Resources INC
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363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 3 N SAMPLE ID > 03	1 N 04	2 N 05	MDL
BENZENE	ND	ND	0.0626	0.0020
BROMOBENZENE	ND	ND	ND	0.0010
BROMOCHLOROMETHANE	ND	ND	ND	0.0005
BROMODICHLOROMETHANE	ND	ND	ND	0.0010
BROMOFORM	ND	ND	ND	0.0005
BROMOMETHANE	ND	ND	ND	0.0050
N-BUTYLBENZENE	ND	ND	ND	0.0005
SEC-BUTYLBENZENE	ND	ND	ND	0.0025
TERT-BUTYLBENZENE	ND	ND	ND	0.0005
CARBON TETRACHLORIDE	ND	ND	ND	0.0001
CHLOROBENZENE	ND	ND	ND	0.0005
CHLOROETHANE	ND	ND	ND	0.0015
CHLOROFORM	ND	ND	ND	0.0015
CHLOROMETHANE	ND	ND	ND	0.0025
2-CHLOROTOLUENE	ND	ND	ND	0.0010
4-CHLOROTOLUENE	ND	ND	ND	0.0010
DIBROMOCHLOROMETHANE	ND	ND	ND	0.0010
1,2-DIBROMO-3-CHLOROPROPANE	ND	ND	ND	0.0015
DIBROMOMETHANE	ND	ND	ND	0.0010
1,2-DIBROMOETHANE	ND	ND	ND	0.0010
1,2-DICHLOROBENZENE	ND	ND	ND	0.0010
1,3-DICHLOROBENZENE	ND	ND	ND	0.0010
1,4-DICHLOROBENZENE	ND	ND	ND	0.0005
DICHLORODIFLUOROMETHANE	ND	ND	ND	0.0020
1,1-DICHLOROETHANE	0.0051	ND	ND	0.0010
1,2-DICHLOROETHANE	ND	ND	ND	0.0005
1,1-DICHLOROETHENE	ND	ND	ND	0.0010
CIS-1,2-DICHLOROETHENE	0.0371	0.0427	0.0078	0.0005
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	0.0005
1,2-DICHLOROPROPANE	ND	ND	ND	0.0025
1,3-DICHLOROPROPANE	ND	ND	ND	0.0025
2,2-DICHLOROPROPANE	ND	ND	ND	0.0005
1,1-DICHLOROPROPENE	ND	ND	ND	0.0025
1,3-DICHLOROPROPENE (TOTAL)	ND	ND	ND	0.0025
ETHYLBENZENE	0.0278	ND	0.3706	0.0010
HEXACHLOROBUTADIENE	ND	ND	ND	0.0015
ISOPROPYLBENZENE	ND	ND	ND	0.0010
P-ISOPROPYLTOLUENE	ND	ND	ND	0.0010
METHYLENE CHLORIDE	ND	ND	ND	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > / SAMPLE ID >	3 N 03	1 N 04	2 N 05	MDL
NAPTHALENE		ND	ND	ND	0.0015
N-PROPYLBENZENE		ND	ND	ND	0.0010
STYRENE		ND	ND	ND	0.0015
1,1,1,2-TETRACHLOROETHANE		ND	ND	ND	0.0010
1,1,2,2-TETRACHLOROETHANE		ND	ND	ND	0.0010
TETRACHLOROETHENE		ND	ND	ND	0.0005
TOLUENE		0.0108	ND	0.0166	0.0010
1,2,3-TRICHLOROBENZENE		ND	ND	ND	0.0010
1,2,4-TRICHLOROBENZENE		ND	ND	ND	0.0005
1,1,1-TRICHLOROETHANE		ND	ND	ND	0.0025
1,1,2-TRICHLOROETHANE		ND	ND	ND	0.0010
TRICHLOROETHENE		0.0030	ND	ND	0.0005
TRICHLOROFLUOROMETHANE		ND	ND	ND	0.0020
1,2,3-TRICHLOROPROPANE		ND	ND	ND	0.0010
1,2,4-TRIMETHYLBENZENE		ND	ND	ND	0.0010
1,3,5-TRIMETHYLBENZENE		ND	ND	ND	0.0015
VINYL CHLORIDE		ND	ND	ND	0.0010
M,P-XYLENE		0.0682	ND	0.4535	0.0015
O-XYLENE		0.0176	ND	0.0355	0.0010

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Subsurface Investigations, Inc.

CHAIN OF CUSTODY RECORD

PROJECT: ~~SF~~ Swivelier PROJECT TITLE: _____

S.I. FACILITY: _____ FIELD PERSONNEL: _____

SAMPLE TYPE (circle): Drinking Water, Industrial Waste, Bottom Sediment, River/Ocean, Other _____, Monitoring Wells, Treatment Facility, Leachate, Stream/Pond, Soil

900615

SAMPLE ID NUMBER	DATE	TIME	STATION	PARAMETERS	REMARKS
1SE	5/31/90	1009		EPA 503.1	
2SW	5/31/90	1037		" " "	
3N	5/31/90	1112		" "	
4N	5/31/90	1149		" "	
5N	5/31/90	1236		" "	

RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
X Robert B Craig	6/1/9 1215		
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
METHOD OF SHIPMENT	SHIPPED BY:	RECEIVED BY:	COMMENTS:
RECEIVED AT LABORATORY BY:		DATE/TIME:	COMMENTS:

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

Subsurface Investigations
331D Rte. 9W
Congers, NY 10920

Attn: Bob Fine

Date of Report: 05/16/91
Work Order #: W1-05-091
Date Received: 05/07/91
Client #: 001093
P.O./Project #: Swivelier

R. Dave 10/11P
Laboratory Manager

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

DATE OF REPORT: 05/14/91
DATE COLLECTED: 05/07/91
DATE RECEIVED: 05/07/91
DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091
DILUTION: 1/2

PARAMETER	CLIENT ID.> WELL#1SE SAMPLE ID.> 01	WELL#2SW 02	WELL#1N 03	WELL#2N 04	WELL#3N 05	MDL
BENZENE	ND	ND	ND	0.0421	0.0032	0.0010
CHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
ETHYLBENZENE	ND	ND	ND	0.2240	0.0401	0.0010
TOLUENE	ND	ND	ND	0.0102	0.0091	0.0010
TOTAL XYLENES	ND	ND	ND	0.3560	0.0723	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

