15

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE II INVESTIGATION

Tuxedo Waste Disposal Site Site No. 336035
Tuxedo Orange County

DATE: March 1989

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BUREAU OF HAZARDOUS SITE CONTROL
DIVISION OF HAZARDOUS WASTE REMEDIATION

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ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES IN THE STATE OF NEW YORK PHASE II INVESTIGATIONS

Tuxedo Waste Disposal Site
Town of Tuxedo, Orange County
NYSDEC I.D. No. 336035

Volume I - Report

Prepared for

DIVISION OF HAZARDOUS WASTE REMEDIATION
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CHAPTER 1

CHAPTER 1

EXECUTIVE SUMMARY

The Tuxedo Waste Disposal (WD) Site is located in the Town of Tuxedo, Orange County, New York. The site lies east of New York State Route 17 and west of the Ramapo River (Figure 1-1). It is bounded on the south by property owned by the Georgia Institute of Technology Foundation and on the north by Johnson's Antiques. The 12-acre site was used to dump construction and demolition (C&D) debris as well as non-C&D material between February or March and October 1987. Odors from the landfill were detected in April 1987 and cover material was placed over the site in October 1987 in an effort to eliminate the problem. Odors were still emanating from the site as of March 1989, however. A portion of the cover material was found to contain low levels of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).

A Phase I investigation was not conducted at this site. The Phase II investigation reported on here consists of a review of existing government and private files, a geophysical survey, soil gas sampling, landfill trenching, groundwater monitoring well installation, surface water and sediment sampling, air monitoring, site surveying, and report preparation.

Conclusions from the Phase II investigation are summarized as follows:

- The landfill produces and will continue to produce nuisance levels of hydrogen sulfide (H_2S).
- The fill material contains high levels of petroleum compounds, PAHs, metals, and low levels of volatile organics. The petroleum compounds are associated with gasoline, coal tars, wood preservatives, fuel oils, and tars. Some of the volatiles are associated with gasoline, others with

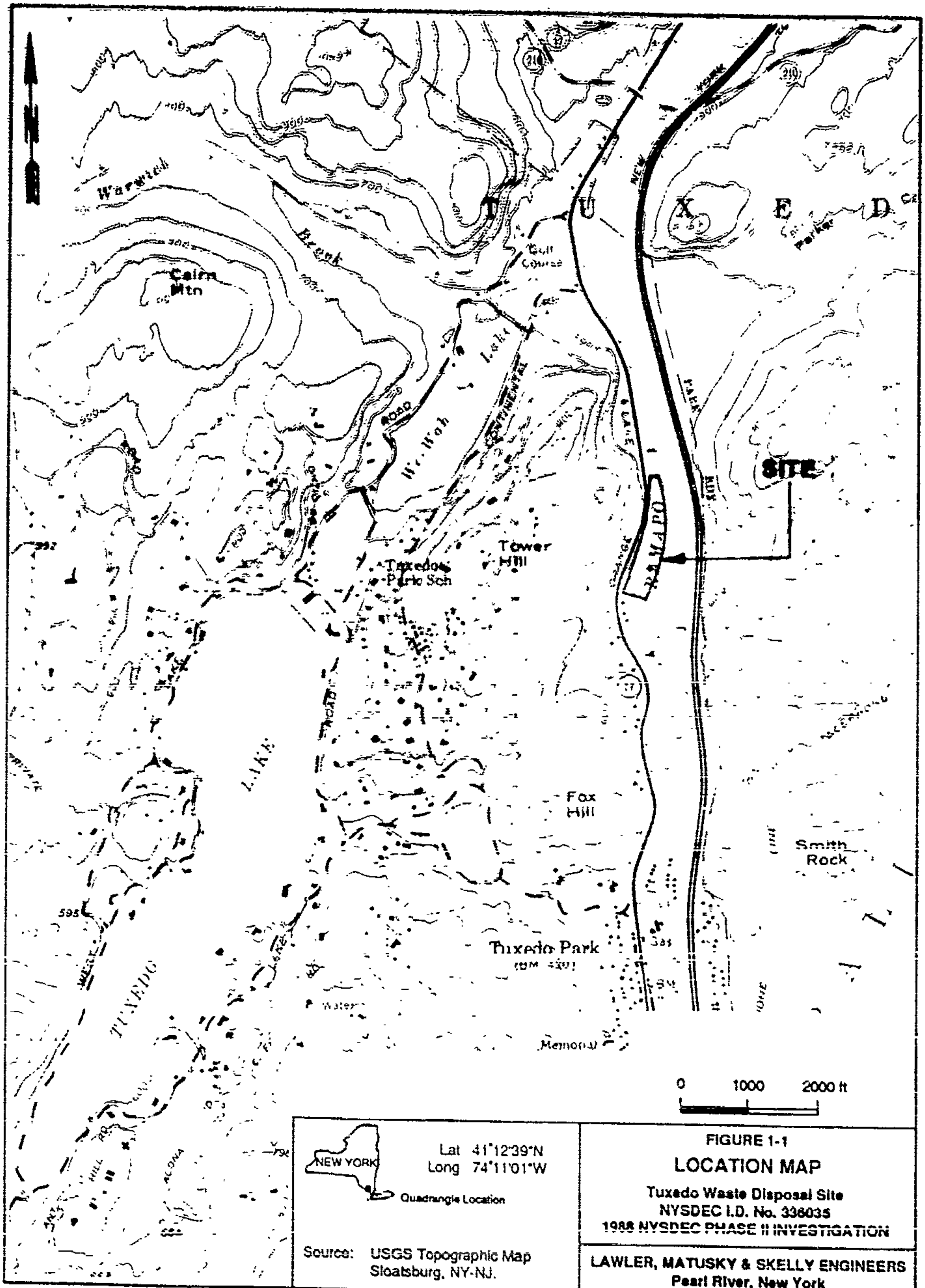

FIGURE 1-1
LOCATION MAP
Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION
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Pearl River, New York

cleaning liquids. Low levels of PCBs and a few pesticides were found. One waste sample failed the extraction procedure toxicity test (6 NYCRR Part 371) for lead, thereby characterizing that sample as hazardous waste. Other samples were within that sample range but below the hazardous level.

- The downgradient groundwater is contaminated by metals leaching from the landfill. The groundwater in the area feeds the Ramapo River, which shows a slight increase in metals downstream of the landfill. We conclude that the metals and high temperatures are the first indication that the landfill has started to leach out chemicals. As the landfill becomes more saturated, other compounds should start leaching also.

- Methane produced in the landfill together with the petroleum compounds could fuel a landfill fire if one started. No groundwater public water supply is threatened by the leachate, and the Ramapo River is not in any immediate danger from the landfill. However, unless the leachate is controlled, the Ramapo River could be affected in the future.

As one element in the site assessment, the data collected during the Phase II sampling and sampling by other agencies and organizations have been used to evaluate the site within the context of the U.S. Environmental Protection Agency (EPA) Hazard Ranking System (HRS). The HRS is used as a tool by the New York State Department of Environmental Conservation (NYSDEC) for assigning classifcations to inactive hazardous waste disposal sites. The HRS assigns numerical values to specific parameters for the purpose of assessing the potential hazards presented by a facility relative to other facilities. It does not address the feasibility, desirability, or degree of cleanup required and does not address all potential environmental or health impacts.

The final HRS score, the hazardous substance migration (S_M) score, is a combination of the values assigned to groundwater (S_{GW}), surface water (S_{SW}), and air (S_A). Fire and explosion

(S_{FE}) and direct contact (S_{DC}) are also scored numerically, but are not considered in the final HRS (S_M) score.

Based on information gathered from this investigation, the Tuxedo WD site was scored as follows:

S_M = 29.98 (S_{GW} = 38.78; S_{SW} = 11.96; S_A = 32.31)

S_{FE} = 28.13 S_{DC} = 25.00

The total score is 29.98 out of a possible 100.

Based on the conclusions of the Phase II investigation, three levels of activities are recommended: immediate remediation, additional studies and monitoring, and RI/FS investigations.

Immediate remediation:

- Install (1) additional cover to prevent venting and reduce infiltration, and (2) a collection and treatment system for the gases produced in the landfill.
- Divert the intermittent stream around the landfill.

Additional studies:

- Install another upgradient well to better represent upgradient, overburden groundwater.
- Conduct additional studies to characterize the wastes in the landfill, using soil gas surveys, deep trenching, or drilling. Deep trenching would require an extensive engineering/excavation program, and the concerns associated with liability and safety present a major problem vis-a-vis drilling.
- Monitor the downgradient wells monthly for landfill parameters and metals and twice annually for full organics scan.

The site will require some type of long-term action to prevent the constant leaching of chemicals from the landfill into the groundwater, then into the Ramapo River. This could involve a full remedial investigation/feasibility study (RI/FS) investigation by NYSDEC if the site is classified 2 or a modified investigation to determine the best action to stop or treat the leachate. Since the Phase II investigation was so comprehensive, we recommend that any RI/FS start with the FS portion of the study.

Note: Based on the results of the Phase II investigation, NYSDEC has determined that a Class 2 designation for the site is appropriate. Class 2 is defined as a "significant threat to public health and/or the environment - presence of hazardous waste is confirmed - action required." In addition, as part of the classification process, the site's name has been changed to reflect the true nature of the site. Because the name change is very recent, some information may still reflect the original site name.

CHAPTER 2

CHAPTER 2

OBJECTIVES

Lawler, Matusky & Skelly Engineers (LMS), under contract to the New York State Department of Environmental Conservation (NYSDEC), conducted a Phase II investigation of the Tuxedo Waste Disposal (WD) Site to address specific concerns regarding past waste disposal practices, characterize fill matarial, identify contaminant migration, and provide additional information to score the site on the Hazard Ranking System (HRS). The specific objectives of the Phase II investigation are to:

- Provide a geologic and hydrogeologic site assessment. This includes locating the water table and determining the aquifer of concern.
- Identify and evaluate the presence, concentrations, and nature of contamination, and determine whether contamination has been released from the site.
- Based on the results of the foregoing studies, determine whether a significant threat to the environment exists.
- Provide additional information to complete the final HRS score.
- Prepare a report documenting findings and outlining any recommendations for possible future work.

CHAPTER 3

CHAPTER 3

DESCRIPTION OF PHASE II INVESTIGATION

3.1 SITE INVESTIGATION

A site reconnaissance investigation of the Tuxedo site was conducted before any field work was initiated to determine:

- Site access problems
- Whether locations of monitoring wells present any access problems for the drill rig
- Volatile organic concentrations, using air-monitoring equipment
- Site hazards, such as drums and vents
- Power and water line locations

An LMS site-specific health and safety plan (HASP) was prepared from the information gathered during the site visit.

3.2 GEOPHYSICAL SURVEY

A geophysical survey was conducted from 21 to 23 June 1988 to estimate the depth of fill and depth to bedrock. Delta Geophysical Services of Clinton, New Jersey, conducted the survey, using both seismic refraction and electrical resistivity methods.

Seismic refraction measurements were taken at seven stations along survey lines chosen in selected areas of interest. After induction of a shock wave, an EG&G Geometrics seismograph (ES-1225) was used to measure the time required for the wave to arrive at 12 geophones located along each line at 10-ft intervals. Analysis of the data (travel times and distances) provided seismic velocities of subsurface material and depths to significant interfaces, such as bedrock and water.

Seismic lines S1 through S5 were located along the railway bordering the eastern edge of the site (Figure 3-1). Because the fill encroached on the railroad right-of-way, S3 was conducted over the fill. This resulted in conflicting data, which frequently reveal more about varying conditions than do conclusive results. Delta Geophysical data for this zone are not consistent, but LMS believes that this is due to the changed angles of (buried) bedrock slope along the S3 trend line. The consequences of this are phantoms in the S3F (forward) traces and scatter in the S3R (reverse) trace. LMS interprets the phantoms of the 3F trace to reflect the true refractive surface (not the data Delta used). If such an interpretation were adopted, an 11-ft slope of the bedrock southward along the seismic line from S3F to position S3R would be shown. The southward depth of bedrock in this zone correlates perfectly with slopes found for seismic trace S4 and the depth indicated at R8. Also, the use of these phantoms at S3F allows for greater correlation of the seismic velocities, i.e., both S3F and S3R = 20,000 ft/sec. Seismic lines S6 and S7 were also placed over the landfill.

Resistivity soundings performed with a Bison earth resistivity meter (Model 2350B) were conducted to determine the depths of the fill material. This technique employs four electrodes in a straight line. A low-frequency AC current is induced in the ground through the two outer electrodes; the potential difference is measured between the two inner electrodes. Eight resistivity soundings were conducted throughout the landfill. Resistivity interpretation software was used to generate geoelectric models of the subsurface beneath each resistivity sounding. The accuracy of resis-

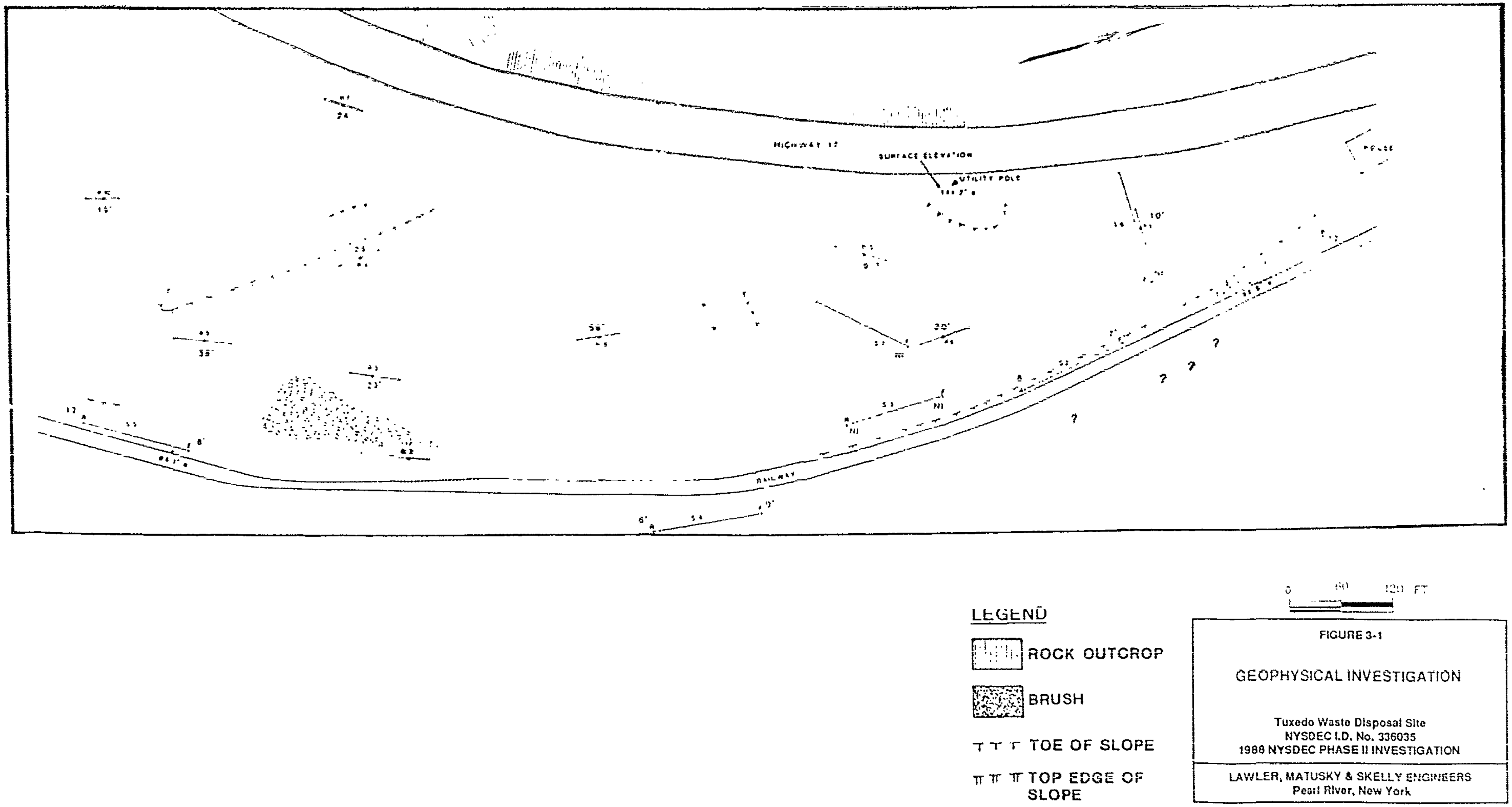

FIGURE 3-1

GEOPHYSICAL INVESTIGATION

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

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Pearl River, New York

tivity data may be affected by the presence of metal in the debris, which was found to be the case for the resistivity sounding at R9.

Curious results are found from testing at the R5 and R8 locations. In both cases the boundaries between vastly different materials were not well delineated. Although Delta Geophysical recognized this at R5, they did not do so at R8. The profiles for R8, although appearing relatively sharp on the log-log sketch, are in fact not sharp. Within each series of readings the data, as plotted, define small "cusps." LMS accepts the specific depth beneath R8 with minor reservations. We allow that materials and groundwaters at that depth are below the groundwater level and highly conductive. The profile suggests a local layering of the debris into lenslike structures.

3.3 SOIL GAS SURVEY

The soil gas survey was conducted to characterize any volatile constituents present in the pore spaces beneath the landfill surface. Results of the survey were used to help determine trench locations as well as monitoring well locations (discussed in subsequent sections).

3.3.1 Probe Installation

Between 27 June and 7 July 1988, 36 soil gas probes were installed throughout the Tuxedo WD Site. Except in areas of refusal, these probes were installed at 4- to 6-ft depths on a 100- by 100-ft grid pattern covering both the perimeter and the interior of the landfill.

The soil gas probes consisted of 3/8-in. Teflon tubing anchored at the bottom of the hole by an aluminum shield point and 3-3/4-in.-

long 10-slot screen. The original method of installation was to use the KVA Analytical Systems' (KV) Model 14 soil gas probe. A slide hammer (impacting a drive head) was used to drive a stainless steel point attached to 5/8-in. stainless steel rods. Using this method, when the required depth was reached, the apparatus was completely retracted from the hole. The permanent aluminum shield point, screen, and Teflon tubing were inserted into the same hole. The rods and head were then retracted a second time and the shield point, screen, and tubing were left in place in the hole. The annulus space was backfilled with cuttings to within 1 ft of grade; the remaining space was plugged with bentonite. The probe was then purged at a rate of 2.5 liters/min for 5 min. The tube openings were sealed and allowed to equilibrate for a minimum of 24 hrs before sampling in most cases.

Installation by this process proved to be slow and was made even more difficult by the presence of buried obstructions. On 5 July 1988 an Acker soil mechanic was used to assist probe installation. The soil mechanic is a portable gasoline-engine-powered drill unit used to collect split-spoon soil samples. To install the soil gas probe, a 2.5-in.-diameter drive point was substituted for the split spoon and was driven to the required depth by a 140-lb hammer over a 30-in. drop, per ASTM standard penetration tests. When the required depth or refusal was reached, the drive point and rods were retracted and the aluminum shield point and Teflon tubing were either inserted by hand or guided using the 5/8-in. KV rods. The annular space was filled and sealed as previously described.

Soil gas probe installation progressed from the north end of the site to the south. The southwest corner of the site appeared to contain more impenetrables, and refusal and damage to the installation equipment became common. In consultation with NYSDEC geologist Dan Eaton, it was agreed to suspend probe installation with SSP-41.

Soil gas data can be affected by recent rainfall and infiltration. After a rainfall (recharge event) the soil gas may be reabsorbed in the matrix and soil gas readings before and after rainfall may not be comparable. However, during the Tuxedo sampling, a second sample was collected after rainfall at one point sampled before the rain. The results were almost identical to the prerainfall conditions. The relatively impermeable cover over most of the site prevented rainfall infiltration and alteration of soil gas concentrations.

3.3.2 Sampling

On 30 June 1988 Analytics Environmental Laboratory Inc. of Portsmouth, New Hampshire, arrived on site with a mobile field laboratory to commence sampling of the soil gas probes. Results of this analysis were then used to identify "hot spots" for further laboratory analysis and to aid in the placement of the monitoring wells and trenches. Sample collection was conducted using a 1-in. piece of Tygon tubing to connect the 3/8-in. Teflon sample tube to a brass swage-lock tee fitted with a sample collection port and attached via Tygon tubing to a vacuum pump. The outlet from the vacuum pump was routed to an air flowmeter to monitor soil gas pumping rates. Soil gas tubes were purged, at least five volumes, at 2.0-2.5 liters/min for 4-5 min each. After purging, and with the sampling pump running, a gas-tight syringe was inserted through the sample port and 1 to 5 ml of soil gas was collected, sealed in the syringe, and immediately transported to the mobile lab. The soil gas samples were then screened on an HNU Model 321 portable field gas chromatograph (GC) housed in the mobile field lab. Compounds present in the samples were detected using photoionization and flame ionization detectors linked in series. Compound peak identification and quantification were carried out on two Hewlett-Packard integrators (Models 3393A and 3390A).

After the soil gas analysis data were received, the results were organized and plotted on a site map. On 23 August 1988, based on a study of the results and eyewitness accounts of areas suspected to contain hazardous wastes, 10 samples of the soil gas from probes SSP-20, 21, 22, 23, 24, 25, 26, 27, 32, and 33 were collected in NIOSH-approved SKC, Inc., charcoal-absorbent tubes for confirmatory GC/MS laboratory analysis (Ref.1, Appendix A).

A minimum of 4 liters of sample were collected from each probe with a personal sampling pump at a flow rate of 0.2 liters/min. All samples were forwarded to Galson Technical Services of East Syracuse, New York, for priority pollutant volatiles analysis.

The soil gas sampling work scope also included analysis of hydrogen sulfide (H_2S) concentrations. Because the analysis must be done in the field, Draeger detection tubes with a detection range of 50 to 600 ppm H_2S were used to determine gas concentrations at each sample point. With the exception of SSP-27, the Draeger tubes indicated the presence of at least 600 ppm H_2S from the 10 selected sampling points. No analysis could be performed at SSP-27 due to the presence of water in the tube. On 12 September 1988 soil gas analysis was conducted using Draeger tubes with an expanded 0-2000 ppm H_2S detection range. Readings indicated H_2S concentrations in excess of 2000 ppm (except at SSP-27, which still contained water).

3.4 TRENCHING

Three trenches were excavated at the site from 2 to 10 August 1988 for the purpose of subsurface exploration within the landfill to estimate what may be buried at the site. Waste samples were also collected for chemical analyses (Ref. 2, Appendix A). Trenching locations were based on the presence of high volatile organic concentrations from soil gas analysis as well as NYSDEC information regarding potential hazardous waste dumping locations. Environmental Drilling Inc. (EDI) of West Creek, New Jersey, was contracted to perform the trenching, and a Kamatsu 150 backhoe was mobilized to the site on 1 August 1988. LMS was responsible for air monitoring, trench lithology logging, sample collection, and support for emergency rescue. An emergency foam-dispensing cannon leased from the Tuxedo Fire Department was set up on site for vapor control in the event of discovery of volatile hazardous wastes or a rapid gas release. A "personnel exclusion zone" 50 ft in circumference was established around each trench. All personnel working within this zone, including the backhoe operator, were outfitted with emergency escape air packs. Self-contained breathing apparatus (SCBA) was on hand for all trained personnel in anticipation of possible Level B work. Ambient air from the excavated material, the trench perimeter, and the exclusion zone perimeter was monitored with an HNU photoionization device, an OVA flame ionization device, an Exotox 40 H_2S meter, an MSA explosimeter, and a dosimeter.

Excavation at trench 2A began on 2 August 1988. The red-brown silty sand cover material varied from 0.5 to 1 ft in thickness. Fill consisting of wood, concrete, fiberglass insulation, metal piping, foam rubber, and scrap metal was encountered from 1 to 6 ft. The fill material was mixed in a black silty sand or fibrous material, and most material was stained black, giving the appearance of scorching or anaerobic decomposition taking place. No significant organic vapor readings were observed during this interval, but personnel described the resulting odors as "septic" and "petroleumlike." At a depth of 6 ft a series of nested logs and tree trunks was encountered along with other C&D debris. These large obstructions slowed progress. After failing to bypass them by extending the trench laterally, work was halted at 16 ft. Air monitoring during excavation of the 6- to 16-ft interval yielded HNU readings of 1.5 to 10 ppm from the excavated debris. The OVA was rendered useless due to excessive heat, but no significant readings were indicated on the other monitoring devices over the debris, and all meters remained at background levels when the 50-ft perimeter was monitored.

Due to the failure to progress past the 16-ft depth, a sample was collected at 16 ft and the trench was backfilled and capped. At the request of the NYSDEC inspector, the trenching operation was suspended until a larger backhoe was available. It was believed that a larger backhoe was needed to achieve the trench dimensions of 30 ft long and 20 ft deep.

A Case 125 excavation backhoe was mobilized on site on 8 August 1988, and the excavation of trench No. 1 was initiated the following day. The cap material was approximately 1 ft deep at this location. With the exception of a few tree trunks, the fill was generally the same in trench 1 as trench 2. Through the first 10 ft, HNU readings ranged from 0.3 to 10 ppm, OVA readings were 20 to 60 ppm, and the Exotox indicated no greater than 1 ppm H_2S. From 10 to 17 ft the OVA readings increased to 580 ppm without a filter. A reading of 260 ppm was observed with a filter that effectively filters out all organic vapors other than methane or ethane. The difference of 320 ppm can therefore be attributed to nonmethane or ethane organics. Odors during the excavation of this interval were described as resembling creosote. During excavation past 17 ft OVA readings increased to over 1000 ppm with and without the filter, with consistent readings of 100-200 ppm in the breathing zone and 20-100 ppm in the cab of the backhoe. Because of the high readings in the breathing zones, all personnel working within the exclusion zone upgraded to Level B personnel protection (SCBA) to complete the trench to 20 ft. Two samples were collected for laboratory analysis and the trench was backfilled and capped.