DATE OF REPORT: 05/14/91
DATE COLLECTED: 05/07/91
DATE RECEIVED: 05/07/91
DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091
DILUTION: 1/2

PARAMETER	CLIENT ID.> WELL#4N SAMPLE ID.> 06	MDL
BENZENE	ND	0.0010
CHLOROBENZENE	ND	0.0010
1,2-DICHLOROBENZENE	ND	0.0010
1,3-DICHLOROBENZENE	ND	0.0010
1,4-DICHLOROBENZENE	ND	0.0010
ETHYLBENZENE	ND	0.0010
TOLUENE	ND	0.0010
TOTAL XYLENES	ND	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 05/14/91

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091

PARAMETER	SAMPLE ID.>	5/8 BLANK	MDL
BENZENE		ND	0.0005
CHLOROBENZENE		ND	0.0005
1,2-DICHLOROBENZENE		ND	0.0005
1,3-DICHLOROBENZENE		ND	0.0005
1,4-DICHLOROBENZENE		ND	0.0005
ETHYLBENZENE		ND	0.0005
TOLUENE		ND	0.0005
TOTAL XYLENES		ND	0.0010

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

W105091

Laboratory Resources INC.
CHAIN OF CUSTODY

CUSTOMER INFORMATION

CUSTOMER: Subsurface Investigations
ADDRESS: 331 Rt 9W Congers
TELEPHONE: 914 268 6660
PROJECT: Swivelier
PROJECT MANAGER: M. Brennan
PROJECT LOCATION: New City STATE: NY
PO NUMBER:

REPORT INFORMATION

SEND REPORT TO:
DATE REPORT REQUIRED:
RUSH RESULTS: FAX

PROJECT INFORMATION

TURNAROUND (INDICATE CALENDAR DAYS, CONFIRM WITH LAB): 2 5 7 (14) 21 OTHER:
DELIVERABLES (PLEASE CIRCLE): TIER I TIER II/ECRA
CLP (RESULTS ONLY) 21E TASA OTHER:
IN CASE WE HAVE ANY QUESTIONS WHEN SAMPLES ARRIVE WE SHOULD CALL:
NAME:
TELEPHONE:

ANALYTICAL REQUESTS

LAB ID CODE	SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE: COMPOSITE (C)	SAMPLE TYPE: GRAB (G)	SAMPLE MATRIX: SOLID (S)	SAMPLE MATRIX: LIQUID (L)	SAMPLE MATRIX: COMBINED (C)	SAMPLE MATRIX: OTHER (O)	PRESERVATIVE*	ANALYSIS
01	Well # 1 SE	5/7/91	AM		X		X				EPA Method 602 BTEX
02	2 SW	"	"		X		X				"
03	1 N	"	"		X		X				"
04	2 N	"	"		X		X				"
05	3 N	"	"		X		X				"
06	4 N	"	"		X		X				"

PLEASE INDICATE NUMBER OF BOTTLES

CUSTODY

SAMPLER:	DATE:	
RECEIVED:	TIME:	
RELINQUISHED:	DATE:	5/7/91
RECEIVED:	TIME:	12:49 PM
RELINQUISHED:	DATE:	
RECEIVED:	TIME:	

COMMENTS, REQUESTS OR REMARKS (Toxic?, Flammable?, Explosive?, High Levels?)

*PRESERVATIVE: NaOH H_2SO_4 HNO_3 HCL ASCORBIC ACID

Laboratory Resources INC.

CHAIN OF CUSTODY

CUSTOMER INFORMATION

CUSTOMER: Subsurface Tech
ADDRESS: 331 Rt 46 Congers
TELEPHONE: 914 268 6611
PROJECT: Swivel
PROJECT MANAGER: M. Brown
PROJECT LOCATION: Newark STATE: NY
PO NUMBER:

REPORT INFORMATION

SEND REPORT TO:
DATE REPORT REQUIRED:
RUSH RESULTS: FAX

PROJECT INFORMATION

TURNAROUND (INDICATE CALENDAR DAYS, CONFIRM WITH LAB): 2 5 7 (14) 21 OTHER:
DELIVERABLES (PLEASE CIRCLE): TIER I TIER II/ECRA
CLP (RESULTS ONLY) 21E TASA OTHER:
IN CASE WE HAVE ANY QUESTIONS WHEN SAMPLES ARRIVE WE SHOULD CALL:
NAME:
TELEPHONE:

ANALYTICAL REQUESTS

LAB ID CODE	SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE: COMPOSITE (C)	SAMPLE TYPE: GRAB (G)	SAMPLE MATRIX: SOLID (S)	SAMPLE MATRIX: LIQUID (L)	SAMPLE MATRIX: COMBINED (C)	SAMPLE MATRIX: OTHER (O)	PRESERVATIVE*	ANALYSIS
	Well Ht 1 SE	5/7/91	AM		X		X				EPA Method 602 BTEX
	2 SW	"	"		X		X				
	1 N				X		X				
	2 N				X		X				
	3 N				X		X				
	4 N				X		X				

PLEASE INDICATE NUMBER OF BOTTLES

CUSTODY

SAMPLER:	DATE:	
RECEIVED:	TIME:	
RELINQUISHED:	DATE:	5/7/91
RECEIVED:	TIME:	12:47 PM
RELINQUISHED:	DATE:	
RECEIVED:	TIME:	

COMMENTS, REQUESTS OR REMARKS (Toxic?, Flammable?, Explosive?, High Levels?)