Trench 3 excavation began on the morning of 10 August 1988. The cover material, approximately 2 ft thick, was a gray-black silty sand with cobbles, termed "Mahwah Sand." From 2 to 6 ft a reddish brown cobbly sand, possibly a roadbed, was encountered. Fill material similar to that previously encountered (wood, concrete, scrap metal, etc.) was found from 6 to 18 ft. Heat was detected emanating from the fill. At 18-20 ft OVA readings of 240 and HNU readings of 420-580 were observed. Very low Draeger tube readings on the benzene, xylene, and toluene tests and negative readings for hydrocarbons were encountered. The trench was completed to approximately 20 ft deep and 32 ft long. Two samples were collected for analysis before the trench was backfilled and capped from a store of 105 yd^3 of clean fill brought on site for this purpose. Because the excavation of trenches 3 and 1 had progressed as expected, it was decided to attempt another 20-ft-deep trench next to trench 2A. Trench 2B excavation began in the afternoon of 10 August 1988 and progressed to 20 ft. During excavation, volatile organic concentrations in air from 0 to 15 ft were only slightly elevated, but from the 15- to 20-ft depth HNU readings of 12 to 150 ppm and OVA readings of greater than 1000 ppm were observed. The material excavated from 2B consisted of scrap wood and metal, tires, tree trunks and stumps, scrap plastic, rags, metal pipes, plastic sheets, rugs, roofing material and associated foam or insulation, railroad ties, a small propane tank, tire rims, autombile radiators, and kitchen whites. A sample was collected for analysis before the trench was backfilled and capped.

3.5 TEST PITS

Five test pits were excavated at the site on 12 to 13 December 1988 to collect additional waste samples to further characterize the fill (Ref. 2, Appendix A). The test pits were located based on high volatile organic soil gas readings and trench locations.

Environmental Drilling, Inc. (EDI), was contracted to perform the test pit excavation. A Koehring 1060 backhoe was mobilized to the site on 12 December 1988. LMS monitored ambient air, recorded test pit lithology and composition, collected samples, and maintained emergency rescue equipment and support. NYSDEC supervised all activities.

A 50-ft-circumference personnel exclusion zone was established around each test pit. Emergency escape packs were not worn by site personnel working within the exclusion zone as they were deemed unnecessary based on August trenching experience. Air monitoring instruments (HNU photoionization detector, MSA 361 explosimeter, Ecotex 40 H_2S meter, dosimeter, and Draeger tubes) were used to determine ambient air quality during each test pit excavation. Self-contained breathing apparatus (SCBA) was available to trained personnel in the event ambient air quality deteriorated so that SCBA (Level B) would be needed to resume work.

Test Pit 1 excavation began and was completed on 12 December 1988. Soil was encountered in the top foot. Slag was excavated from 1 to 2 ft below grade. Fill material was encountered 2 ft below grade to the pit's bottom at 13 ft. Fill material was composed of bricks, wood, soil, steel and metal, plastic, textiles, and decomposed garbage. Two samples were collected at the 11-ft depth (1A) and 13-ft depth (1B). Total pit depth was 13 ft, with length about 8 to 10 ft and width 3 ft.

HNU readings varied between background and 15 ppm, with most readings 3 to 5 ppm. Hydrogen sulfide (H_2S) concentration varied between 1 and 8 ppm. While most readings averaged 4 ppm, perimeter exclusion zone readings were less than those near the pit and fill material. Perimeter HNU readings varied between background and 0.2 ppm. H_2S readings varied between 0 and 1, but peaked at 3 ppm. All readings were taken on site; none were recorded near the property boundary.

Test Pit 2 excavation began on 12 December 1988. The top foot consisted of soil and the remaining 9 ft consisted of soil, wood, plastic, glass, brick, particle board, metal, and badly decomposed fill. The fill was covered with black residue. HNU readings from fill material varied between 0 and 30 ppm. HNU perimeter readings varied between background and 0.2 ppm. H_2S readings varied between 1 and 3 ppm. Two samples were collected from the fill material: one at 6 ft (2A), the other at 10 ft (2B). The test pit was backfilled on 12 December 1988 once the second sample was collected from the pit bottom.

Test Pit 3 excavation began on 13 December 1988. The top 1.5 ft consisted of soil and the remaining 7.5 ft were composed of blackened fill material consisting of metal, plastic, bricks, lumber, railroad ties, and soil. HNU readings from the pit and fill material varied between 3 and 19 ppm. H_2S readings from the pit and fill material varied between 3 and 70 ppm. Two samples were collected: one at 8 ft (3A) and the other at 9 ft (3B) below grade (bottom of Test Pit 3). The test pit was backfilled on 13 December 1988.

Test Pit 4 was excavated on 13 December 1988. Blackened fill from Test Pit 4 was similar in nature to the other three test pits. Two samples were collected: one at 8 ft (4A) and one at 10 ft (4B) (bottom of Test Pit 4) below grade. Pit and fill HNU readings varied between background and 9 ppm. No H_2S was detected. Perimeter HNU readings varied between background and 1.5 ppm. Perimeter H_2S readings varied between 0 and 6 ppm. Test Pit 4 was backfilled on 13 December 1988 after samples were collected.

Test Pit 5 was excavated on 13 December 1988. Fill was similar in composition to the other four test pits. Two samples were collected: one from 7 ft (5A) and the other from 10 ft (5B) (bottom of test pits). HNU readings from the pit and fill varied from 1 to 5 ppm. H_2S readings varied between 0 and 32 ppm. Fifty-foot-perimeter HNU readings varied between background and 10 ppm; H_2S concentration varied from 0 to 13 ppm. Once samples were collected, the pit was backfilled (13 December 1988).

All collected samples were sent daily via overnight delivery to selected laboratories for chemical analysis. Each laboratory is identified in Chapter 4 and analytical results are summarized and discussed in Chapter 4.

3.6 GROUNDWATER INVESTIGATION

3.6.1 Installation of Groundwater Monitoring Wells

Buffalo Drilling Co. (Buffalo, New York) installed seven monitoring wells on site during the last week of July 1988 under LMS and NYSDEC supervision (Ref. 3, Appendix A). The objective of the groundwater investigation was to provide data pertinent to water chemistry, stratigraphy, and groundwater regime at the site. Wells MW-1 and MW-2 were installed in upgradient locations on the northwest and southwest corners of the landfill to provide representative samples of the groundwater flowing into the area. The five remaining wells were installed to monitor downgradient flow directions and water quality, providing an opportunity for interception of any contaminant plumes.

Monitoring well MW-1, a background well located in the northwest corner of the site, was installed beginning on 19 July 1988. Overburden penetration was facilitated with 6-1/4-in. O.D. hollow-stem augers driven by a Diedrich D-50 truck-mounted drilling rig. Continuous split-spoon samples were taken from grade to 16 ft. Stratigraphic columns are included on the boring log of each well listed in Ref. 3, Appendix A. Groundwater was encountered at a depth of approximately 19 ft and the well was screened in the medium to coarse sand aquifer from 17 to 27 ft below grade. Well construction specifics were completed as stated in contract Exhibit 3, Guidelines for Exploratory Boring, Monitoring Wells Installation, and Documentation of These Activities.

On 20 July 1988 the upgradient well MW-2 was installed on the southwestern corner of the site. MW-2 is located in a wooded section belonging to the Georgia Institute of Technology Foundation. The surrounding surface and a nearby drainage ditch indicated that the overburden consisted of many large boulders and cobbles in a silty sand matrix. Split-spoon sampling and hollow-stem augering progressed to refusal at 6 ft. An NX-core was attempted, but the corer broke through a large boulder. Progress continued by driving casing and roller bit through the boulder. It was believed that competent bedrock was encountered at 16 ft and groundwater at 12 ft. A bedrock core was collected from 16 to 21 ft to confirm bedrock. The core sample revealed a highly fractured granite. Well installation progressed at this point, with the screen set from 11 to 21 ft. Following the completion of MW-2, work began on the downgradient wells beginning with MW-7. The following day well MW-2 was found to be dry when an attempt was made to monitor the water level. It was decided to redrill MW-2 after completion of the downgradient wells.

Well MW-7, located in the northeast corner of the site, was installed west of the railroad bed and just off the toe of the fill. Because access to well locations adjacent to the railroad required driving over a railroad bridge and working in close proximity to the tracks, a Conrail flagman was required to be present when MW-6, MW-5, MW-4, and MW-3 were being drilled and constructed. The first 6 ft of MW-7 was drilled through the red silty sand cover material of the landfill that had washed down the toe. From 6 to 12 ft augering progressed through a fine tan sand that graded into a fine to coarse sand and gravel from 12 to 26 ft. Groundwater was encountered at 18.2 ft and the screen was set from 16 to 26 ft.

Wells MW-6 and MW-5 are also located on the eastern side of the site between the toe of the fill and the railroad tracks in a north-south line. Both are 2-in. PVC overburden wells constructed in sandy aquifers. Groundwater was encountered at MW-6 at 9.3 ft and the screen was set from 7.5 to 17.5 ft; groundwater was encountered at MW-5 at 10.3 ft and the screen was set from 8 to 18 ft.

MW-3, located in the southeast corner of the site, was installed next. Standard split-spoon sampling and hollow-stem augering progressed to refusal at 7 ft. Casing was spun from 7 to 9 ft, and a core sample was then collected to confirm bedrock. Next, the hole was reamed by a roller bit to 12 ft to create the bedrock socket. Casing was grouted into the socket. On the following day bedrock coring occurred from 12 to 29 ft. By repeated bailing and recovery checks, sufficient groundwater was confirmed at 17.6 ft in the bedrock aquifer and well construction was completed.

The final downgradient well, MW-4, was proposed at the bottom of a ravine that existed in a west-to-east line across the site prior to the site's receiving fill. Well placement was based on the assumption that contamination could migrate through the fill along the original site topography. Subsurface conditions similar to those in the area of MW-2 were encountered (overburden of cobbles and boulders) and therefore posed the same drilling difficulties. Drilling began by split-spoon sampling followed by hollow-stem augering to refusal at 6 ft. Casing was spun, followed by roller bit drilling, but only to 18 ft because the diamond bit on the casing wore out. The driller believed only steel could wear a bit in this way, so the site was abandoned. A second site was also abandoned when similar conditions were encountered. Progress was made at a third site by roller bit drilling to 10 ft before a second diamond bit was worn trying to spin casing past this point. The borehole was completed in overburden to a depth of 30 ft by a combination of coring and roller bit drilling and driving casing. At this point water could be heard flowing into the well. As the driller was checking the water level, his water level indicator, consisting of a weight covered with duct tape, fell into the well. When attempts at retrieval were unsuccessful, the hole was plugged to avoid contamination from the duct tape glue. The following day casing and a roller bit were driven through the overburden to a depth of 25 ft. Well construction was completed with the screen set from 24.5 to 14.5 ft. Groundwater was at 15.2 ft.

On 29 July 1988 Buffalo Drilling attempted to redrill MW-2. After crumbling their drive head, breaking a piece of casing with a diamond bit below grade, and wearing out their NX-corer and last roller bit, they decided to suspend the operation and subcontract Kendrick Drilling of Chester, New York, to complete the last well.

On 25 August 1988 Kendrick Drilling mobilized an Ingersoll Rand TH 60 air rotary rig to the site. After being forced to move once because of the same overburden difficulties, they were able to drill with their roller bit down to competent bedrock at 24.5 ft. Temporary 6-in. steel casing was driven to a depth of 28 ft and down-hole hammering into bedrock proceeded through the casing. Drilling proceeded from 40 and 60 ft without intersecting the watertable. At 80 ft less than 1 gpm of water was found, and drilling proceeded to 90 ft where an artesian aquifer was encountered. Water in the borehole rose to 24.8 ft as measured from the top of the PVC casing. A well was constructed with the 90- to 25-ft interval screened and the temporary steel casing was removed. Well installation was completed at the Tuxedo WD site on 29 August 1988.

The monitoring wells were surveyed by a licensed New York State surveyor to determine casing and ground elevations (Table 3-1). Water level measurements (depth from top of casing to water level) were recorded on 1 September and 8 November 1988 before each sampling event. Groundwater elevations were calculated by subtracting the water level measurement from the surveyed casing elevation. Since the water elevation of the two upgradient wells (MW-1 and MW-2) is higher than that of the downgradient wells, they are representative upgradient wells. MW-2 has the highest water elevation, followed by MW-1, which is slightly higher than MW-7; MW-3 has the lowest water elevation. On 26 August 1988 the Ramapo River surface water elevation was surveyed at 440.67 ft, 1.91 ft lower than the groundwater elevation in MW-3. During flood stages in the river, the river elevation could be significantly higher and the hydraulic gradient would be from the river into the landfill.

TABLE 3-1

MONITORING WELL AND STATIC WATER LEVEL ELEVATION

Tuxedo WD Site NYSDEC I.D. No. 336035

MONITORING WELL No.	DATE	TOP OF PVC CASING	GROUND LEVEL	WATER DEPTH FROM TOP OF PVC CASING	GROUNDWATER ELEVATION	RANK (HIGHEST TO LOWEST)
1	1 Sep 88	468.4	466.40	19.63	448.77	2
	8 Nov 88	468.4	466.40	18.61	449.79	2
2	1 Sep 88	502.47	500.10	24.78	477.69	1
	8 Nov 88	502.47	500.10	20.11	482.36	1
3	1 Sep 88	459.00	457.20	18.13	440.87	7
	8 Nov 88	459.00	457.20	16.42	442.58	7
4	1 Sep 88	460.07	457.90	16.72	443.35	6
	8 Nov 88	460.07	457.90	10.67	449.40	3
5	1 Sep 88	458.05	456.30	10.99	447.06	4
	8 Nov 88	458.05	456.30	8.86	449.19	5
6	1 Sep 88	456.83	454.80	9.82	447.01	5
	8 Nov 88	456.83	454.80	8.19	448.64	6
7	1 Sep 88	466.93	464.90	18.36	448.57	3
	8 Nov 88	466.93	464.90	17.65	449.28	4

All measurements are in feet.
All elevations in feet above sea level.

3.6.2 Well Development

Following the completed installation of the monitoring wells on the periphery of the site, each well was developed by both the removal of water and surging of the sand pack (Ref. 4, Appendix A). The process involved the use of centrifugal pump, polypropylene tubing (dedicated to each well), and a one-way float valve.

The main objectives for well development are to increase well productivity and sample quality. This was done primarily by pumping water from the well at the maximum rate at which the saturated material would produce sufficient head to maintain a constant flow to the pump. During the pumping the float valve and tubing were vigorously surged within the water column. This process forced water back into the sand pack from the well and cleaned the borehole walls of fine-grained material that had been "smeared" along its length during the drilling process.

Surging water also moved the sand pack, which in effect decreased its porosity by settling and increased its filtering capabilities.

Wells on site were pumped and field chemistries recorded at varying intervals during their development. Field measurements (Ref. 4, Appendix A) included turbidity, specific conductance, temperature, and headspace hydrocarbon content. Pumping continued if turbidity ranges were well above the 50 NTU standard set by NYSDEC.

Each well (except MW-2 and MW-4) was developed by Buffalo Drilling using a 5-ft PVC bailer a minimum of 24 hrs after construction was completed. Each well was bailed in an attempt to remove fine sediment from the sand pack and yield turbidity readings of less than 50 nephelometric units (NTU). Development was attempted first at

MW-1; after 8 hrs of bailing, turbidity readings still remained high. After developing MW-7 for 5.5 hrs and still getting high turbidity, it was decided, in cooperation with NYSDEC, to limit development to 4 hrs per well, but to return at a later date and try pumping the wells. Development of MW-6 yielded acceptable turbidity readings after 4.5 hrs; MW-3, a bedrock well, developed to acceptable levels in just 1.5 hrs. MW-4 was developed on 1 August 1988 and yielded 23 NTU. MW-1, MW-5, MW-6, and MW-7 were redeveloped on 1 August 1988 and yielded 0.1, 15, 65, and 10 NTU. An LMS crew developed the new MW-2 immediately before sampling.

3.6.3 Methods for Groundwater Development Sampling and Permeability Calculations

Monitoring wells were allowed to remain untouched for a period of time following their development; this allowed for the resumption of normal direction of flow of groundwater and for preparation of a coordinated sampling effort.

Monitoring well sampling was performed similarly to development. Initially, static water levels were measured and recorded. Each well's bottom was also sounded. These readings provided accurate water column measurements and quickly indicated whether there was an oversilting condition in the well or some type of defect.

The volume of water to be removed was directly related to the bore-hole diameter and the depth of the water column. When possible, a minimum of four borehole volumes of groundwater were removed from each well.

As in the development, water chemistries were also taken during the well purging; measurements were similar and included pH (Ref. 4, Appendix A). Purging was continued when turbidity was found to be over the required limit of 50 NTU. If pumping and bailing failed to reduce turbidity below the required ceiling, a decision was made by either the sampling crew chief or the NYSDEC representative on site as to whether water quality was acceptable for sampling purposes.

Following well purging, static water levels were allowed to recover to at least 90% of their original level. Actual sampling was performed with dedicated Teflon bailers that had been laboratory decontaminated and stored in an isolated area to avoid cross-contamination. Initially, a field blank was collected from the first bailer by pouring laboratory-filtered water stored in the sample bottles into the Teflon bailer and then allowing it to run into a new set of sample bottles. Field blanks were analyzed for the identical parameter list used for the monitoring wells to determine the existence of residual contamination in the bailer, the sample bottles, or possibly the ambient air. Before water samples were collected for analysis, presample chemistry was recorded. Following the sampling, turbidity was rechecked to ensure that the water quality was within the guidelines for laboratory analysis.

Each sample container was labeled with the well identification number, site, job number, date, time, parameters for which the container was specifically filled, and any added field preservative. Containers were placed in iced coolers to maintain a constant temperature at or as near as possible to 4°C before being shipped to the laboratory. All samples were accompanied with a chain-of-custody form from the time they were extracted from the ground to their acceptance by the laboratory. Numbered laboratory seals were put on the coolers before express shipment.

3.6.4 Permeability Testing

Permeability testing was performed on each monitoring well (Ref. 4, Appendix A). Permeabilities are calculated from data gained from slug tests performed on each well. The slug test measures the time it takes for the volume of water displaced by the slug to be absorbed by the overburden material within the saturated zone.

The slug used in the testing was constructed of solid stainless steel. The procedure was repeated several times to ensure that the recovery rates of the well were reproducible and that the data would be valid. A bail test was also performed at the wells to ensure that slug test data were as accurate as possible. A bail test is essentially the opposite of the previously performed slug test. After the slug is lowered into the water table and the well is allowed to stabilize, the slug is quickly removed and the time that the well takes to regain its original static level is recorded.

During well purging, actual pumping rates were measured as well as the relative short-term drawdown at this rate. Although not needed for permeability calculations, this information is useful for comparing estimated well yields in various areas of the landfill if shallow water recovery and treatment is proposed at a later date.

Two mathematical calculations were used to determine permeabilities in unconfined aquifers with partially or fully penetrating wells (Ref. 5, Appendix A).

3.7 SURFACE WATER AND SEDIMENT SAMPLING

On 4 August 1988 an LMS field crew met Mr. Mike Komoroske of NYSDEC on the Tuxedo WD Site to collect representative surface water and sediment samples (Ref. 6, Appendix A). The former were collected with Teflon dip buckets. Temperature, pH, and specific conductivity measurements were recorded at each surface water location. The sediment samples were collected with stainless steel spoons. The dip buckets and spoons were cleaned at the LMS laboratory with deionized water, detergent, nitric acid, acetone, and hexane. Each sampling device was used only once to avoid cross-contamination.

Surface water samples were collected from the waterbody surface. Streams are homogeneous and not prone to the layering characteristics that could be expected in some soils or sludge. Sediment samples were obtained with a spoon, shovel, or core tube. The sample was collected at the 0-6-in. depth unless otherwise specified.

Each sample container was labeled and identified with a sample location I.D., site I.D., job number, date, time, parameters for analysis, and any preservative that might have been added in the field. The containers were placed in coolers with ice immediately after sampling to keep the samples at 4°C. All samples were accompanied by chain-of-custody forms from collection to arrival at the laboratory for analysis.

The downstream surface water (SW-1) and sediment (RS-1) location, in the middle of the Ramapo River, was sampled first, downstream of the southernmost monitoring well, MW-3. Samples from SW-2 and RS-2 were collected next, 5 ft from the west bank of the river, between monitoring wells MW-6 and MW-7. The sample from SW-3 was collected from standing water north of the landfill between the railroad tracks and the river. SW-4 and RS-4 locations, in the middle of the Ramapo River, upstream from the northern boundary of the landfill were sampled next. A sediment sample, SWS-3, was then collected beneath the standing water at SW-3.

On 9 September 1988 an additional surface water sample was collected at SW-5 east of the railroad tracks at the base of the railroad bed (Ref. 6, Appendix A). This location is between monitoring wells MW-6 and MW-7 on the east side of the railroad tracks. This sample was collected from what appeared to be a seep from under the railroad track bed. There was a visible sheen on the water surface.

On 7 November 1988 an LMS field crew and Mr. Komoroske (NYSDEC) re-sampled the surface water and sediment sample locations (Ref. 6, Appendix A). The surface water samples were collected directly from the river into sample containers. Stainless steel spoons were used to collect the sediment samples. Because the Ramapo River was 3 to 4 ft higher during resampling the downstream location, SW-1/RW-1, had to be moved approximately 65 to 70 ft downstream and 5 ft off the west riverbank. LMS could not collect midriver samples due to the water depth. Samples from SW-2/RS-2 and SW-3/SWS-3 were collected at the same locations as the original samples. Samples from SW-4/RS-4 were collected closer to the west bank due to the water depth. Because the river rose and flooded the SW-5 location, NYSDEC decided that this water was now characteristic of river water and would not be representative of the seep. The sheen visible at this location during the original 9 September 1988 sampling was no longer evident.

3.8 AIR MONITORING

Portable air-monitoring instruments - an organic vapor analyzer (OVA) and an HNU photoionization detector (HNU) - were used to detect volatile organic vapors that could be a potential health hazard to on-site personnel. Air monitoring was performed during the following activities:

- Site reconnaissance. Before any field work was initiated, air monitoring was performed over the entire site to establish health and safety guidelines.

- Drilling. The split-spoon sample and material brought to the surface were monitored.

- Trenching. Ambient air around the trench (including the 50-ft exclusion zone) and landfill material itself was monitored.

- Post-trenching site visit. Once trenching operations were completed, two LMS field personnel returned to the site to inspect the trench locations for settlement as well as any gas vents created by fill and cap settlement.

- Test pit excavation. Ambient air from the pit and fill were monitored. Ambient air was also monitored at a 50-ft exclusion zone centered around each test pit. Hydrogen sulfide was also measured during excavation and at the 50-ft exclusion perimeter.

CHAPTER 4

CHAPTER 4

SITE ASSESSMENT

4.1 SITE HISTORY

The Tuxedo WD Site in the Town of Tuxedo, New York, is located east of New York State Route 17 and west of the Ramapo River. An active Conrail railroad track separates the site and the Ramapo River. The site is currently owned by Renard Barone, Esq., of Tuxedo and Sarkin Khourouzian of Sloatsburg, New York. The 12-acre site is designated as Section 9, Block 1, Lot 11 on tax maps.

Tuxedo Park Associates purchased the undeveloped property in 1885. Anthony Cucolo Corp. purchased the property in 1959. In 1961 it was purchased by Thruway Asphalt Co., which operated a bituminous concrete plant at the southern end of the property, as seen in a March 1968 aerial photo. In addition, a sand and gravel excavation removed large volumes of these overburden materials from the site. A marsh and pond was located on the east side of the property. The pond was fed by a stream of varying discharge that flowed northward through the center of the property. Excessive runoff collected in the pond as the railroad embankment was a natural barrier.

Mr. Barone purchased the property in 1985, with Mr. Khourouzian as co-owner. Mr. Frank Sacco, as manager, began a construction and demolition (C&D) landfill sometime after mid-February 1987. Based on NYSDEC regulations effective at the time, no permit was needed for C&D landfills that operated for less than one year. A 7 March 1987 survey map (Figure 4-1) shows the site before C&D debris began to accumulate.

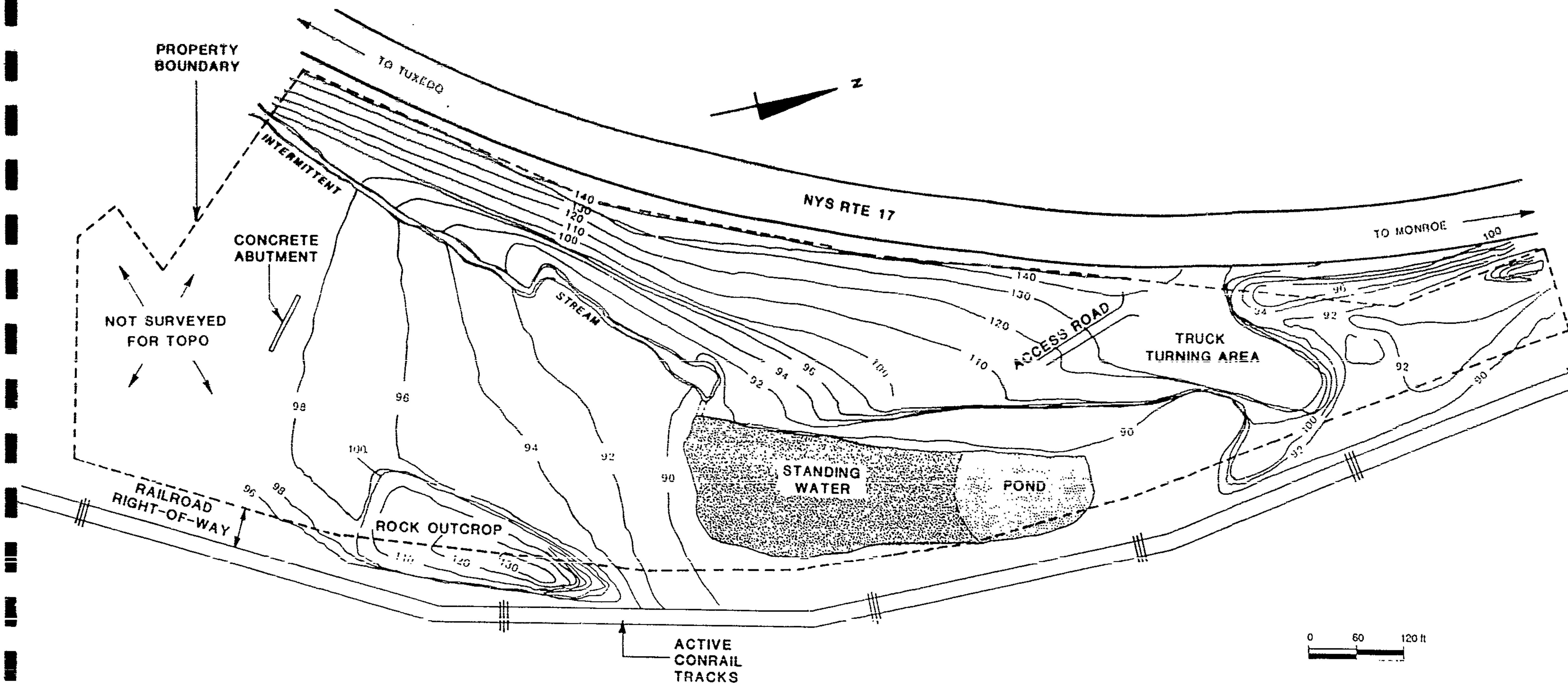


FIGURE 4-1

PRE-FILL TOPOGRAPHIC MAP
AFTER 7 MARCH 1988
CASSIDY SURVEY

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

NYSDEC first became aware of the landfill operation when a NYSDEC forest ranger and a NYSDEC assistant sanitary engineer visited the site on 18 March 1987. They advised Mr. Sacco that he was operating the site in violation of his C&D exemption based on the inclusion of non-C&D wastes in the landfill and lifts higher than 10 ft. Summonses were issued throughout the month, but the site continued to operate. The ranger visited the site again in March, April, May, and August 1987. From these site visits a history of the landfilling was created. The site was also investigated by the state's Bureau of Environmental Conservation Investigation officers, but they uncovered no evidence of hazardous waste (Ref. 7, Appendix A).

The landfill operation began in the southern portion of the site near the location of the old bituminous plant. Debris was dumped in an expanding fan shape. Three pits were dug in the southern end of the property. The western pit, approximately 40 ft deep from existing grade, appeared to be used to provide cover material for various portions of the landfill. The central pit, approximately 12 ft wide, 20 ft long, and 10 to 15 ft deep, was bounded by the cement walls from the former structure. This pit was suspected of being used to bury old tires and fill. The eastern pit, approximately 20 to 30 ft deep, was also created to provide cover material for the landfill. The layers or lifts of fill were approximately 15 to 20 ft thick, exceeding the 10-ft legal maximum. The first lift covered most of the site. An underground drainage pipe was reportedly installed to reroute the intermittent stream from the south to the center of the property, then eastward. A pipe protruding from the eastern edge of the fill marks its exit point. Due to improper placement, this pipe does not reroute the intermittent stream at all. Instead, the water ponds up at the base of the fill and slowly drains directly into the fill. The NYSDEC forest ranger also reported a second pipe heading northward from a tee in the main drainage pipe. This pipe may have been designed to drain the northern end of the landfill and/or the pond (Ref. 7, Appendix A).

As the fill progressed northward, the marsh and pond were drained, filled with 1-in. gravel, and covered with fill (Ref. 7, Appendix A). The first lift extended northward to the property line near Johnson Antiques. A second lift created at the southern end of the property extended northward, much like the first lift. Dirt from the easterly rock outcropping covered landfill materials in that area. The second lift stopped in the middle of the property, near the location of the former pond, when landfilling was halted. A third lift also started at the southern end did not progress beyond the second lift, as landfilling was halted in October 1987. Pursuant to the 7 October 1987 temporary restraining order, soil (hence, cover material) was transported to the site to cover the landfill and control hydrogen sulfide (H_2S) gas. Cover material transported from Mahwah, New Jersey, to the site contains low levels of polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbon (PAH), as determined from 16 October 1987 sampling. The landfill was covered by the end of November 1987.

The landfill accepted C&D materials such as brick, wood, dirt/soil, logs and/or stumps, metal beams or objects, and electrical cable. NYSDEC personnel observed that non-C&D waste, such as auto parts, tires, plastic, foam rubber, cardboard, paper, household garbage, railroad ties, hospital paper refuse, sinks, water heaters, crushed metal and plastic drums, unidentified white goods, and furniture parts, were also landfilled.

Strong odors were reported to emanate from the landfill (beginning in April 1987) by local residents, townspeople, and travelers along Route 17 and the New York State Thruway. The odors are caused by hydrogen sulfide gas generated when debris with high sulfur content decomposes without oxygen (anaerobic). Wallboard (containing gypsum) has been demonstrated to generate hydrogen sulfide under anaerobic conditions. No intact wallboard was observed at the landfill nor was any found during trenching (see Section 4.6.4). This is probably the result of wallboard (as well as other building materials) being processed (ground up) off site and brought to the site in an unrecognizable form. Plaster (as broken chunks or dust) may have been dumped at the site. Both materials are thought to be decomposing to produce hydrogen sulfide gas through a series of chemical reactions. Methane gas, a product of sanitary landfills, has also been detected in significant quantities at the site.

On 7 October 1987 the state court system granted the Attorney General's September 1987 request to issue a temporary restraining order to prevent further dumping at the site and to cover the site with material to control odors. A 21 March 1988 court action continued the dumping prohibition. It also required the owners to cut trees that penetrate the fill material (to prevent venting pathways), cover the vents with plastic and 12 in. of soil, and remove C&D material from above the village water main. Additional cover material was brought to the site in April 1988 and graded over most of the site in compliance with this court order (Ref. 7, Appendix A).

4.2 TOPOGRAPHY

The Tuxedo WD Site is located near the Ramapo River floodplain (Ref. 8, Appendix A). The general topography of the area is that of a floodplain surrounded by valley walls. Drainage in this reach of the river can be classified as deranged dendritic. Local tributaries from much of Palisades Interstate Park to the east as well as the Indian Kill and Warwick Brook to the west drain into the

Ramapo River. The Ramapo River is designated Class A (T) in the reach that borders the site (Ref. 9, Appendix A). In addition, under Environmental Conservation Law (ECL) Article 15, Title 27 (Part 666 regulations) the Ramapo River is a designated recreational river approximately two miles downstream.

4.2.1 Prefill Site Topography

Prefill site topography was primarily a result of the extensive sand and gravel excavation on site. The removal of large volumes of these overburden materials greatly altered the original drainage patterns. As of 7 March 1987 the site topography was dominated by a 50-ft slope leading from Route 17 to the Conrail tracks (Figure 4-1). An intermittent stream at the base of this slope flowed from southwest to northeast, feeding a pond located in the approximate center of the site. The stream, which originated from an area drained to the west of Route 17, entered the southern portion of the site through a culvert located under Route 17, emptied onto the Georgia Institute of Technology's property, and flowed north onto the site. A bedrock outcrop on the southeastern edge of the site stood approximately 40 ft above the level area and adjacent railroad tracks. Another topographic high was the truck turning area next to Route 17 on the property's northwest side. This level area extended 150 ft from Route 17 to the east before dropping off steeply to the railroad level. Because of the sand and gravel excavations, limited or no overburden materials remained in the central portion of the site, resulting in exposed bedrock.

4.2.2 Landfill Topography

Current topography is dominated by three treeless lifts or terraces (Figure 4-2) that extend from the southwestern corner of the site where the third lift is level with Route 17, diagonally across the

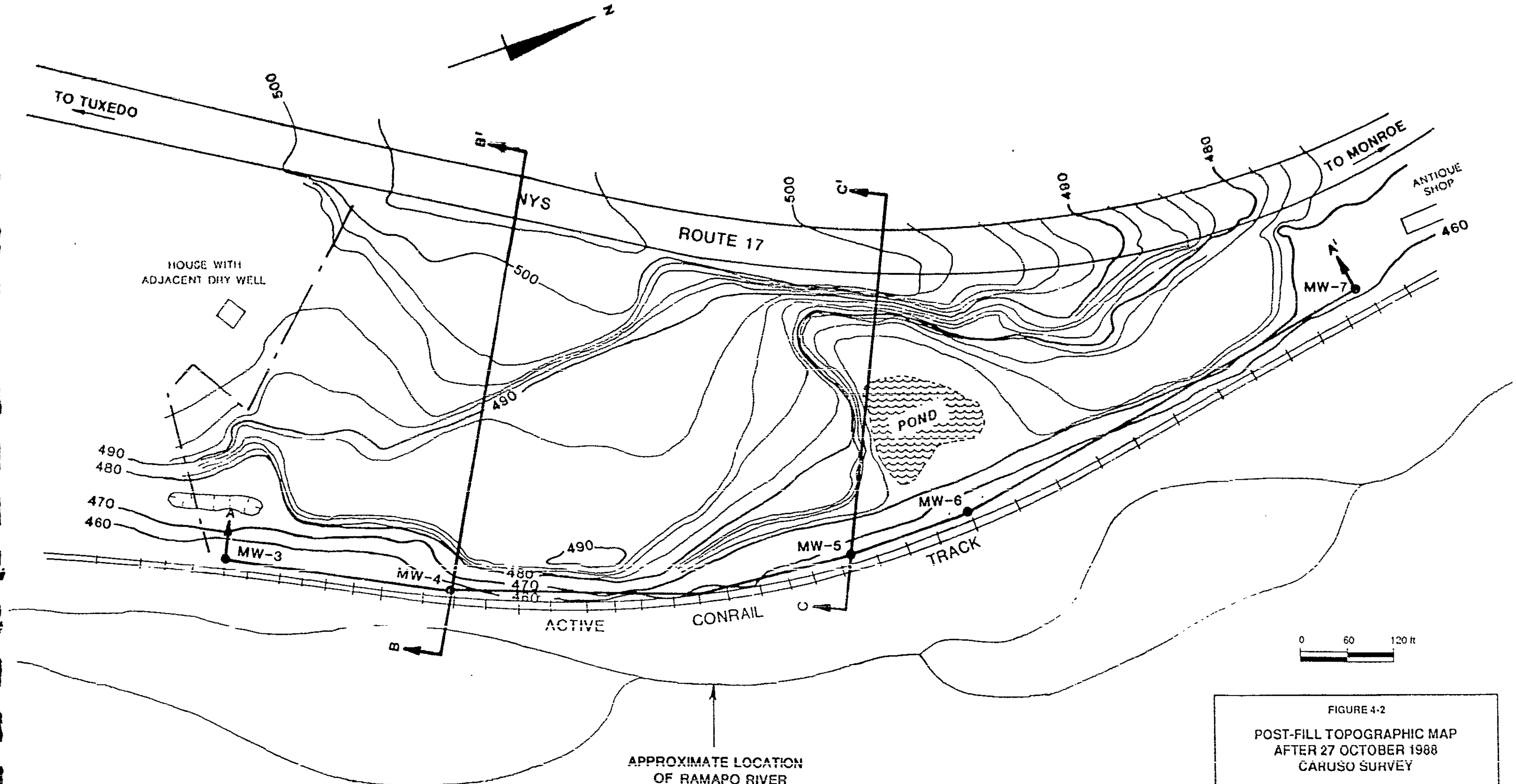


FIGURE 4-2

POST-FILL TOPOGRAPHIC MAP
AFTER 27 OCTOBER 1988
CARUSO SURVEY

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

site to the northeast. The original slope, which extended down from Route 17, appears to have been cut back and slopes more steeply than it had. The third lift area appears to have received the most fill, with reported depths as great as 70 ft (Ref. 7, Appendix A). The intermittent stream is reported to have been culverted under the fill. A ravine extends to the fill on the Georgia Institute of Technology property, where a culvert extends out of the slope. Some of the western surface runoff has been rerouted and a reduced discharge now empties into the ravine. No water appears to flow into the culvert. No water exits the culvert on the eastern side of the site at railroad level just south of the rock outcrop. The bedrock outcrop on the southeastern edge of the site now emerges only a few feet above the second lift. A ponded area located at the toe of the second lift is elevated approximately 15 ft above the original pond. The truck turnaround, while still present, has been cut back. The current turnaround, on bedrock, is less than 100 ft off Route 17, approximately 15 ft above the first lift. The fill in this lift (northern end of the site) is approximately 10 ft.

4.3 GEOLOGY

The Tuxedo WD Site is located within the Hudson Highlands extension of the New England Upland Physiographic Province in the Ramapo River valley. Bedrock in this area consists of a complex gneiss of Precambrian Age that has been subject to slight regional metamorphism.

4.3.1 Bedrock

A study of local bedrock outcrops and previous area geological assessments confirms that core samples from MW-2 and MW-3 consist of two general rock varieties: hornblende granitic gneiss, which contains quartz, potassium feldspar, and plagioclase, is resistant to weathering and therefore forms the cliffs and ridges of the area; biotite gneiss, a more easily eroded constituent, has contributed to valley formation and is therefore less common in outcrops.

4.3.2 Overburden

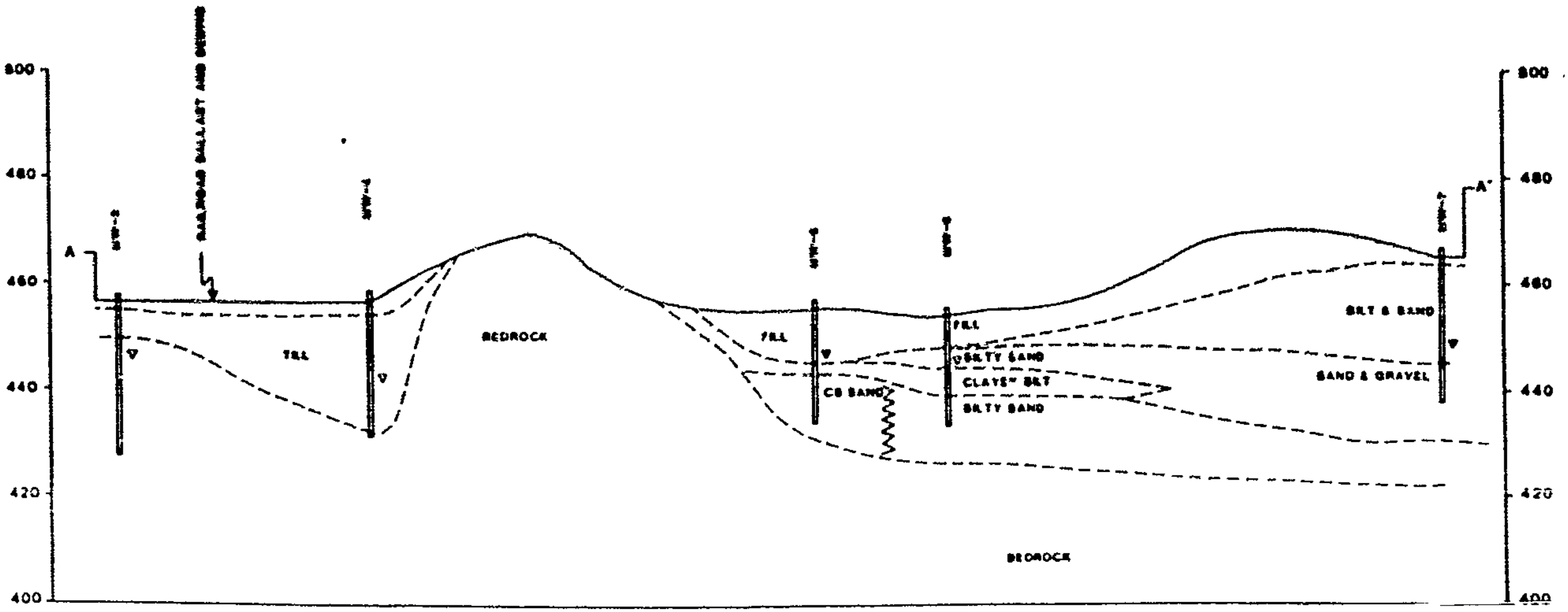
The general setting has been modified by glaciation. At the time of glacial maximum, ice covered the entire county and deposited poorly sorted clay, silt, sand, and boulders over most of the area except on steep hillsides. As glaciers advanced and retreated through the valley, the ice mass scoured and reshaped the bedrock and overburden. During ice advances, a poorly sorted mixture of silt, sand, cobbles, and boulders was densely compacted by the weight of the ice and formed a lodgement till. As the ice retreated it deposited an assortment of sediments within or on top of the ice. This till, known as an ablation till, is not as compact as the lodgement till. As glacial retreat continued farther to the north, the meltwaters drained southward through the valley, depositing well-sorted to moderately well-sorted sediments known as glacial outwash. This sequence of events resulted in a depositional history during which the valley was scoured and the lodgement till, followed by the ablation till, was deposited. Glacial outwash was deposited above the tills. These deposits are thickest along the valley axis and thin toward the crystalline valley walls. More recent river activity has resulted in variations in the accumulation of alluvium and overbank deposits in areas closest to and within the river course.

This depositional scenario is supported by analysis and interpretation of the overburden encountered during drilling. Farthest from the valley axis, MW-2 penetrated what appeared to be ablation till followed by lodgement till before encountering bedrock. Depth to bedrock in the area is highly variable, which may be attributed to a valley and ridgelike topography resulting from differential erosion of the two varieties of gneiss underlying the site. Moving closer to the middle of the valley, MW-1 and MW-7 penetrated the well-sorted sands of glacial outwash. Well MW-6 was drilled through postglacial alluvium and overbank deposits before penetrating glacial outwash. At MW-5 the overburden appeared to be alluvium and overbank deposits, a direct result of postglacial river activities. At MW-4 alluvium directly overlays lodgement till and bedrock. This may be attributed to deposition of the lodgement till around a resistant ridge of granitic gneiss, with the alluvium being deposited postglacially at times of higher river flow. Strata alluvium encountered at MW-3 is similar to MW-4, but with overbank deposits overlaying the till in place of the alluvium (Figures 4-3, 4-4, and 4-5).

4.4 HYDROGEOLOGY

Beneath most of the site groundwater occurs from 9.5 to 19.5 ft in unconfined overburden aquifer located in the fluvial and glacial deposits of the river valley. MW-2, where groundwater occurs under confining conditions, is an exception to this. Groundwater near the valley walls appears to originate from higher elevations, entering bedrock fractures and flowing to the lower elevations of the valley. The groundwater in the area of MW-2 has moved through this bedrock aquifer but is confined by more competent bedrock, the dense lodgement till, or a combination of the two.

The general trend of groundwater flow is from the valley sides to the Ramapo River (Ref. 10, Appendix A). The major water-bearing unit is the glacial outwash of the valley bottom. Slight local variations in groundwater flow direction and elevation may occur in



SCALE: 1" 370

FIGURE 4-3

POST-FILL CROSS SECTION A-A'

Tuxedo Waste Disposal Site
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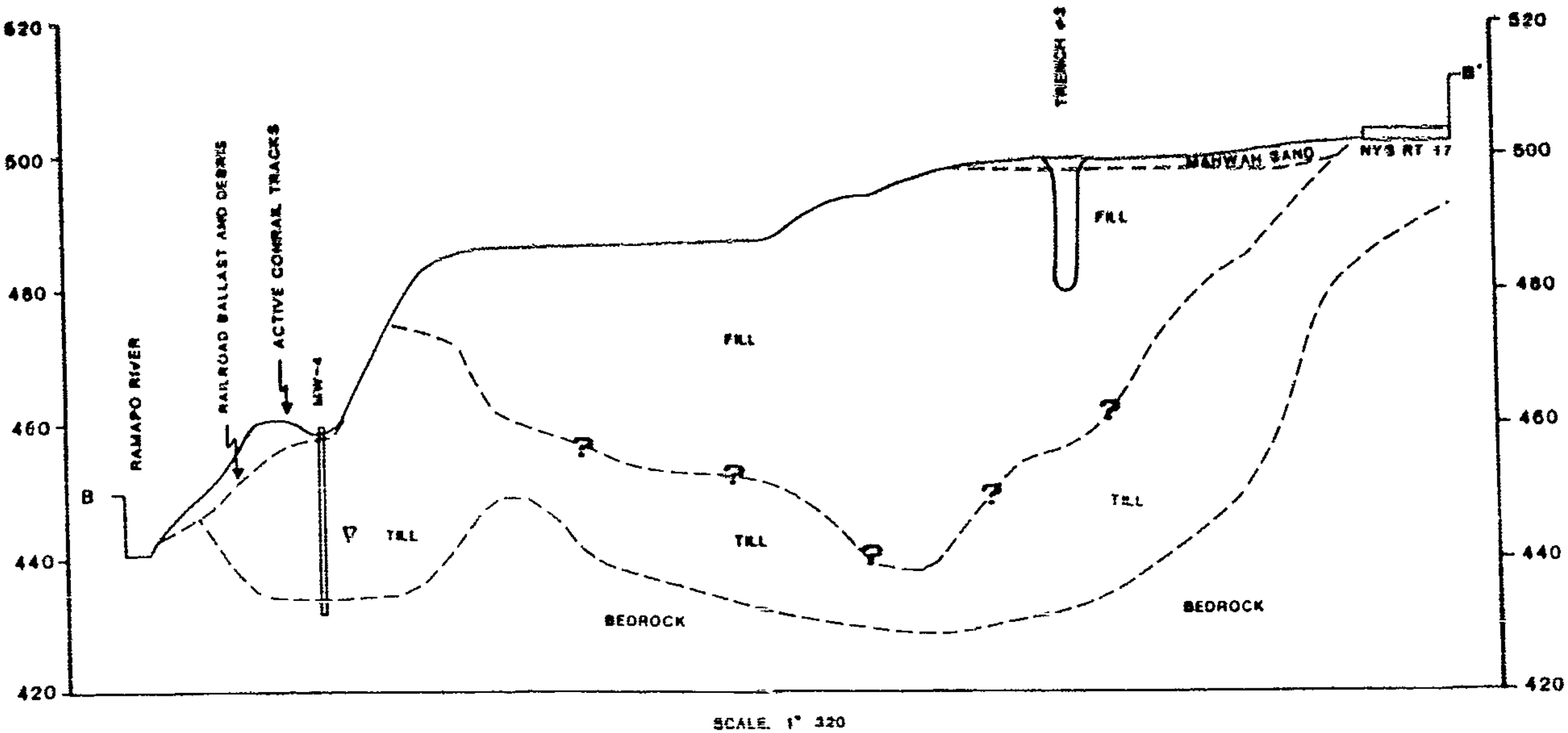

NOTE: Because of sand and gravel excavation, there are areas of fill and bedrock contact. Areas of saturated fill exist (see Section 3.2).

FIGURE 4-4

POST-FILL CROSS SECTION B-B'

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

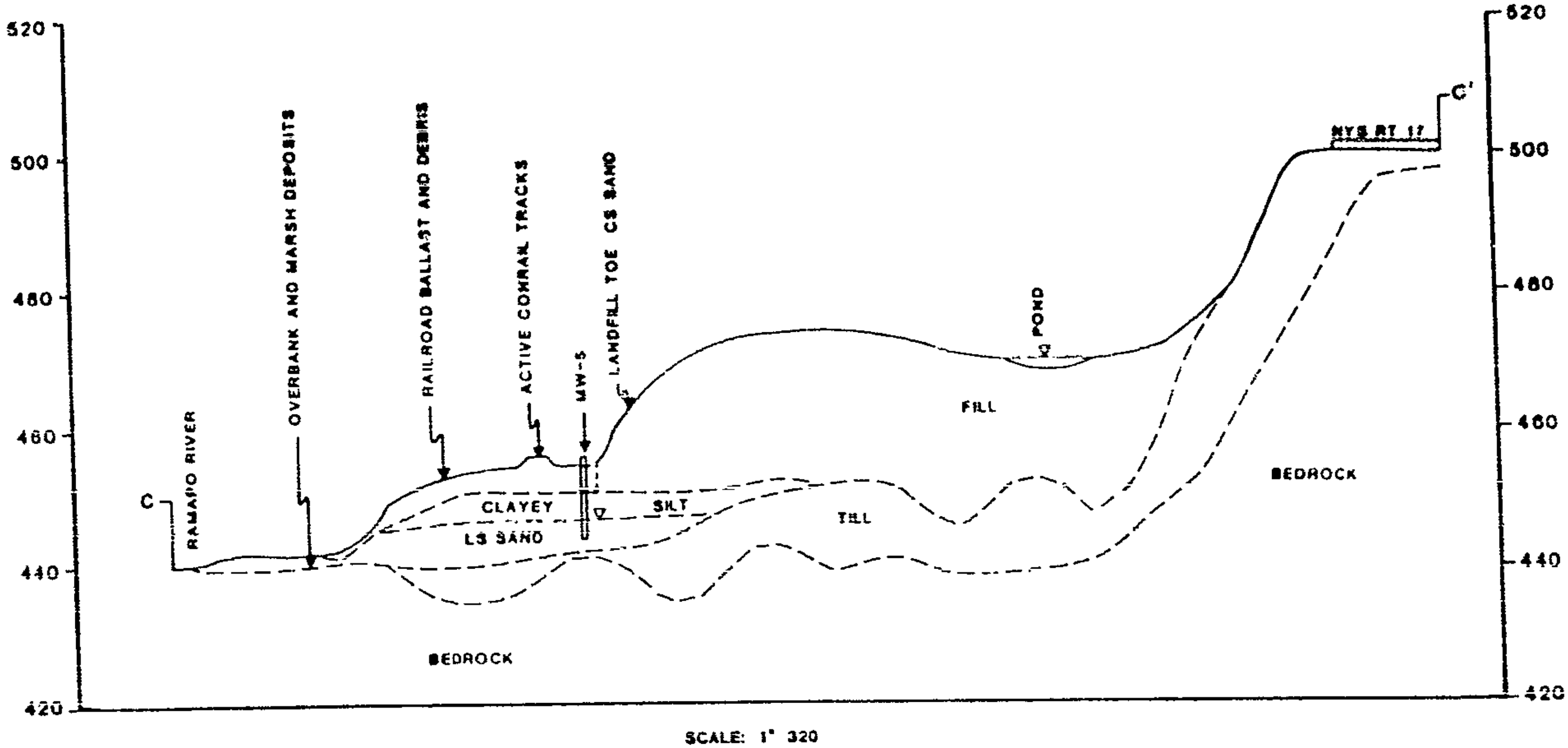

FIGURE 4-5

POST-FILL CROSS SECTION
C-C'

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

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areas where the bedrock ridges and/or lodgement till rise into the water-bearing zone.