*PRESERVATIVE: NaOH H_2SO_4 HNO_3 HCL ASCORBIC ACID

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10586

DATE OF REPORT: 01/14/92

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: L. SUN

DATE OF ANALYSIS: 12/27/91
WORK ORDER #: W112372

PARAMETER	SAMPLE ID.> BLANK	MDL
BENZENE	ND	0.0005
CHLOROBENZENE	ND	0.0005
1,2-DICHLOROBENZENE	ND	0.0005
1,3-DICHLOROBENZENE	ND	0.0005
1,4-DICHLOROBENZENE	ND	0.0005
ETHYLBENZENE	ND	0.0005
TOLUENE	ND	0.0005
TOTAL XYLENES	ND	0.0010
% SURROGATE RECOVERY	102.31%	

MDL =MINIMUM DETECTION LIMIT
ND= NOT DETECTED AT MDL

% SURROGATE RECOVERY RANGE FOR @,@,@-TRIFLUOROTOLUENE = (80-125)

Eileen Smith
GC SUPERVISOR

METHOD 602

009

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
201) 666-6644 • FAX: (201) 666-7978

N.J Certification # 02046
N.Y Certification # 10588

DATE OF REPORT: 01/14/92

DATE OF ANALYSIS: 12/30/91
WORK ORDER #: W112372

D' ENT: SUBSURFACE INVESTIGATIONS
N' .YST: L. SUN

ARAMETER	SAMPLE ID.> BLANK	MDL
E..ZENE	ND	0.0005
H')ROBENZENE	ND	0.0005
,2-DICHLOROBENZENE	ND	0.0005
,' -DICHLOROBENZENE	ND	0.0005
,4-DICHLOROBENZENE	ND	0.0005
TI..LBENZENE	ND	0.0005
O' 'IENE	ND	0.0005
OTAL XYLENES	ND	0.0010

SURROGATE RECOVERY 113.15%

D' :MINIMUM DETECTION LIMIT
D)OT DETECTED AT MDL

: JRROGATE RECOVERY RANGE FOR @,@,@-TRIFLUOROTOLUENE = (80-125)

Eileen Smith
GC SUPERVISOR

IETHOD 602

010

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10888

DATE OF REPORT: 01/14/92
DATE COLLECTED: 12/26/91
DATE RECEIVED: 12/27/91
DATE OF ANALYSIS: 12/28/91
WORK ORDER #: W112372

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: L. SUN

PARAMETER	CLIENT ID.> FIELD BLK SAMPLE ID.> 01	MDL
BENZENE	ND	0.0005
CHLOROBENZENE	ND	0.0005
1,2-DICHLOROBENZENE	ND	0.0005
1,3-DICHLOROBENZENE	ND	0.0005
1,4-DICHLOROBENZENE	ND	0.0005
ETHYLBENZENE	ND	0.0005
TOLUENE	ND	0.0005
TOTAL XYLENES	ND	0.0010
% SURROGATE RECOVERY	104.58%	

MDL=MINIMUM DETECTION LIMIT
ND=NOT DETECTED AT MDL

% SURROGATE RECOVERY RANGE FOR @,@,@-TRIFLUOROTOLUENE = (80-125)

Eileen Smith
GC SUPERVISOR

METHOD 602

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 01/14/92
DATE COLLECTED: 12/26/91
DATE RECEIVED: 12/27/91
DATE OF ANALYSIS: 12/28/91
WORK ORDER #: W112372
DILUTION: 2X

LIENT: SUBSURFACE INVESTIGATIONS
A ALYST: L. SUN

PARAMETER	CLIENT ID.> WELL 1N SAMPLE ID.> 02	MDL
E NZENE	0.0012	0.0010
C LOROBENZENE	ND	0.0010
1,2-DICHLOROBENZENE	ND	0.0010
1 3-DICHLOROBENZENE	ND	0.0010
1.4-DICHLOROBENZENE	ND	0.0010
E.HYLBENZENE	0.0016	0.0010
T LUENE	ND	0.0010
TOTAL XYLENES	ND	0.0020
% SURROGATE RECOVERY	101.28%	

M L=MINIMUM DETECTION LIMIT
N =NOT DETECTED AT MDL

% SURROGATE RECOVERY RANGE FOR @,@,@-TRIFLUOROTOLUENE = (80-125)

* SOME PARAMETERS MAY BE RUN AT VARIOUS DILUTIONS
TO BE QUANTIFIED IN RANGE

Allen Smith
GC SUPERVISOR

METHOD 602

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10568

DATE OF REPORT: 01/14/92
DATE COLLECTED: 12/26/91
DATE RECEIVED: 12/27/91
DATE OF ANALYSIS: 12/30/91
WORK ORDER #: W112372
DILUTION: 25X

LIENT: SUBSURFACE INVESTIGATIONS
ALYST: L. SUN

PARAMETER	CLIENT ID.> WELL 2N SAMPLE ID.> 03	MDL
BENZENE	0.1680	0.0125
CHLOROBENZENE	ND	0.0125
1,2-DICHLOROBENZENE	ND	0.0125
1,3-DICHLOROBENZENE	ND	0.0125
1,4-DICHLOROBENZENE	ND	0.0125
ETHYLBENZENE	0.5500	0.0125
TOLUENE	0.0979	0.0125
TOTAL XYLENES	0.6830	0.0250
* SURROGATE RECOVERY	93.44%	

L=MINIMUM DETECTION LIMIT
=NOT DETECTED AT MDL

SURROGATE RECOVERY RANGE FOR @,@,@-TRIFLUOROTOLUENE = (80-125)