Local drainage and aquifer recharge have been impacted by the landfill operation. Surface runoff from the west has been rerouted to the south. Cover material greatly reduces rainfall infiltration to the landfill. The majority of rain falling onto the site flows to the ponded area or downslope and off site to the east. These two factors reduce on-site recharge to the overburden aquifer.

Groundwater flowing under the site would originate either from open fractures in bedrock on top of the crystalline valley walls or from the infiltration of surface flow down these walls and into the overburden at their base across Route 17. These two scenarios would result in groundwater flow passing beneath or at the base of the fill material.

There are only two sources of groundwater recharge on the site. The first is the ravine running from the Georgia Institute of Technology property to the culvert. Some surface runoff still enters the ravine from the west side of Route 17. Even after heavy rains runoff never enters the culvert, because it is elevated above the ravine bottom. This accounts for a small degree of recharge. The other source for recharge is infiltration through the cover and fill material of the site. As previously stated, surface runoff either leaves the site as overland flow or accumulates in the pond and other topographic low points. The cover material appears to allow only small amounts of accumulated water to percolate through the cover and into the fill. The majority of the standing water is lost to evaporation or overflows to the east off site below the railroad. Any infiltration through the cover at these low points may decrease with time as overland sheet wash continues to deposit sorted fines, creating a natural silt and clay cover in the bottoms of these basins.

It is important to note that while groundwater recharge through the site is limited, it is occurring nonetheless and resulting in leachate production. The hydraulic connection in the overburden soils between the fill material and the Ramapo River allows for discharge of this leachate to the Ramapo River (see Figure 4-5). During periods of high Ramapo River flow, rising groundwater levels cause additional leachate. This occurs when surface water temporarily infiltrates into the fill and overburden materials, then discharges back into the Ramapo River when water levels drop. This mechanism is limited to the northern end of the site.

Permeability Analysis. Monitoring well permeability test results yielded consistent recovery times. Recovery times for MW-1 were between 5.81 and 7.65 sec. Permeability was calculated to be 5.2 m/day or 1.3×10^2 gal/day/ft^2. These values, characteristic of subsurface materials encountered in the water-bearing zone, are typical k values for similar material (Ref. 11, Appendix A).

The water-bearing zone sediments consist of permeable sands. The calculated permeability indicates fine to coarse sand. Groundwater recharge was excellent. Three gallons per minute (gpm) was recovered from the well.

MW-2's permeability was tested using the removal of a column of water for a partially penetrating well (Ref. 5, Appendix A). MW-2 was installed in bedrock not noted to contain large fractures. Permeability was calculated to be 2.6×10^{-5} m/day or 7×10^{-4} gal/day/ft^2 in comparison with typical consolidated values. The bedrock permeability value is equivalent to shale, cemented sandstone, and unfractured igneous and metamorphic rocks. This permeability value should not be assumed for the overall bedrock aquifer, as additional subsurface information is limited and large fractures are common in higher elevations.

MW-3 was also installed in bedrock. Water level measurements indicated it is beneath the bedrock-overburden interface. The permeability rate was similar to that for MW-2. This indicates a more homogeneous consolidated aquifer than anticipated. MW-3 permeability was found to be 1×10^{-2} m/day or 2.46×10^{-1} gal/day/ft^2. MW-3 yielded between 1.5 and 2.0 gpm, but could be evacuated to dryness at this rate. The second sampling (8 November 1988) showed a moderate increase in yield over the 1 August 1988 sampling.

MW-4 was installed within the bedrock-overburden interface. Material above the consolidated zone consisted of cobbles, boulders, and sand. Permeability was greater than in the bedrock wells at 4.3 m/day or 1.29×10^2 gal/day/ft^2. These figures indicate material in the range of fine to coarse sand. Recovery times were consistent (similar to MW-1), between 4.46 and 6.65 sec. Pumping rates varied between 3 and 5 gpm. MW-5 was installed in fine to coarse sand with gravel and cobbles. Groundwater recovery times were slightly lower than previous wells, indicating greater permeability toward the central area of the landfill. Recovery varied between 4.24 and 5.26 sec, giving a permeability estimate of 3.66 m/day or 6.46×10^1 gal/day/ft^2. This indicates a larger percentage of coarse-grained material in the overburden. The estimated yield rate for MW-5 is greater than 5 gal/min.

MW-6 is installed in an area in which the uppermost saturated zone consists of fine to coarse sand and silt with fine to medium gravel. The lower saturated zones reportedly grade to fine deposits, typical of swamp bog material. This fine-grained, less permeable horizon is 4-6 ft thick and overlies more fine to coarse sand and mixed gravel. Permeability is calculated to be 5.64 m/day or 1.29×10^2 gal/day/ft^2. Water-bearing zones in higher yielding areas may be sand and gravel near the top and bottom of the well, with the fine-grained material in the center of the well slowing down an otherwise rapidly recovering well. MW-6 is estimated to yield greater than 5 gpm.

MW-7 was installed in coarse-grained sand with some observed fine material. Lower water-bearing horizons consist of mixed gravel and sand. MW-7 was initially pumped at 10 gpm but was unable to reach this rate during the second sampling event. The overall estimated yield is approximately 5-8 gpm. Water returned to its normal level after pumping quickly in relation to the other wells, between 0.49 and 1.42 sec. Permeability was computed to be 1.7×10^1 m/day or 4.52×10^2 gal/day/ft^2 higher than the other on-site monitoring wells. The overall indication from both pumping and slug test data shows the lower perimeter wells to be highly permeable. Permeability increases from south to north, with coarse material increasing in proportion to fine overburden sand and silt.

4.5 OTHER DATA

Data were generated prior to the Phase II sample collection. Both NYSDEC and NYSDOH collected multimedia samples. EA Science and Technology (EA) analyzed air for the site owner. NUS Corporation, under contract to EPA, completed a preliminary assessment of the site on 7 April 1988. The preliminary assessment form summarizes information obtained so far and is included in Appendix B. Table 4-1 summarizes the previous data generation.

4.5.1 NYSDEC

NYSDEC collected various media samples on several different dates. Air samples were collected by NYSDEC on 17-18 November 1987 (Ref. 1, Appendix C). Two paired ambient air samples were collected and analyzed for volatile organics. Methylene chloride (a common lab-

TABLE 4-1

OTHER DATA/INVESTIGATIONS

Tuxedo WO Site NYSDEC I.D. No. 336035

		MEDIA						
SOURCE	DATE	AMBIENT AIR	GAS VENTS	COVER MATERIAL	LANDFILL MATERIAL	SLUDGE	GROUND-WATER	SURFACE WATER
NYSDEC/DEE	16 Oct 1987			X				
NYSDEC	27 Oct 1987						X?	X?
NYSDEC	17-18 Nov 1987	X	X		X	X		
NYSDOH	16 Jun 1988	X						
NYSDOH	23 Mar 1988	X	X					
NYSDOH	28 Apr 1988						X	
Ward Stone	10 Aug 1988			X	X			
EA Science and Technology (EA)	Pre- 4 Nov 1987	X?	X?					
EA (Data review)	2 Nov 1987 31 Dec 1987							
EPA (through NUS Corp.) Preliminary Assessment Form 2070-12	7 Apr 1988							
Abex Corp.	9 May 1983			X				
North Jersey District Water Supply Commission	Jan-Oct 1988							X
Georgia Institute of Technology Foundation	15 Sep 1988	X		X	X			

oratory contaminant) was the only compound detected in one upwind sample. Soil gas and vent sample analyses yielded mixed results. Table 4-2 lists those samples with detected compounds. The data show high concentrations of volatile organic components originating from SS-4 and SS-5 vents and from a C-7 soil gas vent location (Figure 4-6).

Soil samples were collected on 16 October 1987 (Ref. 2, Appendix C). The samples were collected from the cover material (transported from Mahwah, New Jersey) and analyzed for PCBs and PAH (Table 4-3). The data are discussed in Section 4.5.3. Samples were collected on 17-18 November 1987 from soil, debris, and sludge (Ref. 1, Appendix C). The results (Table 4-4) show some volatile organic components, no detectable pesticides/PCBs, and high concentrations of priority pollutant semivolatiles. The semivolatile compounds are common constituents of coal tar, diesel fuel, asphalt, and wood preservatives.

A water sample collected on 27 October 1987 (Ref. 3, Appendix C) by NYSDEC (location unknown) shows acetone (7 ug/l) and 4-methylphenol (12 ug/l) as the only compounds above detection limits and not found in the sample blanks. Neither pesticides/PCBs nor additional volatile organic compounds were detected. Additional base/neutral compounds were detected and total 238 ug/l.

A groundwater sample was collected on 28 April 1988 from Florence Goldblath's bathroom sink tap (Johnson Antiques). This water is supplied from a bedrock groundwater well (depth reported to be approximately 354 ft) located immediately north of the landfill. The results (Ref. 4, Appendix C) record the presence of one volatile organic (methylene chloride [at 1 ug/l], a common laboratory contaminant), no pesticides/PCBs, no base neutrals/acid phenolics, some metals (above detection limits): lead - 12 ug/l, copper - 701 ug/l, iron - 149 ug/l, manganese - 5 ug/l, strontium - 82 ug/l,

TABLE 4-2

AIR DATA SUMMARY FROM NYSDEC SAMPLES COLLECTED 17-18 NOVEMBER 1987[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

LOCATION SAMPLE No. PARAMETER	BLANK 875409	UPWIND No. 1 875404	AMBIENT AIR 875408	SS-4 VENT 875412	SS-5 VENT 875413	C-2 SOIL GAS VENT 875417	C-7 SOIL GAS VENT 875418
Toluene	ND	ND	ND	16,000	11,000	ND	4,100
Ethylbenzene	ND	ND	ND	2,200	8,800	ND	750
Tetrachloroethene	ND	ND	ND	1,800	5,700	ND	550
Methylene chloride	ND	2,700	ND	ND	ND	6,600	ND
Benzene	ND	ND	ND	ND	ND	ND	750
Trichloroethylene	ND	ND	ND	ND	ND	ND	2,700
Trans-1,2-dichloro-ethene	ND	ND	ND	ND	ND	ND	1,300
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	270
Totals	ND	2,700	ND	20,000	25,500	6,600	10,420

All data in micrograms per cubic meter (ug/m^3).
ND - Not detected.

[a]Sample Nos. 875404 to 875407 are paired up- and downwind ambient air samples. Methylene chloride was the only analyzed constituent detected. Sample Nos. 875408 to 8754022 are vent or soil gas samples.

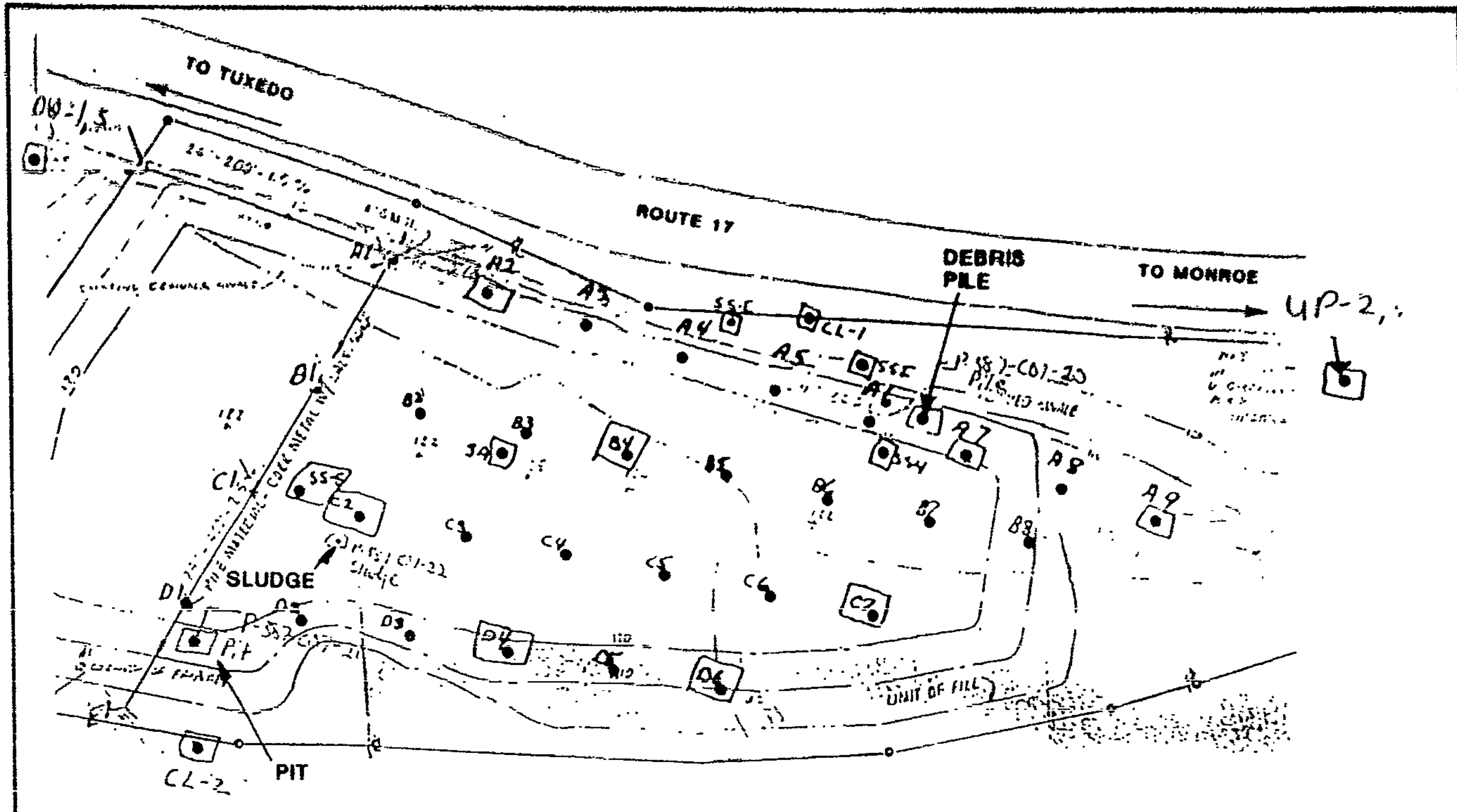

FIGURE 4-6

NYSDEC SAMPLING LOCATIONS
17,18 NOVEMBER 1987

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
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TABLE 4-3
Mahwah, N.J. Cover Material Sample Data Summary
16 October, 1987 NYSDEC

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	874731	874732	874733	874734	874735	874736	874737
PCBs							
.....							
Aroclor 1221	<0.01	<0.002	<0.001	1.04	<0.005	0.19 (SU)	<0.01
Aroclor 1016/1242	0.36	0.03 (SU)	<0.001	<0.02	0.05 (SU)	<0.001	0.04 (SU)
Aroclor 1248	<0.01	<0.002	<0.001	<0.02	<0.005	<0.001	<0.01
Aroclor 1254	0.11	<0.002	<0.001	0.16	<0.005	<0.001	<0.01
Aroclor 1260	<0.01	<0.002	<0.001	<0.02	<0.005	<0.001	<0.01
Totals	0.47	0.03	<0.001	1.20	0.05	0.19	0.04
PAH							
....							
Naphthalene	0.01 (PL)	0.01 (PL)	<0.10	0.10 (PL)	0.10PL (MS)	0.10 (PL)	0.10 (PL)
Acenaphthylene	0.01 (PL)	<0.01	<0.10	0.10 (PL)	0.10PL (MS)	0.10 (PL)	0.10 (PL)
Acenaphthene	0.01 (PL)	0.01 (PL)	<0.10	0.13	0.11 (MS)	0.10 (PL)	0.10 (PL)
Fluorene	0.01 (PL)	0.01 (PL)	<0.10	0.13	0.24 (MS)	0.10 (PL)	0.10 (PL)
Phenanthrene	0.80	0.56	0.10 (PL)	1.30	1.40 (MS)	0.28	0.42
Anthracene	0.15	0.12	0.10 (PL)	0.22	0.33 (MS)	0.10 (PL)	0.10 (PL)
Fluoranthene	0.90	0.90	0.10 (PL)	1.20	1.40 (MS)	0.21	0.73
Pyrene	1.00	1.10	0.10 (PL)	1.50	2.00 (MS)	0.20	1.00
Benzo(a)anthracene	0.15	0.18	<0.10	0.20	0.19 (MS)	<0.10	0.16
Chrysene	0.22	0.30	<0.10	0.31	0.30 (MS)	<0.10	0.27
Benzo(b)fluoranthene	<0.10	0.16	<0.10	0.11	0.10 PL (MS)	<0.10	<0.10
Benzo(k)fluoranthene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(a)pyrene	<0.10	<0.10	<0.10	<0.10	0.10 (MS)	<0.10	<0.10
Dibenzo(a,h)anthracene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(g,h,i)perylene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Indeno(1,2,3-cd)pyrene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Totals	3.62	3.62	0.40	4.00	7.08	1.19	3.08

All data in mg/kg.

SU - Suspicious result. MS - Confirmed result by Mass Spectrometry.

PL - Present but less than the usual minimum reportable value.

TABLE 4-4
NYSDEC Soil Sample Data Summary
17,18 November 1987

Tukedo WD Site NYSDEC I.D. No. 336035

Parameter	20 (Debris)	21 (Soil Pit)	22 (Sludge)
VOLATILE ORGANICS			
Methylene Chloride	210 B	21 AB	740 B
Acetone	ND	ND	2,400
Carbon Disulfide	ND	ND	330 A
Tetrachloroethene	ND	36	680
Toluene	ND	10 A	760
Ethylbenzene	ND	ND	630
Xylene (total)	ND	ND	4,700
Tentatively Identified Compounds			
Total	ND	ND	60,100
SEMIVOLATILES			
Naphthalene	1,800 A	ND	69,000
2-Methylnaphthalene	4,000 A	ND	25,000
Acenaphthene	13,000 A	ND	34,000
Dibenzofuran	7,000 A	ND	16,000
Acenaphthylene	ND	ND	1,200 A
Diethylphthalate	15,000 AB	2,400 AB	3,700 AB
Phenol	ND	ND	7,000
4-Methylphenol	ND	ND	4,200 A
Fluorene	12,000 A	ND	22,000
Phenanthrene	67,000	4,500 A	46,000
Anthracene	20,000	1,400 A	11,000
Di-n-butylphthalate	ND	ND	9,900
Fluoranthene	92,000	9,600	27,000
Pyrene	74,000	8,000	26,000
Butylbenzylphthalate	13,000 A	52,000	4,600
Benzo(a)anthracene	45,000	4,900	12,000
Chrysene	45,000	5,000	12,000
Bis(2-ethylhexyl)phthalate	ND	ND	14,000
Benzo(b or k)fluoranthene	70,000	9,300	22,000
Benzo(a)pyrene	40,000	5,200	12,000
Indeno(1,2,3-cd)pyrene	24,000	2,900	23,000
Benzo(g,h,i)perylene	21,000	ND	ND
Tentatively Identified Compounds			
Total	306,600	124.200	200,800
Pesticide/PCBs	ND	ND	ND

All data in ug/kg.
A - Found in sample below method detection level; estimated concentration.
B - Found in blank. ND - Not detected.

zinc - 111 ug/l, and other miscellaneous parameters (pH - 6.54, sulfate - 53 mg/l, and chloride - 39 mg/l). These results indicate that only some metals may be adversely affecting the quality of this well's waters. Some values may be the result of naturally occurring compounds. When compared to New York State groundwater standards, all metals data are below the upper threshold limit and are considered acceptable.

4.5.2 NYSDOH

NYSDOH collected air samples on 23 March and 16 June 1988 (Ref. 5, Appendix C). The earlier samples were analyzed only for hydrogen sulfide (H_2S) through a Draeger H_2S detector tube with a 20-30 ug/l detection level. One upwind, three downwind, and one vent sample were collected and analyzed. Only the vent sample had any detectable concentrations of H_2S ~~(4400 ug/l or 4,400,000~~ 4.37 ppm).

The three samples from 16 June 1988 were analyzed for volatile organics and H_2S. No sample contained any detectable H_2S. The volatiles results are as follows:

SAMPLE	LOCATION	PARAMETER	CONCENTRATION
1	Upwind	Carbon tetrachloride	1 ug/m^3
		Tetrachloroethane	1 ug/m^3[a]
2	Downwind	1,1,1-Trichloroethane	5 ug/m^3[a]
		Carbon tetrachloride	1.5 ug/m^3
		Tetrachloroethane	1.0 ug/m^3[a]
4	Downwind	None detected	

[a]Present at less than the usual minimum reportable value.

4.5.3 EA Science and Technology (EA)

This consultant was retained by the site owner(s) to review and offer opinions on NYSDEC-collected data. A 2 November 1987 EA letter report (Ref. 6, Appendix C) interpreted the analytical data from the cover material sample (Table 4-3). (EA did not collect any samples.) EA concluded that PCB totals for each sample (maximum 1.2 ppm) are below the 50 ppm level that New York State considers hazardous to human health. While the cover material is not considered a PCB spill, TSCA's PCB Spill Policy (under EPA) may be used as guidance on how clean the Mahwah cover material may be. EPA policy says that PCB-contaminated soil must be excavated and backfilled with clean soil. "Clean" is defined as soil containing less than 1 mg/kg PCBs (Ref. 7, Appendix C). Only one sample analysis was slightly over that value: 1.2 mg/kg (1.2 ppm).

The 2 November 1987 letter report also discusses polynuclear aromatic hydrocarbons. EA compares other observed values and EPA's Multimedia Environmental Goals (MEG) for human health with 13 compounds (Ref. 6, Appendix C) detected in the cover material samples. The conclusion was that the cover material sample values are significantly below each MEG value [except for a conflicting analysis for benzo(a)pyrene].

A second letter report (31 December 1987) interprets total petroleum hydrocarbons (PHC) detected in the samples and reported as weathered coal tar (Ref. 6, Appendix C). The concentrations range from ND in a water sample to <1 to 190 ppm in the soil. EA reports New York State does not have MEG or threshold values for weathered coal tar.

EA used an organic vapor analyzer (OVA) at the landfill to determine organic vapor concentrations. A report on these readings does not exist, nor are the data from the field visit known. Testimony on 9 October 1987 notes that one reading reached 1000 ppm (Ref. 8, Appendix C). It is not known whether a methane filter was used to separate the volatile organics from methane that might have been present. A table comparing NYSDEC-collected soil vapor samples (17-18 November 1987) with Occupational Safety and Health Administration (OSHA) and American Conference of Governmental Industrial Hygienists (ACGIH) illustrates that each compound detected is at least an order of magnitude less than either exposure value (Ref. 6, Appendix C).

4.5.4 Water Company Data

The New Jersey District Water Supply Commission collected at least five paired surface water samples from the Ramapo River (Ref. 9, Appendix C) approximately 300 ft upstream or downstream of each end of the fill. The downstream sample was collected south of the railroad culvert, but its exact location cannot be determined. The data (Table 4-5) show no significant variation in physical parameters, but the metals data indicated a slight downstream concentration increase, except for June 1988. The June data indicate a reverse, slightly higher upstream concentration.

4.5.5 Georgia Institute of Technology Foundation Study

Conestoga-Rovers & Associates (CRA) completed a brief investigation on Georgia Institute of Technology Foundation's property for the Foundation on 14 September 1988. Six trenches and three test pits were dug in the fill.

Air monitoring was performed with an HNU to detect volatile organics. An MSA Model 361 meter was used to detect hydrogen sulfide, oxygen, and combustible gases. The maximum HNU reading was 4.6 ppm. No hydrogen sulfide was detected, and only insignificant deviations were observed for oxygen and combustible gases.

TABLE 4-5

NORTH JERSEY DISTRICT WATER SUPPLY COMMISSION DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

PARAMETER	22 JAN 1988 UPSTREAM	22 JAN 1988 DOWNSTREAM	31 MAY 1988 UPSTREAM	31 MAY 1988 DOWNSTREAM	28 JUN 1988 UPSTREAM	28 JUN 1988 DOWNSTREAM	25 JUL 1988 LANDFILL	25 AUG 1988 UPSTREAM	25 AUG 1988 DOWNSTREAM	27 SEP 1988 UPSTREAM	27 SEP 1988 DOWNSTREAM	20 OCT 1988 UPSTREAM	20 OCT 1988 DOWNSTREAM
Color (scale)	25	25	32	32	30	30	48	30	30	36	38	35	-
Turbidity (NTU)	4.0	4.4	2.1	2.4	3.2	4.1	7.4	4.1	4.1	1.56	1.93	1.42	-
Odor	0	0	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	-
pH	7.4	7.4	7.5	7.8	7.6	8.3	7.5	8.4	8.4	8.2	8.0	7.6	-
Conductivity (umhos/cm)	407	441	286	277	836	501	419	548	575	526	570	563	-
DO (mg/l)	15.0	15.6	-	-	7.0	7.2	5.4	9.9	8.9	7.6	7.6	-	-
Metals (ppm)													
Aluminum	0.1246	0.1506	0.430	0.478	0.369	0.313	0.435	0.241	0.189	0.129	0.114	0.167	0.179
Copper	0.009	0.006	0.0091	0.0075	0.0076	0.0081	-	0.0043	0.0063	0.0022	0.0113	0.00515	0.00545
Sodium	54.5	73.2	24.7	25.8	99.8	48.8	41.4	65.0	67.0	57.2	65.0	48.5	51.9
Lead	0.0214	0.0349	0.016	0.0267	0.0214	0.0156	0.0069	0.0149	0.0195	0.0117	0.0126	0.0130	0.0186
Zinc	0.0391	0.0327	0.073	0.093	0.0822	0.0525	0.0067	0.0157	0.0117	0.0078	0.0098	-	-

Samples collected approximately 300 ft north or south of either fill limit.