SOME PARAMETERS MAY BE RUN AT VARIOUS DILUTIONS
TO BE QUANTIFIED IN RANGE

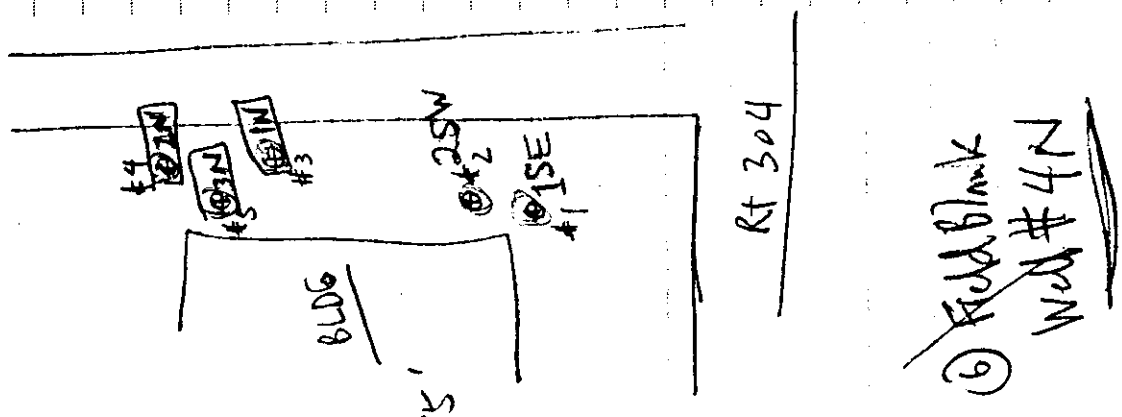
Eileen Smith
GC SUPERVISOR

METHOD 602

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

SUBSURFACE INVESTIGATIONS INC.
331D Route 9W
CONGERS, NEW YORK 10920
(914) 268-6660

JOB Swivelview
SHEET NO. 1 OF 1
CALCULATED BY MJG DATE 5/7/91
CHECKED BY DATE
SCALE



Swivelview #90111

① W#1SE - 4'0"
- 14'
- SWL=4'
② W#2SW - 4"0"
- 14.5'
- SWL=4.2'
③ W#1N - 2"0"
- 19.5'
- SWL= 9'1"
④ W#2N - 2"0"
- 17'2"
- SWL= 7.5'
⑤ W#3N - 2"0"
- 17.25'
- 2.3'

Well	SWL
1SE	4'6"
2SW	3'0"
1N	6'0"
2N	8'0"
3N	2'11"
4N	HB

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

CLIENT: SUBSURFACE INVESTIGATIONS
NALYST: E. SALERNO

DATE OF REPORT: 05/14/91
DATE COLLECTED: 05/07/91
DATE RECEIVED: 05/07/91
DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091
DILUTION: 1/2

ARAMETER	CLIENT ID.> WELL#1SE SAMPLE ID.> 01	WELL#2SW 02	WELL#1N 03	WELL#2N 04	WELL#3N 05	MDL
ENZENE	ND	ND	ND	0.0421	0.0032	0.0010
CHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
THYLBENZENE	ND	ND	ND	0.2240	0.0401	0.0010
TOLUENE	ND	ND	ND	0.0102	0.0091	0.0010
OTAL XYLENES	ND	ND	ND	0.3560	0.0723	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

ETHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

PETROLEUM PRODUCT SPILL # 87-07447
MONTHLY MONITORING REPORT
SWIVELIER COMPANY
NANUET, NEW YORK

WELL #	PRODUCT	ODOR	STATIC WATER LEVEL (FEET BELOW SURFACE) to TOP of PVC CASING		
			12/2/91 ~~8/30/91~~ FOR NOVEMBER '91	12/26 ~~9/30/91~~	2/5/92 ~~10/21/91~~ FOR JANUARY 92
1 SE	NO	NO	~~5.13~~	~~5.13~~	~~5.61~~
2 SW	NO	NO	~~5.22~~	~~5.25~~	~~6.11~~
1N	NO	NO	~~7.75~~ 7.82	~~7.79~~ 8.04	~~7.85~~
2N	NO	NO	~~5.75~~ 5.70	~~5.75~~ 5.23	~~5.85~~
3N	NO	NO	~~3.79~~	--------	~~4.06~~

331 Route 9W
Congers, NY 10920
Phone 914 268-6660
FAX 914 268-2065

Subsurface Investigations Inc.

May 23, 1991

Mr. Joseph McCarthy
NYSDEC - Region 3
21 S. Putt Corners Road
New Paltz, NY 12561

RE: PETROLEUM PRODUCT SPILL # 87-07447
SWIVELIER CO., NANUET, NEW YORK

Dear Mr. McCarthy,

In accordance with your letter of April 22, 1991, Subsurface Investigations, Inc. (SII) is submitting the following monthly monitoring and quarterly status reports on behalf of our client, the Swivelier Company in Nanuet, Rockland County, New York.

Samples were collected using clean bailers, following the removal of three casing volumes of water. Following collection, the samples were immediately placed on ice and delivered under chain-of-custody to Laboratory Resources, Inc. of Westwood, New Jersey (a New York certified laboratory) in accordance with DEC guidelines. Prior to sample collection, static water levels were measured using an electric sounding interface probe. No free product or odors were found in any of the wells sampled.

Wells 1 North and 2 North were sampled and analyzed for BTEX, by EPA Method 602. Results with accompanying chain of custody forms are attached for your review. The results of analysis show none detectable (ND) concentrations.

We will continue the program of monthly monitoring and quarterly sampling as instructed by your department. If there are any questions, please call us.

Sincerely,

Brian H. Mende
Project Manager/Geologist

cc: C. Quinn - RCHD
G. Phelan - Swivelier

BHM:njm
Ref No.: 91448

PETROLEUM PRODUCT SPILL # 87-07447
MONTHLY MONITORING REPORT
SWIVELIER COMPANY
NANUET, NEW YORK

WELL #	PRODUCT	ODOR	STATIC WATER LEVEL (FEET BELOW SURFACE)		
			8/30/91	9/30/91	10/21/91
1 SE	NO	NO	-------	-------	5.61
2 SW	NO	NO	-------	-------	6.11
1N	NO	NO	7.75	7.79	7.85
2N	NO	NO	5.75	5.75	5.85
3N	NO	NO	-------	--------	4.06

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

Subsurface Investigations
531D Rte. 9W
Congers, NY 10920

Attn: Bob Fine

Date of Report: 10/16/91
Work Order #: W1-10-017
Date Received: 10/01/91
Client #: 001093
P.O./Project #: Well 1N/2N

Laboratory Manager

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 10/16/91

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: L. SUN

DATE OF ANALYSIS: 10/08/91
WORK ORDER #: W110017

PARAMETER	SAMPLE ID.> BLANK	MDL
BENZENE	ND	0.0005
CHLOROBENZENE	ND	0.0005
1,2-DICHLOROBENZENE	ND	0.0005
1,3-DICHLOROBENZENE	ND	0.0005
1,4-DICHLOROBENZENE	ND	0.0005
ETHYLBENZENE	ND	0.0005
TOLUENE	ND	0.0005
TOTAL XYLENES	ND	0.0010

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Smith
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 10/16/91
DATE COLLECTED: 10/01/91
DATE RECEIVED: 10/01/91
DATE OF ANALYSIS: 10/08/91
WORK ORDER #: W110017
DILUTION: 2X

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: L. SUN

PARAMETER	CLIENT ID.> WELL 1N SAMPLE ID.> 01	WELL 2N 02	MDL
BENZENE	ND	ND	0.0010
CHLOROBENZENE	ND	ND	0.0010
1,2-DICHLOROBENZENE	ND	ND	0.0010
1,3-DICHLOROBENZENE	ND	ND	0.0010
1,4-DICHLOROBENZENE	ND	ND	0.0010
ETHYLBENZENE	ND	ND	0.0010
TOLUENE	ND	ND	0.0010
TOTAL XYLENES	ND	ND	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Smith
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

W110017

Laboratory Resources INC.

CHAIN OF CUSTODY

CUSTOMER INFORMATION

CUSTOMER: ~~STATEMENT~~ Subsurface

ADDRESS:

TELEPHONE:

PROJECT:

PROJECT MANAGER:

PROJECT LOCATION: STATE:

PO NUMBER:

REPORT INFORMATION

SEND REPORT TO: Subsurface

DATE REPORT REQUIRED:

RUSH RESULTS: FAX

PROJECT INFORMATION

TURNAROUND (INDICATE CALENDAR DAYS, CONFIRM WITH LAB): 2 5 7 14 21 OTHER:

DELIVERABLES (PLEASE CIRCLE): TIER I TIER II/ECRA CLP RESULTS ONLY 21E TASA OTHER:

IN CASE WE HAVE ANY QUESTIONS WHEN SAMPLES ARRIVE WE SHOULD CALL:

NAME:

TELEPHONE:

ANALYTICAL REQUESTS

LAB ID CODE	SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE: COMPOSITE (C)	SAMPLE TYPE: GRAB (G)	SAMPLE MATRIX: SOLID (S)	SAMPLE MATRIX: LIQUID (L)	SAMPLE MATRIX: COMBINED (C)	SAMPLE MATRIX: OTHER (O)	PRESERVATIVE*	ANALYSIS
01	Well 1N										EPA 602 BTEX
02	Well 2N										

PLEASE INDICATE NUMBER OF BOTTLES

CUSTODY

SAMPLER:		DATE:
RECEIVED:		TIME:
RELINQUISHED:	Steven Asquith	DATE: 1 Oct 91
RECEIVED:	[illegible]	TIME: 2:55 PM
RELINQUISHED:		DATE:
RECEIVED:		TIME:

COMMENTS, REQUESTS OR REMARKS (Toxic?, Flammable?, Explosive?, High Levels?)

*PRESERVATIVE: NaOH H_2SO_4 HNO_3 HCL ASCORBIC ACID

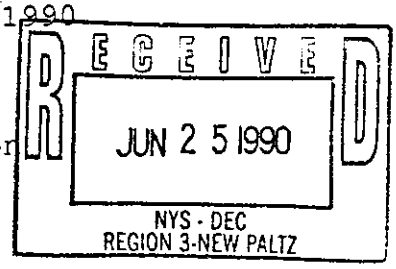
Subsurface agents to call in analysis

I ~~Jr~~/File

365 Route 9W
Congers, NY 10920
Phone 914 268-6660
FAX 914 268-2065

Subsurface Investigations Inc.

21 June 1990



Mr. Karl Weed
N.Y.S. Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, New York 12561

Passive Recovery

RE: Swivelier - Nanuet, New York Spill #87-07447
Rockland Co.

Dear Mr. Weed:

In accordance with your 8 May 1990 letter please find enclosed the results of sampling conducted on (5) five monitoring wells at the above facility.

Please review data and if you have any questions please feel free to contact me.

Yours truly,

Robert B. Fine

RBF:cs
Encl.

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

Subsurface Investigations
365 Rte. 9W
Congers, NY 10920

Date of Report: 06/19/90
Work Order #: 90-06-015
Date Received: 06/01/90
Client #: 001093
P.O. #: Swivelier

ATTACHED ARE THE ANALYSES YOU REQUESTED

Laboratory Manager

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

PARAMETER	SAMPLE ID > BLANK	MDL
BENZENE	ND	0.0004
BROMOBENZENE	ND	0.0002
BROMOCHLOROMETHANE	ND	0.0001
BROMODICHLOROMETHANE	ND	0.0002
BROMOFORM	ND	0.0001
BROMOMETHANE	ND	0.0010
N-BUTYLBENZENE	ND	0.0001
SEC-BUTYLBENZENE	ND	0.0005
TERT-BUTYLBENZENE	ND	0.0001
CARBON TETRACHLORIDE	ND	0.0001
CHLOROBENZENE	ND	0.0001
CHLOROETHANE	ND	0.0003
CHLOROFORM	ND	0.0003
CHLOROMETHANE	ND	0.0005
2-CHLOROTOLUENE	ND	0.0002
4-CHLOROTOLUENE	ND	0.0002
DIBROMOCHLOROMETHANE	ND	0.0002
1,2-DIBROMO-3-CHLOROPROPANE	ND	0.0003
DIBROMOMETHANE	ND	0.0002
1,2-DIBROMOETHANE	ND	0.0002
1,2-DICHLOROBENZENE	ND	0.0002
1,3-DICHLOROBENZENE	ND	0.0002
1,4-DICHLOROBENZENE	ND	0.0001
DICHLORODIFLUOROMETHANE	ND	0.0004
1,1-DICHLOROETHANE	ND	0.0002
1,2-DICHLOROETHANE	ND	0.0001
1,1-DICHLOROETHENE	ND	0.0002
CIS-1,2-DICHLOROETHENE	ND	0.0001
TRANS-1,2-DICHLOROETHENE	ND	0.0001
1,2-DICHLOROPROPANE	ND	0.0002
1,3-DICHLOROPROPANE	ND	0.0005
2,2-DICHLOROPROPANE	ND	0.0001
1,1-DICHLOROPROPENE	ND	0.0001
1,3-DICHLOROPROPENE (TOTAL)	ND	0.0005
ETHYLBENZENE	ND	0.0002
HEXACHLOROBUTADIENE	ND	0.0003
ISOPROPYLBENZENE	ND	0.0002
P-ISOPROPYLTOLUENE	ND	0.0002
METHYLENE CHLORIDE	ND	0.0004