Analytical results of the waste/fill are as follows:

- Xylene was the highest volatile organic compound present, at 2 ppm.
- The maximum base/neutral extracted organic (semivolatile) compound was phenanthrene, at 76 ppm. Dibenzofuran was present below detection.
- Acid extractable organics (semivolatiles) maximums were 4 ppm (4-nitrophenol).
- Pesticides were not detected. The PCB maximum was 3 ppm.
- EP toxicity metals are all below the concentration limits established by 40 CFR 261.24 for definition of an EP toxicity hazardous waste.

CRA concludes that there was no analytical evidence of chemical, industrial, or hazardous wastes disposed of on Georgia Tech Foundation's property. Materials that were disposed of include roofing material, paving material, electric cable, and other construction and demolition material.

4.5.6 Other Data

Abex Corporation operated the Mahwah, New Jersey, site where some of the cover material originated. The Abex site contains foundry waste similar to that at other Abex foundries, whose waste characterization shows the fill to contain some metals, sulfide, and trace amounts of PAH (Ref. 10, Appendix C).

Ward Stone, an associate wildlife pathologist for the State of New York, collected two soil samples on 10 August 1988 (Ref. 11, Appendix C). Table 4-6 summarizes the reported data. One pesticide compound (alpha-BHC) was present just above the detection limit. The metals data show high concentration of aluminum, barium, calcium, iron, magnesium, potassium, and zinc.

TABLE 4-6

10 AUGUST 1988 WARD STONE SOIL SAMPLE DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

PARAMETER	TUXEDO CULVERT[a] 88-37-28	TUXEDO FILL[b] 88-37-29
PESTICIDES/PCBs (dry weight)		
Alpha-BHC	110	ND
METALS		
Aluminum	13,000,000	12,800,000
Arsenic	ND	ND
Barium	282,000	170,000
Beryllium	1,200	1,300
Cadmium	5,200	4,800
Calcium	6,990,000	19,700,000
Chromium	29,800	38,400
Cobalt	8,800	11,500
Copper	90,200	88,700
Iron	19,900,000	19,300,000
Lead	254,000	87,400
Magnesium	5,670,000	8,880,000
Manganese	293,000	1,720,000
Nickel	25,300	97,400
Potassium	949,000	519,000
Sodium	ND	ND
Vanadium	43,400	29,700
Zinc	3,990,000	83,600
OTHER PARAMETERS		
% Solids (pesticides/PCBs)	70.4	96.8
% Solids (metals)	74.8	96.4

All data in micrograms per kilogram (ug/kg).
ND - Not detected.

[a]Sample collected from soil at the base of the corrugated culvert where it exits from the fill on the east side near the Conrail tracks.
[b]Mahwah cover material.

4.6 PHASE II RESULTS

The various parts of the Phase II investigation were conducted in the summer and fall of 1988. Samples collected for chemical analysis were sent to a NYSDEC-certified laboratory, RECRA Environmental Inc., for analysis using Contract Laboratory Program (CLP), November 1987. NYSDEC instituted CLP to standardize the quality of the analytical data emanating from various investigatory programs supervised by NYSDEC but completed by private consulting laboratories. Data reviewed by NYSDEC under CLP protocols must remain within certain quality control limits. If the data fall outside those limits, their validity may be questioned.

The normal procedure under this Phase II investigation is for the contracted laboratory (RECRA) to analyze the samples and then produce a copy of the data and QA/QC package supporting the analytical procedures. The lab sends a copy of the data package to the site investigator (LMS) and to another NYSDEC-certified laboratory (NYTEST) that has been subcontracted to review the data package for compliance with CLP protocols. For the Tuxedo site NYSDEC also reviewed the data package as a check on the reviewing laboratory and an independent verification of the data. Since the review of the Tuxedo data indicated QA/QC problems, NYSDEC requested that the wells and surface water/sediments be recollected and analyzed. The samples collected on 7 and 8 November 1988 were sent to a NYSDEC-approved laboratory for rapid analysis and data reporting. NYSDEC reviewed the QA/QC package for this data set and the data were determined to be acceptable.

The summer data will be known as the August 1988 data set (Appendix D), the early November data as the November 1988 data set (Appendix E). Appendix F presents the QA/QC review of the data and usability. Test pit samples were collected on 12 and 13 December 1988. Some samples were duplicated and sent to two different NYSDEC-approved laboratories for chemical analysis and data reporting. NYSDEC reviewed these QA/QC packages as well.

4.6.1 Site Inspection

LMS conducted an inspection on 16 June 1988 to determine site access problems, evaluate the site, and collect air monitoring data to prepare a site-specific health and safety plan. The weather was partly cloudy; winds were from the southeast at 0-10 mph. Temperature was 80°F, with low humidity. OVA and HNU air monitoring instruments were used to record organic vapor concentration. The results are:

LOCATION	CONCENTRATION (ppm)
Background (NW corner)	OVA - 1 HNU - 1
North end	OVA - 7-10 HNU - 0
Former standing water area (and at northern toe of 3rd lift)	OVA - 7-8 HNU - 0
Top of third left	OVA - 7-10 HNU - 0
Preset ponding area	OVA - 2-10 HNU - 0
Northwest of rock outcrop	OVA - 1-2 HNU - 0.1
West of rock outcrop	OVA - 5 HNU 0 (H_2S smell)
Southwest of rock outcrop	OVA - 1.5 HNU - 0 (H_2S smell)
Near Georgia Institute of Technology property line	OVA - 5-7 HNU - 0 (H_2S smell)

Access to the western and southeastern areas was difficult. Several trucks, a milk truck, and some plastic drums were discovered southwest of the rock outcrop. The milk truck held four steel drums and one plastic drum; six metal and five plastic drums filled with concrete were observed near the truck. The plastic drums had OVA and HNu readings of 3 and 3.5 ppm, respectively. The plastic drums were labeled "liquid reorderant," which apparently was a chemical used to cover or mask the hydrogen sulfide odor. The south and southwest sides of the fill area were exposed, with debris in evidence. The top of the fill in the southern lip also had very thin cover, with some exposed debris. Near the southern one-third of the western side was a deep, steep gully that made access difficult from that side.

4.6.2 Phase II Geophysical Data

Geophysical testing at the Tuxedo landfill was accomplished using seismic and resistivity "sounding." The seismic refraction study provides data on sonic wave velocities in media through which these energies are directed. Resistivity sounding tests generate data of the mean ground resistance to the flow of an electric current.

Although standard methods that identify formational boundary depths and provide sonic and relative resistance data of the formations tested were used, these techniques have limitations that caused the subcontractor minor problems. In retrospect, it is the view of LMS geoscientists that the geophysical effort was more successful than the subcontractor's (Delta Geophysical [DG]) analytical reports indicated (Appendix G).

Seismic prospecting at the edge or on a landfill is difficult. Using the geophysical data, LMS has identified the bedrock structure fringing the lower, eastern portions of the site adjacent to the railroad. The profiles shown as seismic spreads S-1 to S-5 are credible. DG places little faith in data generated by the S-3 traces, but its front (F) and rear (R) spreads indicate a reasonable slope to the underlying bedrock and show it to be 50 to 60 ft deep. These data may be skewed to the deeper values, but they successfully identify the zone of deepest overburden. This has real value. LMS considers the seismic spread data for S-1 through S-5 to be generally valid for depths to bedrock. A craggy, glacially eroded bedrock covered in part by an overburden of coarse gravel or till appears to occur here. This glacial deposit fills in, and in part covers, deeply sculptured portions of the bedrock surface.

Resistivity testing had been performed using standard 4-electrode techniques. The results of these tests are also looked upon as valid estimates of depth of fill. A review of these results shows each as a series of points approximated by a curve. Calculations for each electrode spread provide three-layer interpretation of the results, generating the curve. Each is a fingerprint of layers whose base is bedrock; over this bedrock is glacial gravel or till, and overlying everything C&D fill. Cusps and "phantom" layering are suggested in those cases where the data do not fit the computer model, as represented by a solid line. These cusps and phantoms may be reflections of lenses of material within the fill. If bedrock is found to be deep (such as in test R-4), LMS considers these to consist, in part, of layers of glacial till or gravel. If the array of points is irregular, LMS views these to represent layers of distinctly different material. If the curve is wide (as at R-8), the fill is highly conductive, i.e., wet. The profile for R-7 (at which point DG fixes depth to rock at 24 ft) is unusual for its shallow resistivity and irregular shape. The bedrock may be terraced beneath the fill at this point and, to a lesser degree, beneath R-4.

Wide resistivity curves ordinarily indicate an insensitivity to the technique - frequently a result of groundwater saturated conditions. This appears to be the case at R-8.

4.6.3 Phase II Soil Gas Data

Soil gas from the Tuxedo landfill was sampled on 30 June and 6 and 7 July 1988 by Analytics Environmental Laboratory, Inc., using a mobile laboratory with a field gas chromatograph unit. Installation of 43 soil gas probes (Figure 4-7) was attempted, but only 36 were successfully installed and sampled. Soil sampling points SSP-6, 7, 38, 39, 41, and 42 were not sampled. The analytical data results (Appendix H) were organized into five figures and two tables.

Table 4-7 lists the analytical data results obtained from the sampling of the site in early July 1988. The concentration ranges are given both in parts per million and milligrams per cubic meter. Figure 4-8 shows the total benzene volatile fraction concentration at each soil sampling point. From the volatile organic compound (VOC) analysis, five peaks were observed from the benzene volatile fraction: benzene, toluene, ethylbenzene, m-xylene, and o&p-xylenes. The benzene volatile fraction in the northern portion of the site from sampling points SSP-1 through SSP-9 (of those sampled) was mostly not detected. The concentrations of those detected (SSP-2 and 5) did not exceed 30 ppm (120 mg/m^3). The southwest portion of the site from SSP-35 through SSP-43, with the exception of SSP-37, was mostly refused or not detected. Sampling point SSP-40 was observed to have a concentration of 13 ppm (52 mg/m^3). The middle portion of the site from sampling points SSP-10 through SSP-34 and SSP-37 had the highest overall concentrations on the site and averaged a concentration of about 158 ppm (650 mg/m^3) with a maximum of 410 ppm (1648 mg/m^3) occurring at SSP-23. A little more than half of the sampling points have concentrations

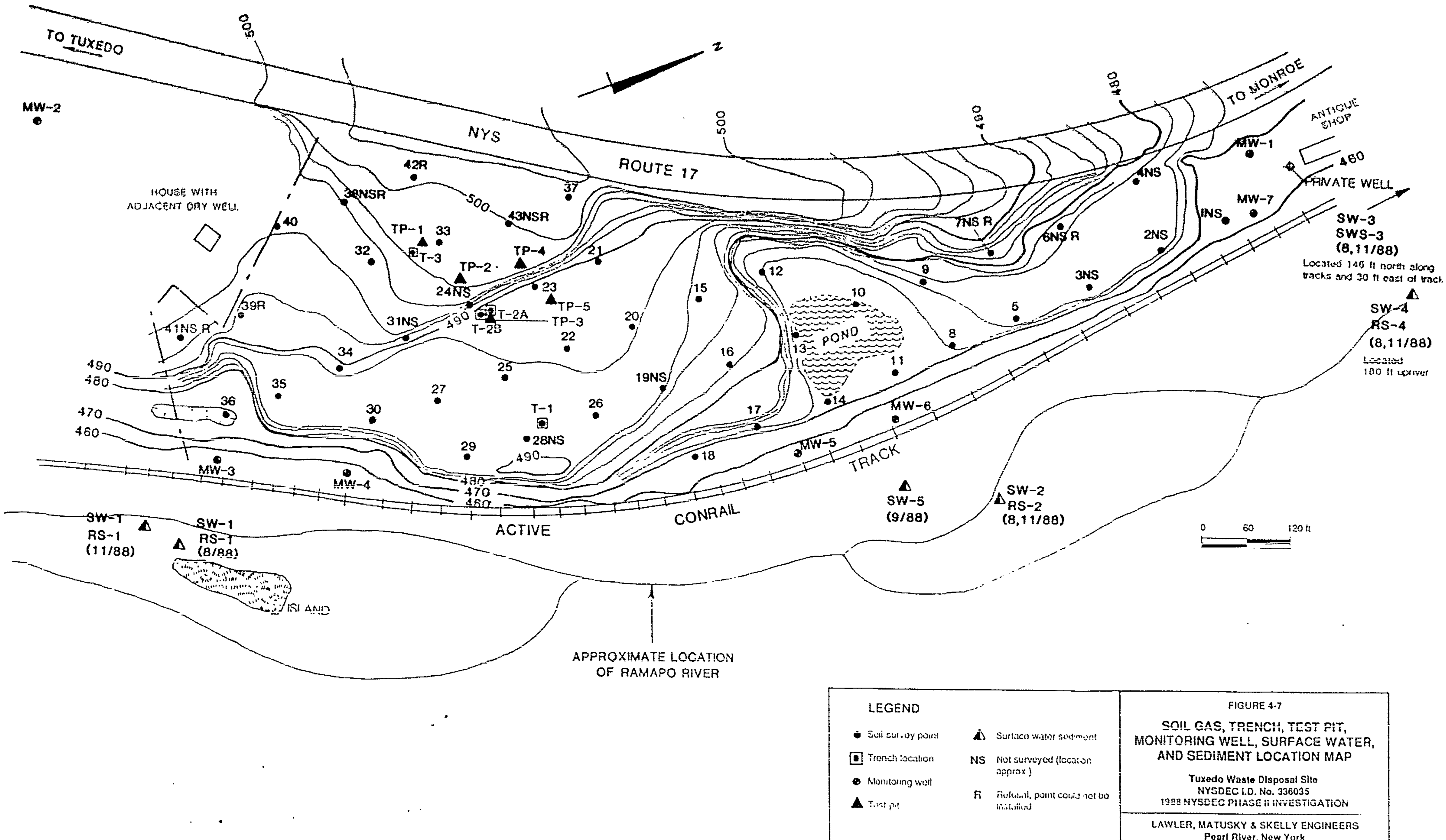

FIGURE 4-7

SOIL GAS, TRENCH, TEST PIT, MONITORING WELL, SURFACE WATER, AND SEDIMENT LOCATION MAP

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

TABLE 4-7 (page 1 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-1 (mg/m3)	SSP-1 (ppm)	SSP-2 (mg/m3)	SSP-2 (ppm)	SSP-3 (mg/m3)	SSP-3 (ppm)	SSP-4 (mg/m3)	SSP-4 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal:	ND	ND	ND	ND	ND	ND	ND	ND
Benzene Volatile Fraction:								
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	7-26	1.7-6.8	ND	ND	ND	ND
Ethylbenzene	ND	ND	23-90	5.2-20	ND	ND	ND	ND
m-Xylene	ND	ND	ND	ND	ND	ND	ND	ND
o & p-Xylenes	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal:	ND	ND	30-116	6.9-27	ND	ND	ND	ND
TOTAL:	ND	ND	30-116	6.9-27	ND	ND	ND	ND
Non-Priority Pollutants:								
Unknowns	ND	ND	11-44	~2-10	ND	ND	ND	ND
Hydrogen Sulfide:	0	0	456	322	248	175	4.3	3

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 33, 39, 41, and 42.

TABLE 4-7 (page 2 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-5 (mg/m3)	SSP-5 (ppm)	SSP-8 (mg/m3)	SSP-8 (ppm)	SSP-9 (mg/m3)	SSP-9 (ppm)	SSP-10 (mg/m3)	SSP-10 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	ND	ND	ND	ND	ND	ND	120-480	30-120
Trichloroethylene	ND	ND	ND	ND	ND	ND	11-42	1.9-7.7
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	2-8	0.3-1.2
Subtotal:	ND	ND	ND	ND	ND	ND	133-530	32-129
Benzene Volatile Fraction:								
Benzene	ND	ND	ND	ND	ND	ND	4-16	1.2-4.9
Toluene	17-68	4.4-18	ND	ND	ND	ND	44-176	11-46
Ethylbenzene	ND	ND	ND	ND	ND	ND	32-126	7.2-29
m-Xylene	ND	ND	ND	ND	ND	ND	35-140	7.9-32
o & p-Xylenes	ND	ND	ND	ND	ND	ND	20-80	4.5-18
Subtotal:	17-68	4.4-18	ND	ND	ND	ND	135-538	32-130
TOTAL:	17-68	4.4-18	ND	ND	ND	ND	268-1068	64-259
Non-Priority Pollutants:								
Unknowns	30-120	~5-30	ND	ND	25-100	~5-25	188-750	~40-170
Hydrogen Sulfide:	1038	732	797	562	13-14	9-10	1041	734

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 3 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-11 (mg/m3)	SSP-11 (ppm)	SSP-12 (mg/m3)	SSP-12 (ppm)	SSP-13 (mg/m3)	SSP-13 (ppm)	SSP-14 (mg/m3)	SSP-14 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	18-72	4.5-18	2-8	0.5-2	410-1640	103-410	31-124	7.8-31
Trichloroethylene	3-10	0.6-1.8	2-8	0.4-1.5	63-250	12-46	<10	<1.8
Tetrachloroethylene	ND	ND	ND	ND	<3	<0.4	ND	ND
Subtotal:	21-82	5.1-20	4-16	0.9-3.5	473-1893	115-456	31-134	7.8-33
Benzene Volatile Fraction:								
Benzene	5.5-22	1.7-6.8	2-8	0.6-2.5	7.5-30	2.3-9.2	ND	ND
Toluene	7.5-30	1.9-7.8	3-10	0.8-2.6	85-340	22-88	14-54	3.6-14
Ethylbenzene	15-60	3.4-14	<3	<0.7	46-184	10-42	ND	ND
m-Xylene	28-110	6.3-25	5.5-22	1.2-5	55-220	12-50	18-70	4.1-16
o & p-Xylenes	14-56	3.2-13	3-12	0.7-2.7	29-114	6.5-26	ND	ND
Subtotal:	70-278	17-67	14-55	3.3-14	223-888	53-215	32-124	7.7-30
TOTAL:	91-360	22-87	18-71	4.2-18	696-2781	168-671	63-258	16-63
Non-Priority Pollutants:								
Unknowns	205-820	~45-185	25-100	~5-25	455-1820	~100-400	65-260	~10-60
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 4 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-15 (mg/m3)	SSP-15 (ppm)	SSP-16 (mg/m3)	SSP-16 (ppm)	SSP-17 (mg/m3)	SSP-17 (ppm)	SSP-18 (mg/m3)	SSP-18 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	150-600	38-150	4-16	1-4	3.5-14	0.9-3.5	ND	ND
Trichloroethylene	16-62	2.9-11	7.5-30	1.4-5.5	2.5-10	0.5-1.8	11-42	1.9-7.7
Tetrachloroethylene	3.5-14	0.5-2	2.4-10	0.4-1.5	ND	ND	ND	ND
Subtotal:	170-676	41-163	14-56	2.8-11	6-24	1.4-5.3	11-42	1.9-7.7
Benzene Volatile Fraction:								
Benzene	7.5-30	2.3-9.2	4-16	1.2-4.9	4-16	1.2-4.9	6-24	1.8-7.4
Toluene	90-360	23-94	78-310	20-81	17-68	4.4-18	3-10	0.8-3.1
Ethylbenzene	47-186	11-42	23-90	5.2-20	12-46	2.6-10	11-42	2.4-9.5
m-Xylene	65-260	15-59	30-120	6.8-27	20-78	4.5-18	95-380	21-86
o & p-Xylenes	47-186	11-42	19-76	4.3-17	6.5-26	1.5-5.9	21-82	4.7-19
Subtotals	257-1022	62-246	154-612	38-150	60-254	14.2-57	136-538	31-125
TOTAL:	427-1698	104-409	168-668	41-161	66-278	16-62	147-580	33-133
Non-Priority Pollutants:								
Unknowns	357-1500	~80-335	135-540	~30-120	135-540	~30-120	760-3040	~168-675
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 5 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-19 (mg/m3)	SSP-19 (ppm)	SSP-20 (mg/m3)	SSP-20 (ppm)	SSP-21 (mg/m3)	SSP-21 (ppm)	SSP-22 (mg/m3)	SSP-22 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	58-230	15-58	115-460	29-115	135-540	34-135	80-320	20-80
Trichloroethylene	7-28	1.3-5.1	50-200	9.2-37	60-240	11-44	45-180	8.3-33
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal:	65-258	16-63	165-660	38-152	195-780	45-179	125-500	28-113
Benzene Volatile Fraction:								
Benzene	5-20	1.5-6.2	4-16	1.2-4.9	5.5-22	1.7-6.8	5-20	1.5-6.2
Toluene	92-366	24-95	115-460	30-120	100-400	26-104	170-680	44-177
Ethylbenzene	39-154	8.8-35	55-220	12-50	80-320	18-72	50-200	11-45
m-Xylene	51-204	12-46	65-260	15-59	95-380	21-86	70-280	16-63
o & p-Xylenes	45-178	10-40	55-220	12-50	80-320	18-72	65-260	15-59
Subtotal:	232-922	56-222	294-1176	70-284	361-1442	85-341	360-1440	88-350
TOTAL:	297-1180	72-285	459-1836	108-436	556-2222	130-520	485-1940	116-463
Non-Priority Pollutants:								
Unknowns	300-1200	~67-270	5150-20600	~1140-4570	8050-32200	~1785-7140	5250-21000	~1165-4655
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 6 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-23 (mg/m3)	SSP-23 (ppm)	SSP-24 (mg/m3)	SSP-24 (ppm)	SSP-25 (mg/m3)	SSP-25 (ppm)	SSP-26 (mg/m3)	SSP-26 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	140-560	35-140	40-160	10-40	75-300	19-75	13-50	3.1-13
Trichloroethylene	185-740	34-136	110-440	20-81	11-44	2-8.1	18-72	3.3-13
Tetrachloroethylene	ND	ND	10-40	1.5-5.8	ND	ND	2-8	0.3-1.2
Subtotal:	325-1300	69-276	160-640	32-127	86-344	21-83	33-130	6.7-27
Benzene Volatile Fraction:								
Benzene	5-20	1.5-6.2	3.5-14	1.1-4.3	5.5-22	1.7-6.8	3-12	0.9-3.7
Toluene	265-1060	95-275	49-194	13-50	90-360	23-94	85-340	22-88
Ethylbenzene	37-148	8.4-34	20-80	4.5-18	40-160	9-36	33-130	7.5-29
m-Xylene	65-260	15-59	43-170	9.7-38	60-240	14-54	37-148	8.3-33
o & p-Xylenes	40-160	9-36	23-92	5.2-21	55-220	12-50	31-124	7-28
Subtotal:	412-1648	129-410	139-550	33-131	251-1002	60-241	189-754	46-182
TOTAL:	737-2948	198-686	299-1190	65-258	337-1346	81-324	222-884	52-209
Non-Priority Pollutants:								
Unknowns	4850-19400	~1075-4300	3425-13700	~759-3037	4650-18600	~1031-4123	1013-16050	~225-3558
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 7 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-27 (mg/m3)	SSP-27 (ppm)	SSP-28 (mg/m3)	SSP-28 (ppm)	SSP-29 (mg/m3)	SSP-29 (ppm)	SSP-30 (mg/m3)	SSP-30 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	3-12	0.8-3	5.5-22	1.4-5.5	50-200	13-50	ND	ND
Trichloroethylene	4.5-18	0.8-3.3	6-24	1.1-4.4	21-84	3.9-15	ND	ND
Tetrachloroethylene	2-8	0.3-1.2	ND	ND	ND	ND	ND	ND
Subtotal:	9.5-38	1.9-7.5	12-46	3-10	71-284	17-65	ND	ND
Benzene Volatile Fraction:								
Benzene	3-12	0.9-3.7	ND	ND	ND	ND	ND	ND
Toluene	250-1000	65-260	4.5-18	1.2-4.7	25-100	6.5-26	3.5-14	0.9-3.6
Ethylbenzene	6-24	1.4-5.4	15-60	3.4-14	8-32	1.8-7.2	ND	ND
m-Xylene	16-64	3.6-14	15-60	3.4-14	11-44	2.5-9.9	ND	ND
o & p-Xylenes	9.5-38	2.1-8.6	10-40	2.3-9	6-24	1.4-5.4	ND	ND
Subtotal:	285-1138	73-292	45-178	10-42	50-200	12-49	3.5-14	0.9-3.6
TOTAL:	294-1176	75-299	56-224	13-52	121-484	29-114	3.5-14	0.9-3.6
Non-Priority Pollutants:								
Unknowns	1125-4500	~249-998	1035-4150	~230-920	775-3100	~170-690	ND	ND
Hydrogen Sulfide:	---	---	---	---	310	219	958	676

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42

TABLE 4-7 (page 8 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo I™ Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-31 (mg/m3)	SSP-31 (ppm)	SSP-32 (mg/m3)	SSP-32 (ppm)	SSP-33 (mg/m3)	SSP-33 (ppm)	SSP-34 (mg/m3)	SSP-34 (ppm)
Ethylene Volatile Fraction:								
1,2-Dichloroethylene (cis or trans)	70-280	18-70	95-380	24-95	435-1740	109-435	55-220	14-55
Trichloroethylene	6-24	1.1-4.4	6-24	1.1-4.4	36-144	6.6-26	18-72	3.3-13
Tetrachloroethylene	2-8	0.3-1.2	ND	ND	25-100	3.6-15	2-8	0.3-1.2
Subtotal:	78-312	19-76	101-404	25-99	496-1984	119-476	75-300	18-69
Benzene Volatile Fraction:								
Benzene	2-8	0.6-2.5	2.5-10	0.8-3.1	3.5-14	1.1-4.3	ND	ND
Toluene	55-220	14-57	70-280	18-73	17-68	4.4-18	44-174	11-45
Ethylbenzene	24-94	5.4-21	30-120	6.8-27	16-62	3.6-14	16-64	3.6-15
m-Xylene	38-152	8.6-34	43-172	9.7-39	11-42	2.4-9.5	33-130	7.4-29
o & p-Xylenes	30-120	6.8-27	33-132	7.4-30	5-20	1.1-4.5	25-100	5.6-23
Subtotal:	149-594	35-142	179-714	43-172	52-206	13-50	118-468	28-112
TOTAL:	227-906	55-217	280-1118	68-272	548-2190	132-526	193-768	46-181
Non-Priority Pollutants:								
Unknowns	4100-16400	~909-3636	4850-19400	~1075-4301	1875-7500	~416-1663	3125-12500	~693 2717
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

TABLE 4-7 (page 9 of 9)

July 1988 NYSDEC Phase II Soil Gas Survey Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	SSP-35 (mg/m3)	SSP-35 (ppm)	SSP-36 (mg/m3)	SSP-36 (ppm)	SSP-37 (mg/m3)	SSP-37 (ppm)	SSP-40 (mg/m3)	SSP-40 (ppm)
Ethylene Volatile Fraction:								
1,2 Dichloroethylene (cis or trans)	ND	ND	ND	ND	ND	ND	7.5-30	1.9-7.5
Trichloroethylene	ND	ND	ND	ND	24-96	4.4-18	17-68	3.1-12
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND
Subtotal:	ND	ND	ND	ND	24-96	4.4-18	25-98	5-20
Benzene Volatile Fraction:								
Benzene	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	15-58	3.9-15	10-40	2.6-10
Ethylbenzene	ND	ND	ND	ND	9-36	2-8.1	3-12	0.7-2.7
m-Xylene	ND	ND	ND	ND	20-80	4.5-18	ND	ND
o & p-Xylenes	ND	ND	ND	ND	14-56	3.2-13	ND	ND
Subtotal:	ND	ND	ND	ND	58-230	14-54	13-52	3.3-13
TOTAL:	ND	ND	ND	ND	82-326	18-72	38-150	8.3-33
Non-Priority Pollutants:								
Unknowns	ND	ND	ND	ND	2250-9000	499-1995	170-680	38-151
Hydrogen Sulfide:	---	---	---	---	---	---	---	---

NOTE: Soil sampling points not installed (refused) are: SSP-6, 7, 38, 39, 41, and 42.

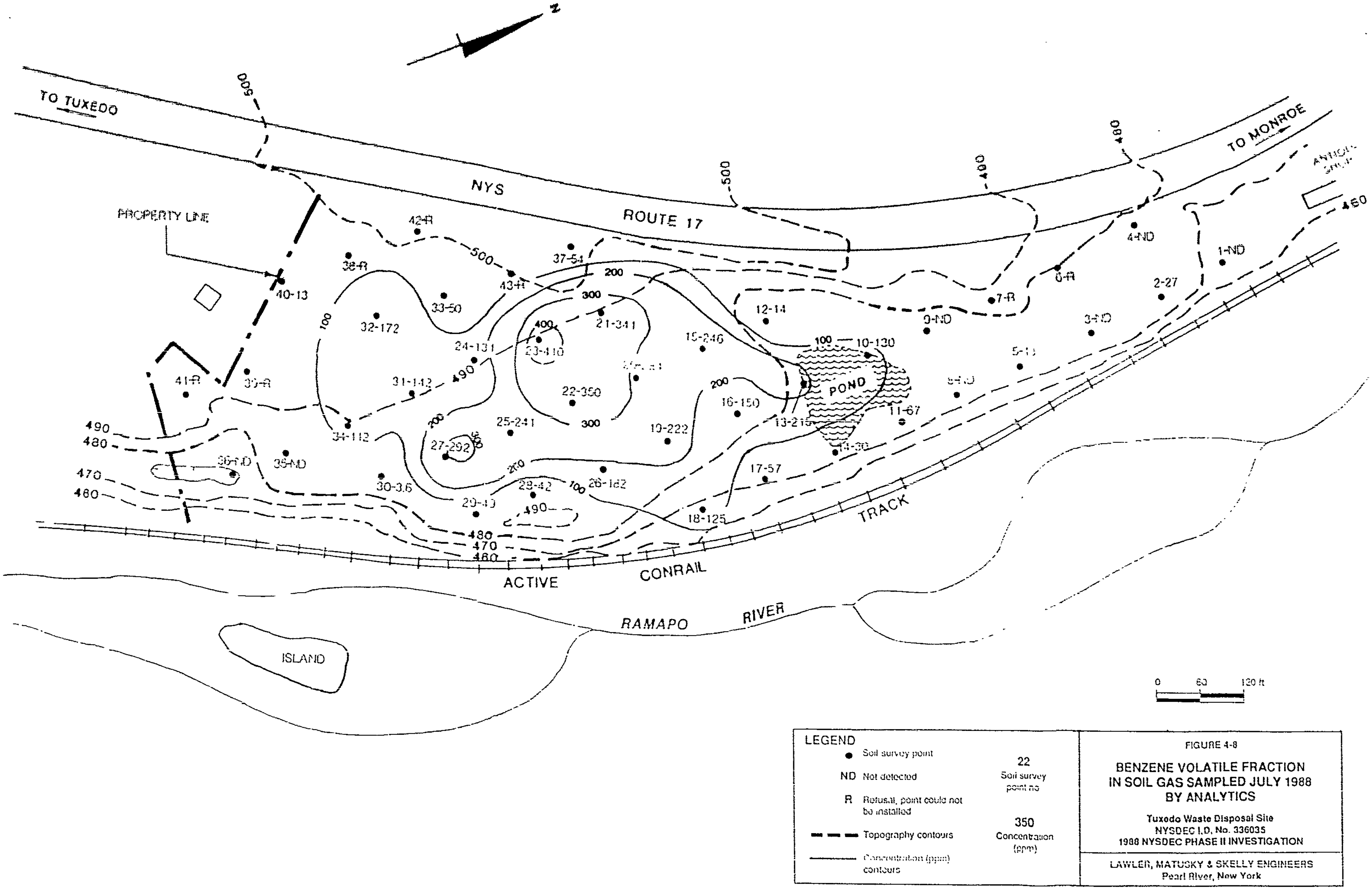

FIGURE 4-8

BENZENE VOLATILE FRACTION IN SOIL GAS SAMPLED JULY 1988 BY ANALYTICS

Tuxedo Waste Disposal Site
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above 100 ppm (500 mg/m^3) and a quarter of them (SSP-15, 20, 21, 22, 23, 25, and 27 at center of landfill) are above 230 ppm (1000 mg/m^3). As the sampling points get farther from the center, the concentrations decrease. However, the contaminants are spread throughout a large area of the site. Most of the sampling points in the middle portion of the site, in order of decreasing concentration, consist of toluene, m-xylene, o&p-xylenes, ethylbenzene, and benzene. m-Xylene concentrations are highest (toluene is second highest) in the northeastern sampling points (SSP-11, 14, 17, and 18) of the middle portion of the site.

Figure 4-9 shows the total ethylene volatile fraction concentration at each soil sampling point. From the VOC analysis, three peaks were observed from the ethylene volatile fraction: 1,2-dichloroethylene (cis or trans), trichloroethylene, and tetrachloroethylene. The ethylene volatile fraction distribution is similar to the benzene volatile fraction except that the peaks tend to be more to the north and south and the plume is more to the west. The northern portion, sampling points SSP-1 through SSP-9, of those sampled, is not detected. The southwest portion, sampling points SSP-35 through SSP-43 with the exception of SSP-37, was mostly refused or not detected. The concentration of those detected (SSP-40) did not exceed 20 ppm (98 mg/m^3). The following compounds were detected in the middle portion of the site (SSP-10 through SSP-34 and SSP-37): 1,2-dichloroethylene (cis or trans), trichloroethylene, and tetrachloroethylene. Generally, the concentration at the sampling points in order of decreasing concentration is 1,2-dichloroethylene, trichloroethylene, and tetrachloroethylene; sometimes, however (SSP-16, 18, 24, 26, and 27), it is trichloroethylene, 1,2-dichloroethylene, and tetrachloroethylene. The average concentration in the middle portion of the site is about 103 ppm (443 mg/m^3), with a maximum of 476 ppm (1984 mg/m^3) at SSP-33. Approximately a third are over 100 ppm (500 mg/m^3), and over half are greater than 60 ppm (250 mg/m^3). The highest concentrations

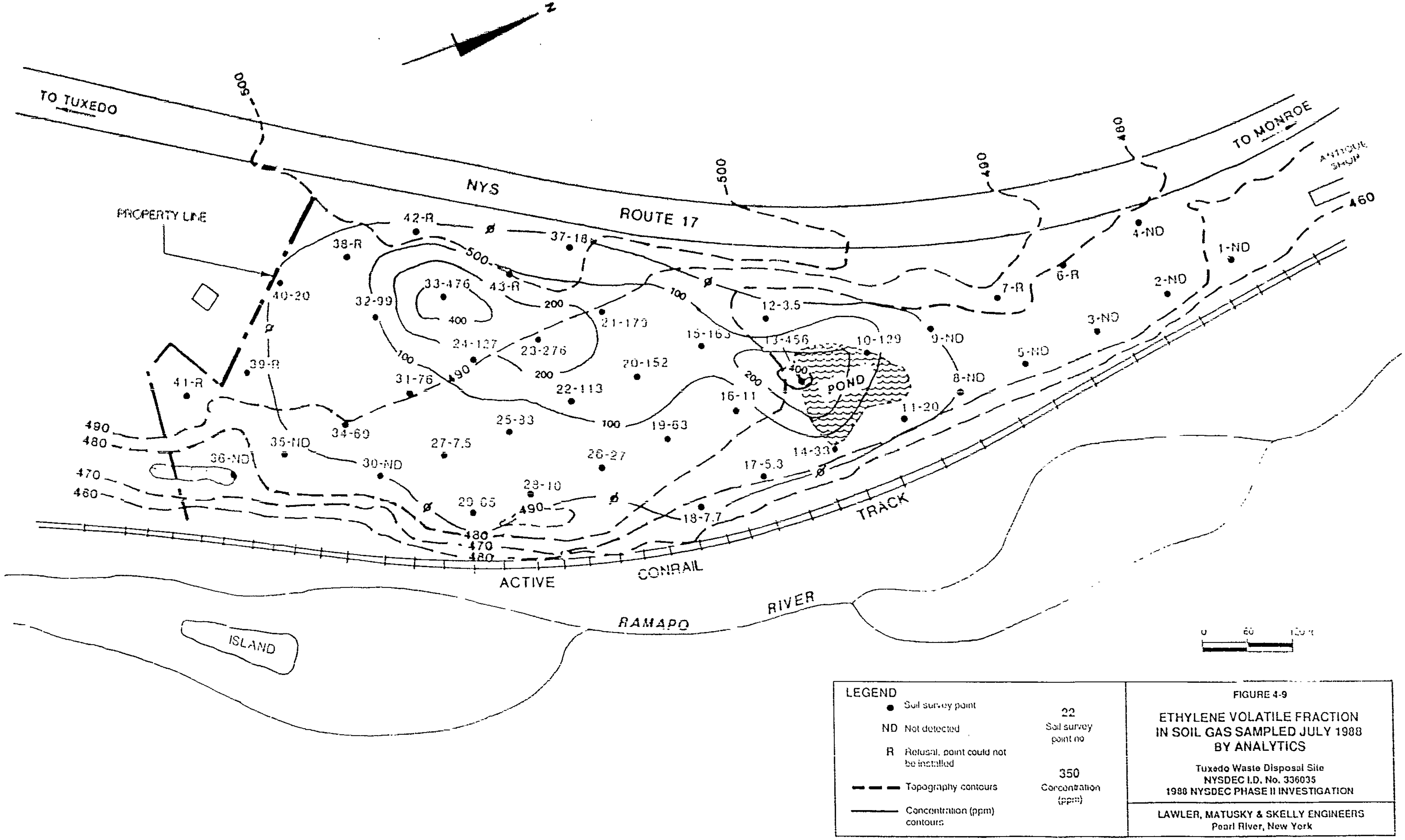

FIGURE 4-9

ETHYLENE VOLATILE FRACTION IN SOIL GAS SAMPLED JULY 1988 BY ANALYTICS

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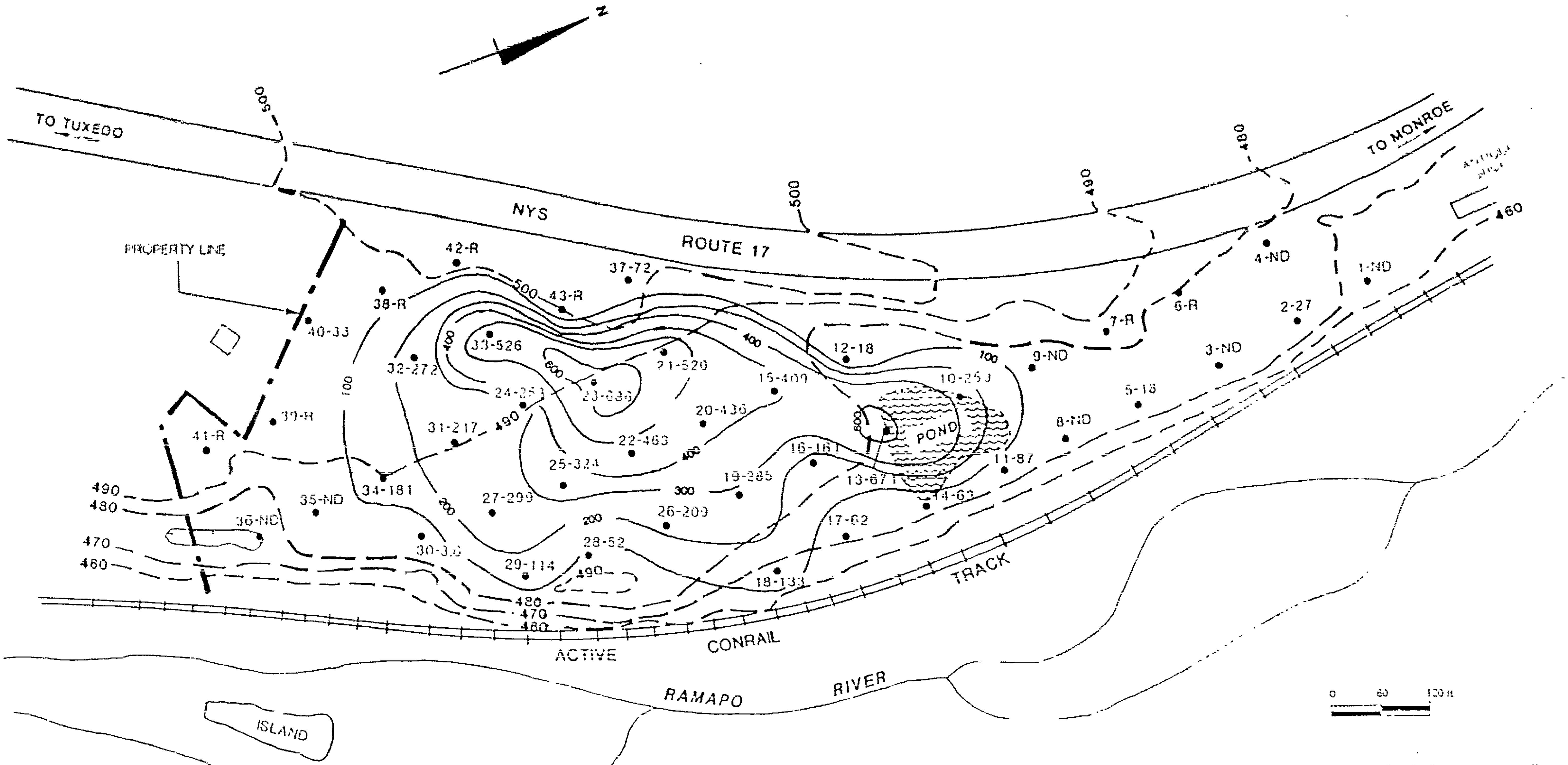
(greater than 100 ppm or 400 mg/m^3) are located on a line, running northeasterly from SSP-32 and SSP-33 through to SSP-10 and SSP-13 (approximate center of landfill).

Figure 4-10 shows the maximum total volatile organic compound (VOC) concentration (benzene and ethylene fractions combined) at each soil sampling point. Very few VOCs were detected in the northern portion of the site (SSP-1 through SSP-9). Those detected concentrations (SSP-2 and 5) did not exceed 30 ppm (120 mg/m^3). Those detected concentrations are composed entirely of the benzene volatile fraction. The sampling points in the southwest portion of the site from SSP-35 through SSP-43, with the exception of SSP-37, were not installed because of refusal or not detected. Sampling point SSP-40 was observed to have a concentration of no more than 35 ppm (150 mg/m^3), of which 60% of the total combined concentration is the ethylene volatile fraction contribution. The middle portion of the site, from sampling points SSP-10 through SSP-34 and SSP-37, had the highest overall concentrations on the site and averaged a concentration of about 260 ppm (1100 mg/m^3), with a maximum of 686 ppm (2948 mg/m^3) occurring at SSP-23. Roughly 68% of the VOC concentration at each sampling point is composed of the benzene volatile fraction.

On 23 August 1988 10 soil gas sampling points were resampled. The 10 points (SSP-20, 21, 22, 23, 24, 25, 26, 27, 32, and 33) were chosen based on their initial high concentrations of volatile organics reported in the field analysis stage. The soil gas was retained in charcoal-absorbent tubes that were forwarded to Galson Technical Services for analysis for the detected contaminants in the July results. Table 4-8 compares the analytical results between the two methods and the two labs. The results of Analytics are all much higher (one order of magnitude or more) than the results from Galson. This difference can be explained by the fact that not only were the samples collected a month apart, but the



LEGEND

- ● Soil survey point
- ND Not detected
- R Refusal, point could not be installed
- Topography contours
- Concentration (ppm) contours

22
Soil survey point no.

350
Concentration (ppm)

FIGURE 4-10

TOTAL VOLATILE ORGANIC COMPOUNDS IN SOIL GAS SAMPLED JULY 1988 BY ANALYTICS
(Benzene and Ethylene Fractions Combined)

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TABLE 4-8 (page 1 of 2)

COMPARISON BETWEEN ANALYTICS AND GALSON'S SOIL GAS SAMPLING RESULTS

Tuxedo WD Site NYSDEC I.D. No. 336035

VOLATILE ORGANIC COMPOUND	CONCENTRATION (ppm)									
	SSP-20		SSP-21		SSP-22		SSP-23		SSP-24	
	A	G	A	G	A	G	A	G	A	G
1,2-Dichloroethylene (cis or trans)	115	<0.2	134	0.6	79	1.3	139	<0.2	40	<0.2
Toluene	120	<0.05	104	1.1	178	4	277	<0.05	51	<0.05
Trichloroethylene	37	<0.2	44	0.4	33	5	135	<0.2	80	<0.2
Tetrachloroethylene	ND	<0.2	ND	<0.2	ND	<0.2	ND	<0.2	6	<0.2
Xylenes	109	<0.07	158	2	122	2	95	<0.07	59	<0.07
Ethylbenzene	50	<0.05	72	0.5	45	0.6	34	<0.05	18	<0.05
Benzene	5	<0.06	7	0.3	6	2.1	6	<0.06	4	<0.06
Methyl Ethyl Ketone (MEK)	---	---	---	0.6	---	2.4	---	---	---	---
Total Volatile Organics	---	---	---	3.6	---	11	---	---	---	---
Stoddard Solvent	---	---	---	26	---	20	---	---	---	---

NOTES: A - Analytics Environmental Laboratories.
G - Galson Technical Laboratories, Inc.
ND - Not detected.

TABLE 4-8 (page 2 of 2)

COMPARISON BETWEEN ANALYTICS AND GALSON'S SOIL GAS SAMPLING RESULTS

Tuxedo WD Site NYSDEC I.D. No. 336035

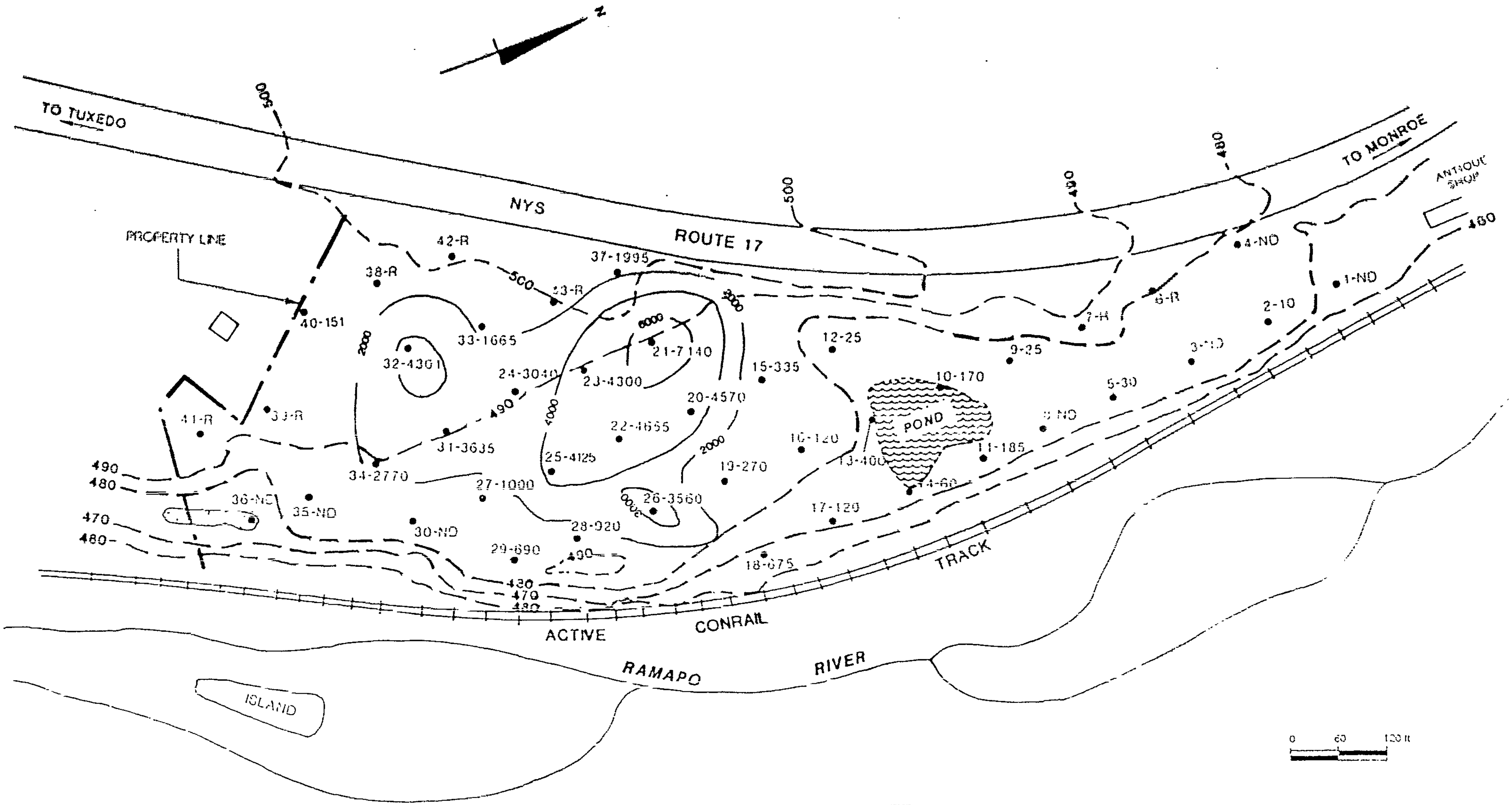
VOLATILE ORGANIC COMPOUND	CONCENTRATION (ppm)									
	SSP-25		SSP-26		SSP-27		SSP-32		SSP-33	
	A	G	A	G	A	G	A	G	A	G
1,2-Dichloroethylene (cis or trans)	74	0.8	12	<0.2	3	<0.2	94	<0.2	431	<0.2
Toluene	94	1.2	89	<0.05	261	<0.05	73	<0.05	18	<0.05
Trichloroethylene	8	0.6	13	<0.2	3	<0.2	4	<0.2	26	<0.2
Tetrachloroethylene	ND	<0.2	1	<0.2	1	<0.2	ND	<0.2	15	<0.2
Xylenes	290	0.9	62	<0.07	23	<0.07	69	<0.07	14	<0.07
Ethylbenzene	36	0.3	29	<0.05	5	<0.05	27	<0.05	14	<0.05
Benzene	7	0.5	4	<0.06	4	<0.06	3	<0.06	4	<0.06
Methyl Ethyl Ketone (MEK)	---	3.1	---	---	---	---	---	---	---	---
Total Volatile Organics	---	2.9	---	---	---	---	---	---	---	---
Stoddard Solvent	---	6.3	---	---	---	---	---	---	---	---

NOTES: A - Analytics Environmental Laboratories.
G - Galson Technical Laboratories, Inc.
ND - Not detected.

charcoal tubes were received by the laboratory on 26 August 1988, three days after being sampled. The charcoal tubes' volatile organics may have volatilized during the three days of holding and/or the soil's volatile organics might have volatilized because the second sampling occurred in late August, a hotter and dryer month than early July.