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

PARAMETER	SAMPLE ID > BLANK	MDL
NAPTHALENE	ND	0.0003
N-PROPYLBENZENE	ND	0.0002
STYRENE	ND	0.0003
1,1,1,2-TETRACHLOROETHANE	ND	0.0002
1,1,2,2-TETRACHLOROETHANE	ND	0.0002
TETRACHLOROETHENE	ND	0.0001
TOLUENE	ND	0.0002
1,2,3-TRICHLOROBENZENE	ND	0.0002
1,2,4-TRICHLOROBENZENE	ND	0.0001
1,1,1-TRICHLOROETHANE	ND	0.0005
1,1,2-TRICHLOROETHANE	ND	0.0002
TRICHLOROETHENE	ND	0.0001
TRICHLOROFLUOROMETHANE	ND	0.0004
1,2,3-TRICHLOROPROPANE	ND	0.0002
1,2,4-TRIMETHYLBENZENE	ND	0.0002
1,3,5-TRIMETHYLBENZENE	ND	0.0003
VINYL CHLORIDE	ND	0.0002
M,P-XYLENE	ND	0.0003
O-XYLENE	ND	0.0002

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 1 SE SAMPLE ID > 01	2 SW 02	MDL
BENZENE	0.0006	ND	0.0004
BROMOBENZENE	ND	ND	0.0002
BROMOCHLOROMETHANE	ND	ND	0.0001
BROMODICHLOROMETHANE	ND	ND	0.0002
BROMOFORM	ND	ND	0.0001
BROMOMETHANE	ND	ND	0.0010
N-BUTYLBENZENE	ND	ND	0.0001
SEC-BUTYLBENZENE	ND	ND	0.0005
TERT-BUTYLBENZENE	ND	ND	0.0001
CARBON TETRACHLORIDE	ND	ND	0.0001
CHLOROBENZENE	ND	ND	0.0001
CHLOROETHANE	ND	ND	0.0003
CHLOROFORM	ND	ND	0.0003
CHLOROMETHANE	ND	ND	0.0005
2-CHLOROTOLUENE	ND	ND	0.0002
4-CHLOROTOLUENE	ND	ND	0.0002
DIBROMOCHLOROMETHANE	ND	ND	0.0002
1,2-DIBROMO-3-CHLOROPROPANE	ND	ND	0.0003
DIBROMOMETHANE	ND	ND	0.0002
1,2-DIBROMOETHANE	ND	ND	0.0002
1,2-DICHLOROBENZENE	ND	ND	0.0002
1,3-DICHLOROBENZENE	ND	ND	0.0002
1,4-DICHLOROBENZENE	ND	ND	0.0001
DICHLORODIFLUOROMETHANE	ND	ND	0.0004
1,1-DICHLOROETHANE	ND	ND	0.0002
1,2-DICHLOROETHANE	ND	ND	0.0001
1,1-DICHLOROETHENE	ND	ND	0.0002
CIS-1,2-DICHLOROETHENE	0.0078	ND	0.0001
TRANS-1,2-DICHLOROETHENE	ND	ND	0.0001
1,2-DICHLOROPROPANE	ND	ND	0.0002
1,3-DICHLOROPROPANE	ND	ND	0.0005
2,2-DICHLOROPROPANE	ND	ND	0.0001
1,1-DICHLOROPROPENE	ND	ND	0.0001
1,3-DICHLOROPROPENE (TOTAL)	ND	ND	0.0005
ETHYLBENZENE	ND	ND	0.0002
HEXACHLOROBUTADIENE	ND	ND	0.0003
ISOPROPYLBENZENE	ND	ND	0.0002
P-ISOPROPYLTOLUENE	ND	ND	0.0002
METHYLENE CHLORIDE	ND	ND	0.0004

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

PARAMETER	CLIENT ID > 1 SE SAMPLE ID > 01	2 SW 02	MDL
NAPTHALENE	ND	ND	0.0003
N-PROPYLBENZENE	ND	ND	0.0002
STYRENE	ND	ND	0.0003
1,1,1,2-TETRACHLOROETHANE	ND	ND	0.0002
1,1,2,2-TETRACHLOROETHANE	ND	ND	0.0002
TETRACHLOROETHENE	ND	ND	0.0001
TOLUENE	0.0019	ND	0.0002
1,2,3-TRICHLOROBENZENE	ND	ND	0.0002
1,2,4-TRICHLOROBENZENE	ND	ND	0.0001
1,1,1-TRICHLOROETHANE	ND	ND	0.0005
1,1,2-TRICHLOROETHANE	ND	ND	0.0002
TRICHLOROETHENE TCE	0.027.7	ND	0.0001
TRICHLOROFLUOROMETHANE	0.0020	ND	0.0004
1,2,3-TRICHLOROPROPANE	ND	ND	0.0002
1,2,4-TRIMETHYLBENZENE	ND	ND	0.0002
1,3,5-TRIMETHYLBENZENE	ND	ND	0.0003
VINYL CHLORIDE	0.0013	ND	0.0002
M,P-XYLENE	ND	ND	0.0003
O-XYLENE	ND	ND	0.0002