In addition to the benzene and ethylene volatile fractions, unidentified hydrocarbon peaks are reported as unknowns (nonpriority pollutants [NPP]). Figure 4-11 shows the total unidentified hydrocarbon concentrations at each soil sampling point (these values are sums of all unidentified hydrocarbons at each point and are not one compound). The high NPP concentrations correlate well with the reporting of Stoddard solvent from Galson. In fact, the NPP reported by Analytics probably is Stoddard solvent, which is made up of mineral spirits and is a common solvent used in dry cleaning operations. In the northern area, sampling points SSP-1 through SSP-9 had gas concentrations that were mostly not detectable. The concentrations of those detected did not exceed 30 ppm (120 mg/m^3). Excluding the data from the southwest portion of the site (sampling points SSP-35 and 36), the average total concentration for nonpriority pollutants is 1955 ppm (8821 mg/m^3), with a maximum of 7140 ppm (32,200 mg/m^3) occurring at SSP-21. Approximately one-third of the points have concentrations above 2220 ppm (10,000 mg/m^3). Again, the high concentrations are clustered at soil gas collection points located in the middle of the landfill.

Figure 4-12 shows the hydrogen sulfide concentrations at each soil sampling point. Analyses of hydrogen sulfide (H_2S) concentrations were conducted at 10 locations. Sampling points SSP-1 through SSP-10 plus SSP-29 and SSP-30 (with the exception of SSP-6 and SSP-7, which were not installed) were sampled in early July. Generally, the sampling points farthest away from the center of the landfill had the lowest concentrations of H_2S and those closest to the cen-



LEGEND

- ● Soil survey point
- ND Not detected
- R Refusal, point could not be installed
- Topography contours (dashed line)
- Concentration (ppm) contours (solid line)

22 — Soil survey point no

350 — Concentration (ppm)

FIGURE 4-11

TOTAL NONPRIORITY POLLUTANTS IN SOIL GAS SAMPLED JULY 1988 BY ANALYTICS (Unknown Hydrocarbons)

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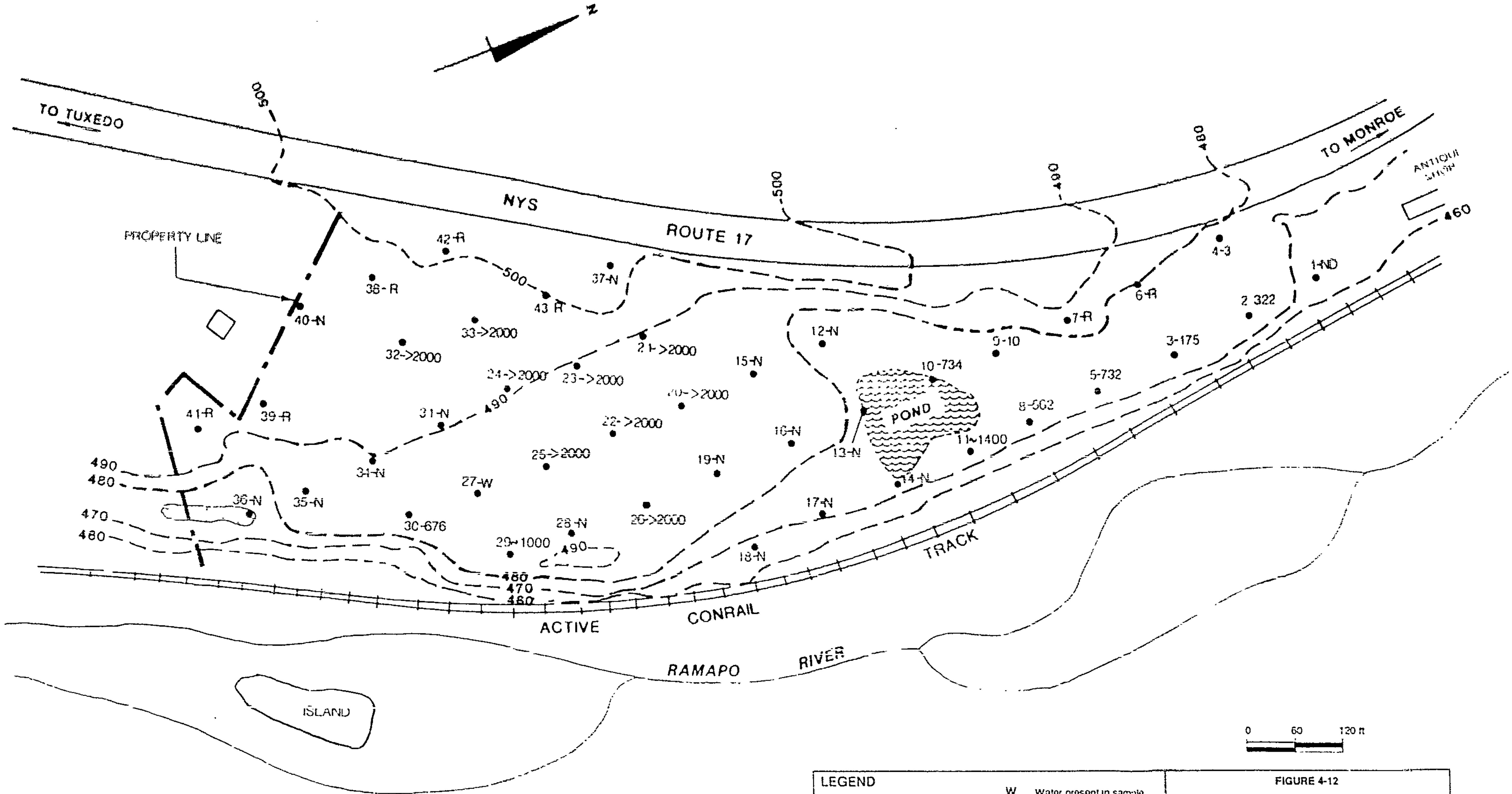

NOTES:

Each concentration represents highest value recorded at that location.

Sampling points 1, 2, 3, 4, 5, 8, 9, 10, 29, and 30 were sampled in July 1988.

Sampling points 20, 21, 22, 23, 24, 25, 26, 27, 32, and 33 were sampled in August 1988 and again in September 1988.

Sampling points 11, 22, 29, 32, and 33 were sampled in December 1988

LEGEND

●	Soil survey point	W	Water present in sample not possible to analyze
N	Not sampled	>	Greater than
NS	Not surveyed, sample location approximate	▬ ▬ ▬	Topography contours
R	Refusal, point could not be installed	———	Hydrogen sulfide contours
		22 Soil survey point no.	350 Concentration (ppm)

FIGURE 4-12

HYDROGEN SULFIDE IN SOIL GAS

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

ter had higher H_2S concentrations (up to 735 ppm [1044 mg/m^3]). Concentrations above 700 ppm (994 mg/m^3) occurred at SSP-5 and SSP-10. The lowest concentrations (less than 10 ppm [14 mg/m^3]) occurred at SSP-1, 4, and 9. When the 10 sampling points, designated as hot spots (SSP-20, 21, 22, 23, 24, 25, 26, 27, 32, and 33), were resampled in August, H_2S concentration estimates were obtained using Draeger tubes with a detection range of 50-600 ppm (71-852 mg/m^3) H_2S. The Draeger tubes showed that at least 600 ppm (852 mg/m^3) H_2S was present at nine of these sampling points. The 10 hot spots were resampled with Draeger tubes with an expanded detection limit of 0-2000 ppm (0-2840 mg/m^3) H_2S in September; at least 2000 ppm (2840 mg/m^3) H_2S was present at nine of the sampling points. One spot, SSP-27, could not be sampled (analyzed) because of water present in the tubes.

SSP-11, 22, 29, 32 and 33 were resampled on 12 December 1988 for hydrogen sulfide with 0-2000 ppm (0-2840 mg/m^3) Draeger tubes (Figure 4-7). SSP-22, 32, and 33 contained greater than 2000 ppm (2840 mg/m^3) hydrogen sulfide, which could not be quantified because it was greater than the maximum Draeger tube detection range. Sampling points 11 and 29 contained approximately 1400 and 1000 ppm (1988 and 1420 mg/m^3) hydrogen sulfide, respectively. Some ice was noted in the sampling tube, possibly depressing hydrogen sulfide levels.

4.6.4 Phase II Trenching Data

As described in Section 3.4, three trenches (Figure 4-7) were excavated and sampled during 2-10 August 1988. Two samples from each trench were collected and analyzed for the target compound list (TCL) organics and inorganics. A library search was conducted for the 30 tentatively identified compounds (TICs) of highest concentration (10 volatiles and 20 acid/base/neutrals [ABN]). Percent solids, EP toxicity metals, ignitability, and reactivity tests were also run on the samples.

Some of the QA/QC trench sample data did not meet the CPL requirements. A discussion of the QA/QC data and usability is presented in Appendix F. The results of trench sample analyses presented here are for the semivolatiles, lead, cyanide, total phenols, and hazardous waste characteristics (Appendix D), the only data that passed QA/QC or are considered usable.

4.6.4.1 <u>Volatile Organics</u>. The volatile organic analyses did not pass quality assurance/quality control standards and as such are not usable for waste characterization or interpretation.

4.6.4.2 <u>Semivolatile Organics</u>. As previously mentioned, the semivolatile organic analyses did not meet the state QA/QC requirement. These data are estimations of compounds present in the samples. They can be used only qualitatively, and are indicated as estimated on Table 4-9. In the semivolatile portion, polycyclic aromatic hydrocarbons (PAHs) made up most of the constituents identified. These compounds include pyrene, fluorene, anthracene, benzo(a)pyrene, chrysene, and other similar compounds. Total PAH ranged from 177,300 ug/kg in trench 1A to 382,400 ug/kg in trench 2B. These compounds, which were found in high concentrations, are the coal tars used to preserve railroad ties. Since railroad ties were found in great abundance (particularly at trench 2), these high concentrations were to be expected. Phthalate acid esters (PAEs) were also found in high concentrations (15,200 to 44,100 ug/kg) in the trench samples. These compounds, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, etc., are generally used as plasticizers and are therefore found wherever quantities of plastics are found, such as in landfills. They are also a common laboratory contaminant and in fact were found in several method blanks. However, because of their ubiquitous

TABLE 4-9 (page 1 of 3)

August 1988 Trench (T) Data Summary

All semivolatile organics data are estimates only. They cannot be used quantitatively.

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	T-1 S-A	T-1 S-B	T-2 S-A	T-2 S-B	T-3 S-A	T-3 S-B
SEMIVOLATILES						
....						
Phenol	ND	1,500 a	m	ND	850 a	2,200 a
1,4-Dichlorobenzene	ND	540 a	m	ND	ND	ND
4-Methylphenol	ND	ND	m	ND	550 a	2,400 a
Benzoic Acid	ND	ND	m	ND	1,400 a	1,800 a
Naphthalene	14,000	7,700	m	13,000 a	8,600	15,000
2-Methylnaphthalene	7,000	3,000 a	m	7,100 a	3,900 a	4,800
Acenaphthene	14,000	6,800	m	15,000 a	5,600	9,100
Dibenzofuran	9,300	4,700	m	10,000	3,700 a	5,300
Acenaphthylene	ND	ND	m	4,700	ND	ND
4-chloro-3-Methylphenol	ND	ND	m	670 a	ND	ND
Bis(2-chloroethyl)ether	ND	ND	m	730 a	ND	ND
Fluorene	12,000	8,500	m	18,000	6,300	7,800
Phenanthrene	31,000	53,000	m	80,000 k, n	29,000	43,000
Anthracene	7,400	13,000	m	28,000	7,300	12,000
Di-n-butylphthalate	1,400 ba	1,900 ba	m	1,500 ba	5,500 b	2,200 ba
Fluoranthene	28,000	58,000	m	64,000	34,000	40,000
Pyrene	24,000	52,000	m	43,000	23,000 a	38,000
Butylbenzylphthalate	2,600 a	2,100 a	m	4,000 a	8,100	8,200
Benzo(a)anthracene	11,000	27,000	m	23,000	16,000	20,000
Chrysene	12,000	27,000	m	24,000	17,000	22,000

All data in ug/kg.

a - Estimated concentration, compound present below method detection level. b - Found in blank.

ND - Not detected at analytical detection level, see Appendix D for detection levels.

m - Data unusable since sample not run within 12 hours of an acceptable GC/MS tune and reanalysis was done outside of sample holding time.

k - Result for this compound is reported at higher dilution since original analysis exceeded calibration range of equipment.

n - Qualified data. Estimated quantity since reanalyzed outside of holding time.

TABLE 4-9 (page 2 of 3)

August 1988 Trench (1) Data Summary

All semivolatile organics data are estimates only. They cannot be used quantitatively.

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	T-1 S-A	T-1 S-B	T-2 S-A	T-2 S-B	T-3 S-A
SEMIVOLATILES (con't)					
Bis(2-ethylhexyl)phthalate	7,600 b	8,000 b	m	13,000 b	11,000 b
Di-n-octylphthalate	3,600 a	3,800 a	m	ND	740 a
Benzo(b)fluoranthene	8,800	24,000	m	19,000	14,000
Benzo(a)pyrene	8,100	23,000	m	18,000	14,000
Indeno(1,2,3-cd)pyrene	4,200 a	12,000	m	11,000	8,400
Dibenzo(a,h)anthracene	ND	5,900	m	2,600 a	2,300 a
Benzo(g,h,i)perylene	4,600 a	13,000	m	12,000	9,300
Tentatively Identified Compounds					
4-methyl-3-penten-2-one	20,000 baj	200,000 baj	m	70,000 baj	100,000 baj
1,8-Dimethyl-Naphthalene	4,000 a	ND	m	ND	ND
1,2-Dimethyl-Naphthalene	ND	ND	m	ND	ND
1-Methyl-Naphthalene	ND	ND	m	ND	ND
2-Ethenyl-Naphthalene	ND	ND	m	ND	ND
Benzo[b]thiophene	ND	ND	m	ND	ND
Butanoic acid	ND	ND	m	ND	40,000 a
Dibenzothiophene	ND	30,000 a	m	40,000 a	ND
Benzo(a)pyrene	ND	50,000 a	m	ND	ND
alpha-Pinene	ND	ND	m	ND	ND
1,1'-Biphenyl	ND	ND	m	20,000 a	ND
2,5-Dibenzonobutaoic acid	ND	ND	m	ND	ND
4-methoxyl-4-methyl-2-pentanone	ND	ND	m	ND	30,000 a
Unknown	12,000 a (1)	70,000 a (2)	m	750,000 a (5)	1,100,000 a (3)
Unknown	109,000 ba (2)	1,110,000 ba (3)	m	ND	1,100,000 ba (3)
Unknown hydrocarbon	55,000 a (11)	570,000 a (10)	m	670,000 a (10)	800,000 a (10)
Unknown methyl-benzene isomer	3,000 a (1)	ND	m	ND	ND
Unknown methyl-naphthalene isomer	2,000 a (1)	ND	m	20,000 a	ND
Unknown dimethyl-naphthalene isomer	ND	ND	m	20,000 a	40,000 a

All data in ug/kg.

a - Estimated concentration, compound present below method detection level. b - Found in blank. (8) - Number of compounds in group total.

ND - Not detected at analytical detection level, see Appendix D for detection levels. NR - Not run.

j - Non TCL is suspected; aldo-condensation product.

m - Data unusable since sample not run within 12 hours of an acceptable GC/MS tune.

TABLE 4-9 (page 3 of 3)

August 1988 Trench (T) Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	T-1 S-A	T-1 S-B	T-2 S-A	T-2 S-B	T-3 S-A
METALS					

Lead	473,000 f	320,000 f	697,000 f	655,000 f	1,170,000 f
OTHER PARAMETERS					

Cyanide	1,900 f	1,100 f	3,300 f	1,800 f	3,300 f
Phenolics	ND	ND	ND	ND	ND
% Solids	68.5	82.2	73.2	79.5	79.5

All data in ug/kg.

f - Duplicate analysis not within control limits.

ND - Not detected.

nature, the finding of these high concentrations in the Tuxedo landfill is not suprising. Semivolatile TICs were also found in the trench samples, all below the method detection limit of the compound.

Dibenzofuran was detected in fairly high concentrations (3700 to 10,000 ug/kg). Dibenzofuran is a minor component of coal tars and coal tar distillation residues. Products that use coal tars and residues are asphalts, roofing material, and road oils. Semivolatile TIC unknown hydrocarbons constitute the second largest compound group (55,000 to 800,000 ug/kg), behind only the two unknown groups. These amounts, combined with other hydrocarbon compounds, indicate large quantities of hydrocarbons present in the fill over a large area.

4.6.4.3 Pesticides/PCBs. The pesticide/PCB data were rejected by NYSDEC and are unusable for waste characterization and interpretation.

4.6.4.4 Metals. Of the 23 metals analyzed for, all but the lead data were rejected by NYSDEC and are unusable. Lead was found in fairly high concentrations (up to 1170 mg/kg). These elevated concentrations may be from gasoline-contaminated soil dumped at the site. High BTX values in both the test pit samples and soil gas lend credibility to this hypothesis. Since high metals concentrations are also found in the groundwater in the downstream monitoring wells, it can be said that the source is most likely from the landfill.

Cyanide was detected in fairly high concentrations: 1.1 to 3.3 mg/kg. Cyanide is usually used in the manufacture of fumigants and fungicides.

4.6.4.5 EP Toxicity. EP toxicity (metals only), reactivity, and ignitability tests were also run on the trench samples to determine whether they could be considered hazardous (Table 4-10). All of the EP toxicity and reactivity data are below the levels that lead to classification of waste as hazardous. However, lead values are from one to three orders of magnitude higher than any other EP toxic parameter. Acceptable EP toxicity levels are based on 100 times the drinking water standard. A proposed change in the Federal (and hence state) lead drinking water standard may reduce the current value from 0.050 to 0.015 or 0.010 mg/l. This reduction may have the effect of failing five of six samples for EP toxic lead values and making the fill material hazardous.

One ignitability sample (T-3 SB) had a flashpoint below 140°F; however, since it did not have free-flowing liquid (one of the requirements of the ignitability test), it only marginally fails the criteria for ignitability for hazardous waste characterization. Limited fill temperature measurements are available only from trench 3 (Ref. 2, Appendix A). Two fill material samples from 18 ft below grade were less than 37.74°C (100°F).

4.6.5 Phase II Test Pit Data

Two samples were collected from each test pit and labeled "A" and "B" (see Chapter 3 for details on sampling; Appendix I for original laboratory data). Two laboratories, York Laboratories (York) and Enseco, Inc. (Enseco), received a complete set of all 10 samples for analysis for hazardous waste characteristics and the A samples for extraction procedure toxicity (EP toxicity) testing. In addition to the 1986 version of the EP toxicity procedure, five samples (B sample from each test pit) were split and sent to two labs, York and Compuchem Laboratories (Compuchem), for analyses using the new Toxicity Characteristic Leaching Procedure (TCLP). Whole soil analysis for the target compound list (TCL) for volatiles, semi-

TABLE 4-10

AUGUST 1988 PHASE II TRENCH SAMPLES EP TOXICITY AND IGNITABILITY/REACTIVITY TEST DATA SUMMARY

Tuxedo WD Site, NYSDEC I.D. No. 336035

PARAMETER	SAMPLE LOCATION T-1A	T-1B	T-2A	T-2B	T-3A	T-3B	EPA MAXIMUM ALLOWABLE CONCENTRATION
EP TOXICITY (all data in mg/l or parts per million: ppm)							
Total arsenic	0.0071	0.0059	0.014	0.010	0.015	0.015	5.0
Total barium	0.19	0.28	0.25	0.16	0.22	0.13	100.0
Total cadmium	0.006	0.010	0.022	0.015	0.12	0.31	1.0
Total chromium	0.014	<0.01	0.014	0.014	0.013	0.020	5.0
Total lead	1.6	0.99	1.6	1.7	2.7	2.1	5.0
Total mercury	0.0031	0.0047	0.0061	0.0055	0.0059	0.0037	0.2
Total selenium	0.0096	<0.005	<0.005	<0.005	<0.005	<0.005	1.0
Total silver	<0.005	0.005	0.005	<0.005	<0.005	<0.005	5.0
IGNITABILITY/REACTIVITY							
Flash point (°F)	>200	>200	>200	>200	>200	132	
Oxidizer spot test	Negative	Negative	Negative	Negative	Negative	Negative	
Total available cyanide (mg/kg)	<10	<10	<10	<10	<10	<10	
Total available sulfide (mg/kg)	<10	<10	<10.2	<10	<10	<10	

volatiles, pesticides, and PCBs was conducted on all 10 samples; five of the 10 samples were sent to Enseco (Enseco also analyzed for metals) and the other five were analyzed at Versar Laboratories, Inc. (Versar). Finally, two samples were analyzed at Enseco for dioxin. Table 4-11 gives sample analyses by each laboratory.

4.6.5.1 Hazardous Waste Characteristics. York and Enseco received split samples of all 10 samples collected and conducted analyses for hazardous waste characteristics on all 10. These tests include water reactivity, cyanide reactivity, sulfide reactivity, ignitability, and corrosivity. None of the samples exhibited water reactivity or cyanide reactivity from either of the laboratories' analyses (Table 4-12). Sulfide reactivity was detected at low levels by both labs, with Enseco's values ranging from ND to 3.8 mg/kg and York's values ranging from ND to 34.1 mg/kg. No analyses measured sulfide evolution from the samples at a concentration greater than 34.1 mg/kg (York TP-4B). The EPA criteria for classification of hazardous waste based on sulfide reactivity is 500 mg/kg. All pH values from both labs were between 7.3 and 8.1. The EPA regulations use less than 2 and greater than 12.5 as the criteria for hazardous waste based on pH corrosivity. None of the samples had free-flowing liquid and none exhibited ignitability using the flash-point tester. Based on the results of these tests and using the criteria established by EPA, none of the soil samples collected exhibited any of the characteristics of hazardous wastes.

4.6.5.2 EP Toxicity/TCLP. The second set of analyses conducted by York and Enseco were the EP toxicity testing on five of the 10 samples. Both laboratories analyzed only the A samples from the five test pits, using the 1986 EPA SW-846 method (Table 4-12). The remainder of the samples, the B samples, were analyzed using the new TCLP methods by York and by Compuchem Labs (Table 4-13). Both of these tests use a simulated leaching procedure to determine the level of specific contaminants that will be leached from the soils

TABLE 4-11

DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE DISTRIBUTION

Tuxedo WD Site NYSDEC I.D. No. 336035

ANALYSIS	YORK	ENSECO	COMPUCHEM	VERSAR	PHASE II REPORT TABLE NUMBER
Group I (Hazardous waste characteristics)					4-12
Reactivity (24 hrs)	10	10	-	-	
Corrosivity (pH)	10	10	-	-	
Ignitability	10	10	-	-	
EP toxicity (full)	5	5	-	-	
Group II					
Toxicity Characteristic Leaching Procedure (TCLP)	5	-	5	-	4-13
Group III					4-14
Pesticides/PCBs	-	5	-	5	
Base/neutral acids	-	5	-	5	
Volatile organics	-	5	-	5	
Dioxin (plus 2, 3, 7, 8 Dioxin)	-	2 plus MS, MSD	-	-	

TABLE 4-12 (Page 1 of 4)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1A		1B		
LABORATORY	YORK	ENSECO	YORK	ENSECO	
NYSDEC I.D. No.	SH336035-01	SH336035-11	SH336035-02	SH336035-12	EPA MAXIMUM ALLOWABLE CONCENTRATIONS (ug/l - ppb)[a]
PARAMETER					
Reactive cyanide (ug/kg)	ND	ND	ND	ND	250 mg HCN/kg
Reactive sulfide (ug/kg)	ND	3800	ND	11,400	250 mg H_2S/kg
Water reactivity	None	NR	None	NR	
Corrosivity/pH	7.91	7.4	7.74	7.4	<2 or >12.5
Ignitability	b	b	b	b	<140°C
EP Toxicity (ug/l or parts per billion - ppb)		[SH336035-21]			
Arsenic	105B	ND	NR	NR	5,000
Barium	518	ND	NR	NR	100,000
Cadmium	ND	ND	NR	NR	1,000
Chromium	5.3B	ND	NR	NR	5,000
Lead	200	ND	NR	NR	5,000
Mercury	ND	ND	NR	NR	200
Selenium	ND	ND	NR	NR	1,000
Silver	ND	ND	NR	NR	5,000
Lindane	ND	ND	NR	NR	NFS
Endrin	ND	ND	NR	NR	200c
Methoxyclor	ND	ND	NR	NR	NFS[c]
Toxaphene	ND	ND	NR	NR	500[c]
2,4-D	ND	ND	NR	NR	NFS[c]
Silvex	ND	ND	NR	NR	NFS[c]

ND - Not detected.
NR - Not run.
NFS - No Federal standard.
B - Found in blank.

[a]100 times the Federal Drinking Water Standard.
[b]Nonignitable.

Additional test pit data are summarized on Tables 4-13 and 4-14.