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 06/11/90
DATE SA. COLLECTED: 05/31/90
DATE SA. RECEIVED: 06/01/90
DATE OF ANALYSIS: 06/06/90
WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 3 N SAMPLE ID > 03	1 N 04	2 N 05		MDL
BENZENE	ND	ND	0.0626	62 ppb	0.0020
BROMOBENZENE	ND	ND	ND		0.0010
BROMOCHLOROMETHANE	ND	ND	ND		0.0005
BROMODICHLOROMETHANE	ND	ND	ND		0.0010
BROMOFORM	ND	ND	ND		0.0005
BROMOMETHANE	ND	ND	ND		0.0050
N-BUTYLBENZENE	ND	ND	ND		0.0005
SEC-BUTYLBENZENE	ND	ND	ND		0.0025
TERT-BUTYLBENZENE	ND	ND	ND		0.0005
CARBON TETRACHLORIDE	ND	ND	ND		0.0001
CHLOROBENZENE	ND	ND	ND		0.0005
CHLOROETHANE	ND	ND	ND		0.0015
CHLOROFORM	ND	ND	ND		0.0015
CHLOROMETHANE	ND	ND	ND		0.0025
2-CHLOROTOLUENE	ND	ND	ND		0.0010
4-CHLOROTOLUENE	ND	ND	ND		0.0010
DIBROMOCHLOROMETHANE	ND	ND	ND		0.0010
1,2-DIBROMO-3-CHLOROPROPANE	ND	ND	ND		0.0015
DIBROMOMETHANE	ND	ND	ND		0.0010
1,2-DIBROMOETHANE	ND	ND	ND		0.0010
1,2-DICHLOROBENZENE	ND	ND	ND		0.0010
1,3-DICHLOROBENZENE	ND	ND	ND		0.0010
1,4-DICHLOROBENZENE	ND	ND	ND		0.0005
DICHLORODIFLUOROMETHANE	ND	ND	ND		0.0020
1,1-DICHLOROETHANE	0.0051 5 ppb	ND	ND		0.0010
1,2-DICHLOROETHANE	ND	ND	ND		0.0005
1,1-DICHLOROETHENE	ND	ND	ND		0.0010
CIS-1,2-DICHLOROETHENE	0.0371 37 ppb	0.0427	0.0078	8 ppb	0.0005
TRANS-1,2-DICHLOROETHENE	ND	ND	ND		0.0005
1,2-DICHLOROPROPANE	ND	ND	ND		0.0025
1,3-DICHLOROPROPANE	ND	ND	ND		0.0025
2,2-DICHLOROPROPANE	ND	ND	ND		0.0005
1,1-DICHLOROPROPENE	ND	ND	ND		0.0025
1,3-DICHLOROPROPENE (TOTAL)	ND	ND	ND		0.0025
ETHYLBENZENE	0.0278 28 ppb	ND	0.3706	370 ppb	0.0010
HEXACHLOROBUTADIENE	ND	ND	ND		0.0015
ISOPROPYLBENZENE	ND	ND	ND		0.0010
P-ISOPROPYLTOLUENE	ND	ND	ND		0.0010
METHYLENE CHLORIDE	ND	ND	ND		0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Laboratory Resources INC.
A UNITED WATER RESOURCES COMPANY
363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
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WORK ORDER #: 9006015

CLIENT: SUBSURFACE
ANALYST: E. SALERNO

PARAMETER	CLIENT ID > 3 N SAMPLE ID > 03	1 N 04	2 N 05	MDL
NAPTHALENE	ND	ND	ND	0.0015
N-PROPYLBENZENE	ND	ND	ND	0.0010
STYRENE	ND	ND	ND	0.0015
1,1,1,2-TETRACHLOROETHANE	ND	ND	ND	0.0010
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	0.0010
TETRACHLOROETHENE	ND	ND	ND	0.0005
TOLUENE	0.0108 11 ppb	ND	0.0166 17 ppb	0.0010
1,2,3-TRICHLOROBENZENE	ND	ND	ND	0.0010
1,2,4-TRICHLOROBENZENE	ND	ND	ND	0.0005
1,1,1-TRICHLOROETHANE	ND	ND	ND	0.0025
1,1,2-TRICHLOROETHANE	ND	ND	ND	0.0010
TRICHLOROETHENE	0.0030 3 ppb	ND	ND	0.0005
TRICHLOROFLUOROMETHANE	ND	ND	ND	0.0020
1,2,3-TRICHLOROPROPANE	ND	ND	ND	0.0010
1,2,4-TRIMETHYLBENZENE	ND	ND	ND	0.0010
1,3,5-TRIMETHYLBENZENE	ND	ND	ND	0.0015
VINYL CHLORIDE	ND	ND	ND	0.0010
M,P-XYLENE	0.0682 68 ppb	ND	0.4535 454 ppb	0.0015
O-XYLENE	0.0176 17 ppb	ND	0.0355 35 ppb	0.0010

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 502.2

William Jimenez
ORGANICS MANAGER

Subsurface Investigations, Inc.

CHAIN OF CUSTODY RECORD

PROJECT: SF Swivel PROJECT TITLE: _____

S.I. FACILITY: _____ FIELD PERSONNEL: _____

SAMPLE TYPE (circle): Drinking Water, Industrial Waste, Bottom Sediment, River/Ocean, Other _____, Monitoring Wells, Treatment Facility, Leachate, Stream/Pond, Soil

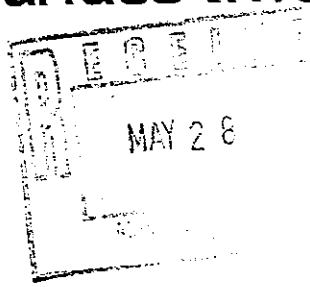
900615

SAMPLE ID NUMBER	DATE	TIME	STATION	PARAMETERS	REMARKS
01 1SE	5/31/90	1009		EPA 503.1	
02 2SW	5/31/90	1037		" " "	
03 3N	5/31/90	1112		" "	
04 1N	5/31/90	1149		" "	
05 2N	5/31/90	1236		" "	

RELINQUISHED BY: X Robert B Gunn	DATE/TIME: 6/1/9 1215	RECEIVED BY:	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
RELINQUISHED BY:	DATE/TIME:	RECEIVED BY:	COMMENTS:
METHOD OF SHIPMENT	SHIPPED BY:	RECEIVED BY:	COMMENTS:
RECEIVED AT LABORATORY BY:		DATE/TIME:	COMMENTS:

331 Route 9W
Congers, NY 10920
Phone 914 268-6660
FAX 914 268-2065

Subsurface Investigations Inc.



May 23, 1991

Mr. Joseph McCarthy
NYSDEC - Region 3
21 S. Putt Corners Road
New Paltz, NY 12561

Rockland Co.

RE: PETROLEUM PRODUCT SPILL # 87-07447
SWIVELIER CO., NANUET, NEW YORK

Dear Mr. McCarthy,

In accordance with your recent letter of April 22, 1991, we are submitting the following monthly monitoring and quarterly status report on behalf of our client, the Swivelier Company in Nanuet, Rockland County, New York.

Samples were collected using clean bailers, following the removal of three well volumes to draw in fresh aquifer water. Transport and chain of custody were conducted within DEC guidelines. Prior to sample collection, static water levels were measured using an electric sounding device. No free product or odors were found in any of the wells sampled.

All wells plus a field blank were analyzed for BTEX, by EPA Method 602. Two of the five wells had positive readings for these compounds. Results with accompanying chain of custody forms are attached for your review. Although the compounds are still present, there has been a reduction in concentration levels since the last sampling event in June, 1990.

We will continue the program of monthly monitoring and quarterly sampling as instructed by your department. If there are any questions, please call us.

Sincerely,

Michael J. Brenner, P.E.
Director of Engineering

MJB:njm
Ref No.: 91150

cc: C. Quinn - RCHD
G. Phelan - Swivelier

MONTHLY MONITORING REPORT
SWIVELIER COMPANY
NANUET, NEW YORK
MAY 1991

WELL #	SWL	PRODUCT	ODOR
1 SE	4'6"	NO	NO
2 SW	5'	NO	NO
1N	6'9"	NO	NO
2N	8'6"	NO	NO
3N	2'11"	NO	NO
4N	FIELD BLANK	NO	NO

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

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Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10589

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

DATE OF REPORT: 05/14/91
DATE COLLECTED: 05/07/91
DATE RECEIVED: 05/07/91
DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091
DILUTION: 1/2

PARAMETER	CLIENT ID.> WELL#1SE SAMPLE ID.> 01	WELL#2SW 02	WELL#1N 03	WELL#2N 04	WELL#3N 05	MDL
BENZENE	ND	ND	ND	0.042,1	0.0032	0.0010
CHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	0.0010
ETHYLBENZENE	ND	ND	ND	0.224,0	0.040,1	0.0010
TOLUENE	ND	ND	ND	0.010,2	0.009,1	0.0010
TOTAL XYLENES	ND	ND	ND	0.356,0	0.072,3	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

Laboratory Resources INC
A UNITED WATER RESOURCES COMPANY

363 Old Hook Road
Westwood, New Jersey 07675-3235
(201) 666-6644 • FAX: (201) 666-7978

NJ Certification # 02046
NY Certification # 10588

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

DATE OF REPORT: 05/14/91
DATE COLLECTED: 05/07/91
DATE RECEIVED: 05/07/91
DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091
DILUTION: 1/2

PARAMETER	CLIENT ID.> WELL#4N SAMPLE ID.> 06	MDL
BENZENE	ND	0.0010
CHLOROBENZENE	ND	0.0010
1,2-DICHLOROBENZENE	ND	0.0010
1,3-DICHLOROBENZENE	ND	0.0010
1,4-DICHLOROBENZENE	ND	0.0010
ETHYLBENZENE	ND	0.0010
TOLUENE	ND	0.0010
TOTAL XYLENES	ND	0.0020

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

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NJ Certification # 02046
NY Certification # 10588

DATE OF REPORT: 05/14/91

DATE OF ANALYSIS: 05/08/91
WORK ORDER #: W105091

CLIENT: SUBSURFACE INVESTIGATIONS
ANALYST: E. SALERNO

PARAMETER	SAMPLE ID.>	5/8 BLANK	MDL
BENZENE		ND	0.0005
CHLOROBENZENE		ND	0.0005
1,2-DICHLOROBENZENE		ND	0.0005
1,3-DICHLOROBENZENE		ND	0.0005
1,4-DICHLOROBENZENE		ND	0.0005
ETHYLBENZENE		ND	0.0005
TOLUENE		ND	0.0005
TOTAL XYLENES		ND	0.0010

MDL=MINIMUM DETECTION LIMIT
ND = NOT DETECTED AT MDL

METHOD 602

Eileen Salerno
GC SUPERVISOR

All results expressed as mg/L unless otherwise stated
(See reverse for additional information)

W105091

Laboratory Resources Inc.
CHAIN OF CUSTODY

CUSTOMER INFORMATION

CUSTOMER: Subsurface Investigations
ADDRESS: 331 Rt 9W Congers
TELEPHONE: 914 268 6660
PROJECT: Swivelier
PROJECT MANAGER: Mr. Brennan
PROJECT LOCATION: New City STATE: NY
PO NUMBER:

REPORT INFORMATION

SEND REPORT TO:

DATE REPORT REQUIRED:
RUSH RESULTS: FAX

PROJECT INFORMATION

TURNAROUND (INDICATE CALENDAR DAYS, CONFIRM WITH LAB): 2 5 7 (14) 21 OTHER:
DELIVERABLES (PLEASE CIRCLE): TIER I TIER II/ECRA
CLP (RESULTS ONLY) 21E TASA OTHER:
IN CASE WE HAVE ANY QUESTIONS WHEN SAMPLES ARRIVE WE SHOULD CALL:
NAME:
TELEPHONE:

ANALYTICAL REQUESTS

LAB ID CODE	SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE: COMPOSITE (C)	SAMPLE TYPE: GRAB (G)	SAMPLE MATRIX: SOLID (S)	SAMPLE MATRIX: LIQUID (L)	SAMPLE MATRIX: COMBINED (C)	SAMPLE MATRIX: OTHER (O)	PRESERVATIVE*	ANALYSIS
01	Well # 1 SE	5/7/91	AM		X		X				EPA Method 602 BTEX
02	2 SW	"	"		X		X				
03	1 N	"	"		X		X				
04	2 N	"	"		X		X				
05	3 N	"	"		X		X				
06	4 N	"	"		X		X				

PLEASE INDICATE NUMBER OF BOTTLES

CUSTODY

SAMPLER:
RECEIVED:
RELINQUISHED: [signature]
RECEIVED: [signature]

DATE:
TIME:
DATE: 5/7/91
TIME: 12:49 PM

COMMENTS, REQUESTS OR REMARKS (Toxic?, Flammable?, Explosive?, High Levels?)

*PRESERVATIVE: NaOH H_2SO_4 HNO_3 HCL ASCORBIC ACID