TABLE 4-12 (Page 2 of 4)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	2A		2B		3A		
LABORATORY	YORK	ENSECO	YORK	ENSECO	YORK	ENSECO	
NYSDEC I.D. No.	SH336035-01	SH336035-13	SH336035-04	SH336035-14	SH336035-03	SH336035-15	
PARAMETER							EPA MAXIMUM ALLOWABLE CONCENTRATIONS (ug/l - ppb)[a]
Reactive cyanide (ug/kg)	ND	ND	ND	ND	ND	ND	250 mg HCN/kg
Reactive sulfide (ug/kg)	21,200	920	10,500	2,700	10,500	ND	250 mg H_2S/kg
Water reactivity	None	NR	None	NR	None	NR	
Corrosivity/pH	7.77	7.6	7.79	7.7	7.77	7.5	<2 or >12.5
Ignitability	b	b	b	b	b	b	<140°C
EP Toxicity (ug/l - ppb)		[SH336035-22]				[SH336035-23]	
Arsenic	88.2B	ND	NR	NR	121B	ND	5,000
Barium	154B	ND	NR	NR	203	ND	100,000
Cadmium	ND	ND	NR	NR	ND	ND	1,000
Chromium	5.6B	ND	NR	NR	5.0B	ND	5,000
Lead	76.7	ND	NR	NR	210	ND	5,000
Mercury	ND	ND	NR	NR	ND	ND	200
Selenium	ND	ND	NR	NR	ND	ND	1,000
Silver	ND	ND	NR	NR	ND	ND	5,000
Lindane	ND	ND	NR	NR	ND	ND	NFS
Endrin	ND	ND	NR	NR	ND	ND	200
Methoxyclor	ND	ND	NR	NR	ND	ND	NFS
Toxaphene	ND	ND	NR	NR	ND	ND	500[c]
2,4-D	ND	ND	NR	NR	ND	ND	NFS[c]
Silvex	ND	ND	NR	NR	ND	ND	NFS[c]

ND - Not detected.
NR - Not run.
NFS - No Federal standard.
B - Found in blank.

[a]100 times the Federal Drinking Water Standard.
[b]Nonignitable.

Additional test pit data are summarized on Tables 4-13 and 4-14.

TABLE 4-12 (Page 3 of 4)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	3B		4A		4A	4B		
LABORATORY	YORK	ENSECO	YORK	ENSECO	YORK	YORK	ENSECO	
NYSDEC I.D. No.	SH336035-06	SH336035-16	SH336035-07	SH336035-17	SH336035-07D	SH336035-08	SH336035-18	EPA MAXIMUM ALLOWABLE CONCENTRATIONS (ug/l - ppb)[a]
PARAMETER								
Reactive cyanide (ug/kg)	ND	ND	ND	ND	NR	ND	ND	250 mg HCN/kg
Reactive sulfide (ug/kg)	ND	ND	ND	ND	NR	34,100	ND	250 mg H_2S/kg
Water reactivity	None	NR	None	NR	NR	None	NR	
Corrosivity/pH	7.71	7.3	7.87	8.1	7.92	7.81	7.7	<2 or >12.5
Ignitability	b	b	b	b	b	b	b	<140°C
EP Toxicity (ug/l - ppb)				[SH336035-24]				
Arsenic	NR	NR	121B	ND	137B	NR	NR	5,000
Barium	NR	NR	446	ND	671	NR	NR	100,000
Cadmium	NR	NR	ND	ND	ND	NR	NR	1,000
Chromium	NR	NR	ND	ND	ND	NR	NR	5,000
Lead	NR	NR	62.8	ND	33.6	NR	NR	5,000
Mercury	NR	NR	ND	ND	ND	NR	NR	1,000
Selenium	NR	NR	ND	ND	ND	NR	NR	5,000
Silver	NR	NR	ND	ND	ND	NR	NR	NFS
Lindane	NR	NR	ND	ND	NR	NR	NR	NFS
Endrin	NR	NR	ND	ND	NR	NR	NR	200
Methoxyclor	NR	NR	ND	ND	NR	NR	NR	NFS
Toxaphene	NR	NR	ND	ND	NR	NR	NR	500
2,4-D	NR	NR	ND	ND	NR	NR	NR	NFS
Silvex	NR	NR	ND	ND	NR	NR	NR	NFS

ND - Not detected.
NR - Not run.
NFS - No Federal standard.
B - Found in blank.

[a]100 times the Federal Drinking Water Standard.
[b]Nonignitable.

Additional test pit data are summarized on Tables 4-13 and 4-14.

TABLE 4-12 (Page 4 of 4)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	5A		5A	5B		
LABORATORY	YORK	ENSECO	YORK	YORK	ENSECO	
NYSDEC I.D. No.	SH336035-09	SH336035-19	SH336035-090	SH336035-10	SH336035-20	EPA MAXIMUM ALLOWABLE CONCENTRATIONS (ug/l - ppb)[a]
PARAMETER						
Reactive cyanide (ug/kg)	ND	ND	NR	ND	ND	250 mg HCN/kg
Reactive sulfide (ug/kg)	24,300	920	NR	ND	1050	250 mg H_2S/kg
Water reactivity	None	NR	NR	None	NR	
Corrosivity/pH	7.65	7.3	NR	7.54	7.6	<2 or >12.5
Ignitability	b	b	NR	b	b	<140°C
EP Toxicity (ug/l - ppb)		[SH336035-25]				
Arsenic	66.1B	ND	NR	NR	NR	5,000[b]
Barium	145B	ND	NR	NR	NR	100,000
Cadmium	ND	ND	NR	NR	NR	1,000
Chromium	ND	ND	NR	NR	NR	5,000
Lead	ND	ND	NR	NR	NR	5,000
Mercury	ND	ND	NR	NR	NR	200
Selenium	ND	ND	NR	NR	NR	1,000
Silver	ND	ND	NR	NR	NR	5,000
Lindane	ND	ND	NR	NR	NR	NFS
Endrin	ND	ND	NR	NR	NR	200
Methoxyclor	ND	ND	NR	NR	NR	NFS
Toxaphene	ND	ND	NR	NR	NR	500
2,4-D	ND	ND	NR	NR	NR	NFS
Silvex	ND	ND	NR	NR	NR	NFS

ND - Not detected.
NR - Not run.
NFS - No Federal standard.
B - Found in blank.

[a]100 times the Federal Drinking Water Standard.
[b]Nonignitable.

Additional test pit data are summarized on Tables 4-13 and 4-14.

TABLE 4-13 (Page 1 of 5)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE TCLP DATA SUMMARY[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1B		1B
LABORATORY	YORK	COMPUCHEM	YORK
NYSDEC I.D. No.	SH336035-02	SH336035-31	SH336035-02D
PARAMETER			
Volatile Organics			
Carbon disulfide	5	2 J	
2-butanone	ND	1 J	
Chloroform	5	ND	
Methylene chloride	14 B	6 JB	
Toluene	4 J	4 J	
Semivolatile Organics			
Phenol	12	12 J	
o-Cresol	ND	ND	
m&p Cresol (total)[b]	14	44	
Pesticides			
Gamma-BHC (lindane)	ND	0.15	
Herbicides		ND	
Metals			
Arsenic	146 B	ND	134 B
Barium	407	572 E	478
Cadmium	ND	10	ND
Chromium	ND	[5.4]	ND
Lead	23.8	3580	212
Mercury	ND	ND	ND
Selenium	ND	ND N	ND
Silver	ND	[5.7]	ND

[a]All data in micrograms per liter or parts per billion (ug/l or ppb).
[b]Indistinguishable isomers; value is total of both.

See Tables 4-12 and 4-14 for additional test pit data.

ND - Not detected.
J - Present but below method detection level.
B - Found in blank.
E - Concentration exceeds calibration range.
N - Spike sample recovery exceeds control limit.
[] - Less than contract-required detection limit.

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE TCLP DATA SUMMARY[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	2B	
LABORATORY	YORK	COMPUCHEM
NYSDEC I.D. No.	SH336035-04	SH336035-32
PARAMETER		
Volatile Organics		
Carbon disulfide	5	ND
2-butanone	ND	ND
Chloroform	5	ND
Methylene chloride	21 B	6 JB
Toluene	7	3 J
Semivolatile Organics		
Phenol	ND	ND
o-Cresol	ND	4 J
m&p Cresol (total)[b]	5 J	ND
Pesticides		
Gamma-BHC (lindane)	ND	ND
Herbicides	ND	ND
Metals		
Arsenic	126 B	[3.3]
Barium	550	811 E
Cadmium	ND	12
Chromium	ND	ND
Lead	66.9	3480
Mercury	ND	ND
Selenium	ND	ND
Silver	ND	ND

[a]All data in micrograms per liter or parts per billion (ug/l or ppb).
[b]Indistinguishable isomers; value is total of both.

See Tables 4-12 and 4-14 for additional test pit data.

ND - Not detected.
J - Present but below method.
B - Found in blank.
E - Concentration exceeds calibration range.
[] - Less than contract-required detection limit.

TABLE 4-13 (Page 3 of 5)

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT
SAMPLE TCLP DATA SUMMARY[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	3B	
LABORATORY	YORK	COMPUCHEM
NYSDEC I.D. No.	SH336035-06	SH336035-33
PARAMETER		
Volatile Organics		
Carbon disulfide	8	5
2-butanone	ND	ND
Chloroform	5	ND
Methylene chloride	5 B	20 B
Toluene	4 J	28
Semivolatile Organics		
Phenol	7 J	32
o-Cresol	5 J	15
m&p Cresol (total)[b]	46	220
Pesticides		
Gamma-BHC (lindane)	ND	0.61
Herbicides	ND	ND
Metals		
Arsenic	161 B	21
Barium	278	538 E
Cadmium	ND	[4.9]
Chromium	4.5	21
Lead	149	2020
Mercury	ND	ND
Selenium	ND	ND N
Silver	ND	ND

[a]All data in micrograms per liter or parts per billion (ug/l or ppb).
[b]Indistinguishable isomers; value is total of both.

See Tables 4-12 and 4-14 for additional test pit data.

ND - Not detected.
J - Present but below method detection level.
B - Found in blank.
E - Concentration exceeds calibration range.
N - Spike sample recovery exceeds control limit.
[] - Less than contract-required detection limit.

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST
PIT SAMPLE TCLP DATA SUMMARY[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	4B	
LABORATORY	YORK	COMPUCHEM
NYSDEC I.D. No.	SH336035-08	SH336035-34
PARAMETER		
Volatile Organics		
Carbon disulfide	4 J	2 J
2-butanone	ND	ND
Chloroform	5	ND
Methylene Chloride	4 JB	10 B
Toluene	10	11
Trichloroethene	ND	4 J
Benzene	ND	1 J
Semivolatile Organics		
Phenol	ND	12
o-Cresol	ND	ND
m&p Cresol (total)[b]	27	ND
Pesticides		
Gamma-BHC (lindane)	ND	ND
Herbicides	ND	ND
Metals		
Arsenic	167 B	25
Barium	215	376 E
Cadmium	ND	5.1
Chromium	10.6	15
Lead	ND	1510
Mercury	ND	ND
Selenium	ND	ND N
Silver	ND	ND

[a]All data in micrograms per liter or parts per billion (ug/l or ppb).
[b]Indistinguishable isomers; value is total of both.

See Tables 4-12 and 4-14 for additional test pit data.

ND - Not detected.
J - Present but below method detection level.
B - Found in blank.
E - Concentration exceeds calibration range.
N - Spike sample recovery exceeds control limits.

12, 13 DECEMBER 1988 NYSDEC PHASE II TEST PIT SAMPLE TCLP DATA SUMMARY[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	5B		EPA MAXIMUM
LABORATORY	YORK	COMPUCHEM	ALLOWABLE
NYSDEC I.D. No.	SH336035-10	SH336035-35	CONCENTRATION[a,c]
PARAMETER			
Volatile Organics			
Carbon disulfide	4 J	3 J	14,400
2-butanone	ND	ND	NRL
Chloroform	4 J	ND	70
Methylene chloride	8 B	95 B	8,600
Toluene	11	93	14,400
Trichloroethene	ND	6	70
Benzene	ND	1 J	70
Semivolatile Organics			
Phenol	ND	1 J	14,400
o-Cresol	ND	ND	10,000[d]
m&p Cresol (total)[b]	130	52	10,000[d]
Pesticides			
Gamma-BC (lindane)	ND	ND	60
Herbicides	ND	ND	-
Metals			
Arsenic	139 B	ND	5,000
Barium	245	271 E	100,000
Cadmium	ND	7.1	1,000
Chromium	ND	[8.8]	5,000
Lead	ND	8130	5,000
Mercury	ND	ND	200
Selenium	ND	ND N	1,000
Silver	ND	ND	5,000

[a]All data in micrograms per liter or parts per billion (ug/l or ppb).
[b]Indistinguishable isomers; value is total of both.
[c]40 CFR 261.24 regulatory levels are proposed. The final regulatory levels may change once promulgated sometime in late 1989.
[d]Total o, m, and p cresol concentration should not exceed 10,000 ug/l.

See Tables 4-12 and 4-14 for additional test pit data.

ND - Not detected.
NRL - No regulatory level.
J - Present but below method detection level
B - Found in blank.
E - Concentration exceeds calibration range.
N - Spike sample recovery exceeds control limits.
[] - Less than contract-required detection limit.

by water at pH 5. The main difference between the two tests is that the TCLP test uses a zero headspace extraction for volatiles; the EP toxicity test does not include volatiles. The levels of the contaminants in the leachate are compared to maximum allowable levels established by EPA at 100 times the drinking water limits. Results of the EP toxicity tests from York show detectable levels of four metals - arsenic, barium, chromium, and lead - in most of the samples. Enseco had much higher detection limits for these metals and consequently reported all of them as nondetected. These data are consistent with the York data, which detected all values less than Enseco's detection limits. Results, shown in Table 4-12, indicated that none of the levels were above the EPA maximum allowable concentrations. The value that was closest to exceeding these limits was the lead concentration in sample test pit 3A, which was 210 ug/liter. The TCLP method, considered to be essentially the same test, did show some different results. York also conducted the TCLP analyses on the 8 samples along with Compuchem. While York's results did not show any violations, the Compuchem lead results were considerably higher than any of York's lead results. Lead concentrations ranged from 1510 ug/liter in sample TP-4B to 8130 ug/liter in sample TP-5B. The EPA TCLP criteria for hazardous waste for lead is 5000 ug/liter and the TP-5B sample exceeded this level. A split sample analyzed at York was reported as ND with a detection limit of 19.4 ug/liter. Detectable levels in the York samples ranged from 23.8 ug/liter in sample TP-1B to 149 ug/liter in sample TP-3B. No explanation for the difference in these values is available. The original trenching sample data obtained from RECRA did show lead values at approximately 2000-3000 ug/liter, but no values were over 5000 ug/liter.

4.6.5.3 Volatiles. All of the above analyses were conducted to determine whether the fill in the landfill can be considered hazardous waste using the EPA regulations. In addition to these analyses, a group of analyses were run on the samples to determine the level (if any) of TCL contaminants present. Enseco and Versar each received five samples for these analyses. Enseco received the A samples from each test pit and Versar received the B samples. Results of these analyses, listed in Table 4-14, indicate the same types and levels of contaminants as detected in the soil gas analyses. From the volatile organic compound (VOC) list the major contaminants were ketones (acetone, 2-butanone, and 4-methyl-2-pentanone), mono-aromatics (benzene, toluene, ethylbenzene and xylenes), and chlorinated ethenes (dichloroethene, trichloroethene and tetrachloroethene). The sample that contained the highest total VOCs was the test pit 1A sample analyzed at Enseco: 2244 ug/kg. The Versar results for the TP-1B sample had a comparable concentration of 17,000 ug/kg. The other test pit samples contained total VOC concentrations less than this value. The major VOC contaminant in all the samples was acetone, which ranged up to 1700 ug/kg. The levels and the types of contaminants found were consistent with the previous soil gas analyses that also detected the same classes of compounds.

4.6.5.4 <u>Semivolatiles</u>. The highest levels of contaminants detected in the test pit soil analyses were from the semivolatile organic compound list or, more specifically, the polycyclic aromatic hydrocarbons. These results are again similar to those found in the trench samples. While some phthalate acid esters (PAEs) were detected, they were generally only a small fraction of the total semivolatile fraction. The range of concentrations for the total semivolatiles was from 194,900 ug/kg in TP-1B to 2,853,200 ug/kg in TP-4A. In the case of sample TP-4A, over 2,250,000 ug/kg of total TCL semivolatiles were detected. Not included in this value are the non-TCL semivolatiles, which also occurred in high concentrations. When both the TCL and the non-TCL compounds are summed for each sample, the total soil concentrations approach 0.3% (in TP-4A) semivolatile organic compounds. As stated earlier, the most likely source for the PAHs is from creosote, which is often

TABLE 4-14 (Page 1 of 7)

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1A	1B	2A	2B	3A		3B
LABORATORY	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-26	SH336035-36	SH336035-27	SH336035-37	SH336035-28	SH336035-28DL	SH336035-38
PARAMETER							
TCL Volatiles (ug/kg or ppb)							
Methylene chloride	32B	95	9J	77	44	NR	110
Acetone	1,300E	870	190	570B	63	NR	1,400E
Carbon disulfide	42	37J	20	ND	66	NR	41
1,2-Dichloroethene (total)	ND	ND	10J	ND	10J	NR	ND
2-Butanone	240	320	45	110	ND	NR	280
Trichloroethene	ND	ND	18	ND	8J	NR	ND
Benzene	ND	ND	6J	ND	ND	NR	ND
4-Methyl-2-pentanone	51J	ND	29	ND	21J	NR	ND
Tetrachloroethene	ND	ND	ND	ND	13J	NR	ND
Toluene	77	110	110	35	78	NR	49
Ethylbenzene	40	60	86	20J	55	NR	35
Total xylenes	150	260	310	64	230	NR	150
Volatile TICs (ug/kg)							
C10H16 Isomer	860J (3)	ND	990J (3)	ND	1,240J (3)	NR	ND
Unknown	ND	1,250J (3)	ND	263J (2)	ND	NR	915J (3)
TCL Semivolatiles (ug/kg)							
Phenol	ND	ND	390J	ND	ND	ND	ND
Benzyl alcohol	ND	ND	370J	ND	ND	ND	ND
4-Methylphenol	5,500J	ND	370J	ND	4200J	ND	3400
Naphthalene	2,2000	3200	5900	17000	270000E	ND	23000
2-Methylnaphthalene	6,100J	ND	2400J	3700	42000	27000JD	8300
Dimethylphthalate	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	1,400J	ND	1600J	ND	2400J	3000JD	ND
Acenaphthene	9200	ND	2000J	2400	46000	41000D	16000
Dibenzofuran	6,000J	ND	2200J	1700	40000	39000D	13000
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND
Fluorene	10000	ND	4000	2800	52000	48000D	17000
Phenanthrene	56000	9700	26000	18000	220000	200000D	53000E
Anthracene	12000	2000	5200	3800	42000	40000D	15000
Di-n-butylphthalate	ND	2400	ND	ND	ND	9600JB	2400
Fluoranthene	59000	13000	25000	24000	140000	160000D	50000E
Pyrene	44000	11000	22000	19000	120000	87000D	42000E
Butylbenzylphthalate	5700J	31000	5200	2200	67000	58000D	3200
Benzo(a)anthracene	25000	5500	9400	8900	34000	34000D	15000
Bis(2-ethylhexyl)phthalate	52000	28000B	20000	55000BE	21000	18000JD	22000B
Chrysene	22000	5100	10000	8200	33000	35000D	16000
Benzo(b)fluoranthene	20000	4800	16000X	6400	34000X	43000X	11000
Benzo(k)fluoranthene	21000	3200	16000X	6000	34000X	43000X	8000

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration; compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1A	1B	2A	2B	3A		3B
LABORATORY	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-26	SH336035-36	SH336035-27	SH336035-37	SH336035-28	SH336035-28DL	SH336035-38
PARAMETER							
TCL Semivolatiles (ug/kg or ppb) (Cont.)							
Benzo(a)pyrene	19000	4500	9400	6600	16000	18000JD	8400
Indeno(1,2,3-cd)pyrene	14000	2400	5600	3100X	11000J	5000JD	3400
Dibenzo(a,h)anthracene	ND	ND	1900J	NE	ND	ND	ND
Benzo(g,h,i)perylene	13000	2400	4600	3000X	8700J	3600JD	2800X
Di-n-octylphthalate	ND	1900	ND	1700	ND	ND	830J
Semivolatile TICs (ug/kg)							
C10H16 Isomer	23000J	ND	6600J	ND	60000J	45000JD	ND
C10H16 Isomer	13000J	ND	ND	ND	ND	27000JD	ND
Benzene proprionic acid	92000J	ND	ND	ND	ND	ND	ND
C12H16O2 Isomer	11000J	ND	ND	ND	ND	ND	ND
4H-Cyclopenta[def] phenanthrene	8700J	ND	5900J	ND	34000J	32000JD	ND
Hexadecanoic acid	24000J	ND	ND	ND	ND	ND	ND
Sulfur, mol. (S8)	460000J	ND	26000J	ND	400000J	290000JD	ND
Unknowns	14000J (2)	29800J (10)	ND	34000J (6)	279000J (5)	666000JD (6)	51900J (7)
Unknown alkanoic acid	11000J	ND	ND	ND	ND	ND	ND
Unknown branched alkane	9600J	ND	ND	ND	ND	ND	ND
C17H12 Aromatic isomer	20600J (2)	ND	11000J (2)	ND	28000J	ND	ND
~~Unknown alkane~~	~~79000J (4)~~	~~5900J (3)~~	~~35100J (4)~~	~~ND~~	~~87000J (4)~~	~~151000JD (4)~~	~~7600J (3)~~
Unknown phthalate	71000J	ND	8600J	ND	ND	ND	ND
Benzo(j)fluoranthene	9200J	ND	ND	ND	ND	ND	ND
Benzo(e)pyrene	14000J	ND	4300J	ND	ND	ND	ND
1-Methyl-1-(methylethyl) benzene	ND	ND	3000J	ND	ND	20000JD	ND
C11H24 Isomer	ND	ND	41000J	ND	ND	ND	ND
C10H18 Isomer	ND	ND	3000J	ND	ND	ND	ND
Methylphenanthrene/anthracene	ND	ND	3500J	ND	ND	ND	ND
Docosane	ND	ND	7100J	ND	ND	ND	ND
Tetracosane	ND	ND	13000J	ND	ND	ND	ND
C18H12 & C18H10 Aromatic isomers	ND	ND	15000J	ND	ND	20000JD	ND
Pentacosane	ND	ND	17000J	58000J (3)	28000J	23000JD	ND
Hexacosane	ND	ND	ND	ND	42000J	25000JD	ND
Unknown adipate	ND	ND	ND	ND	56000J	ND	ND
~~Benzo(b)thiophene~~	~~ND~~	~~ND~~	~~ND~~	~~ND~~	~~20000J~~	~~ND~~	~~ND~~
1-Methylnaphthalene	ND	ND	ND	ND	23000J	21000JD	ND
C11H24 Isomer	ND	ND	ND	ND	60000J	ND	ND
Bicyclo[2.2.1]heptan-2-one, trimethyl isomer	ND	ND	ND	1900J	ND	20000JD	ND

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration; compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

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TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1A	1B	2A	2B	3A		3B
LABORATORY	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-26	SH336035-36	SH336035-27	SH336035-37	SH336035-28	SH336035-28DL	SH336035-38
PARAMETER							
Semivolatile TICs (ug/kg or ppb) (Cont.)							
Dibenzothiophene	ND	ND	ND	ND	ND	ND	ND
9H-Carbazole	ND	ND	ND	ND	ND	ND	ND
Benzo[B]naphtho[2,3-D]furan	ND	ND	ND	ND	ND	ND	ND
9H-Fluorene-carbonitrile isomer and unknown alkane	ND	ND	ND	ND	ND	ND	ND
C12H9N isomer	ND	ND	ND	ND	ND	ND	ND
2-Phenylnaphthalene	ND	ND	ND	ND	ND	ND	ND
Octanoic acid	ND	ND	ND	ND	ND	ND	ND
Unknown hydrocarbon	ND	10400J (2)	ND	73600J (9)	ND	ND	55400J (4)
Unknown ketone	ND	13200J (2)	ND	ND	ND	ND	12200J (2)
Unknown PAH	ND	6000J (2)	ND	ND	ND	ND	39800J (2)
Unknown substituted benzene	ND	1400J	ND	ND	ND	ND	11000J
5-Hexen-2-one, 5-methyl	ND	ND	ND	9300J	ND	ND	ND
3-Heptanone,2,4-dimethyl	ND	ND	ND	2600J	ND	ND	ND
Limonene	ND	ND	ND	1300J	ND	ND	ND
1,2-Ethanediol, monoacetate	ND	ND	ND	1300J	ND	ND	ND
1,4-Methanonapthalene, 1,4-	ND	ND	ND	2000J	ND	ND	ND
Heptadecane, 2,6-dimethyl	ND	ND	ND	3200J	ND	ND	ND
Pentatriacontane	ND	ND	ND	20000J	ND	ND	ND
Heptadecane, 2,6-dimethyl	ND	ND	ND	12000J	ND	ND	ND
Pesticides/PCBs ug/kg							
Dieldrin	ND	ND	ND	NR	ND	ND	20
Aroclor 1242	ND	1000	ND	970	ND	ND	640
Aroclor 1260	ND	200	ND	350	ND	ND	500

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration; compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

TABLE 4-14 (Page 4 of 7)

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	4A		4B	5A	5B	1A		1B	
LABORATORY	ENSECO	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-29	SH336035-29DL	SH336035-39	SH336035-30	SH336035-40	SH336035-26MS	SH336035-26MSD	SH3360-36MS	SH3360-36MSD
PARAMETER									
TCL Volatiles (ug/kg or ppb)									
Methylene chloride	15	ND	140	10J	220	91B	84B	99	110
Acetone	320	ND	730B	360	1300B	1100	1700E	930	970
Carbon disulfide	14	ND	ND	ND	ND	10J	14J	ND	ND
1,2-Dichloroethene (total)	9J	ND	ND	11J	ND	ND	ND	ND	ND
2-Butanone	110	ND	91	130	ND	220	320	390	400
Trichloroethene	8J	ND	ND	10J	ND	ND	ND	ND	ND
Benzene	7J	ND	ND	7J	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	76	ND	ND	68	ND	46J	62	ND	ND
Tetrachloroethene	5J	ND	ND	3J	ND	ND	ND	ND	ND
Toluene	160	ND	57	160	64	ND	ND	ND	ND
Ethylbenzene	62	ND	23J	55	54	26J	28J	42J	41J
Total xylenes	190	ND	78	180	190	110	120	210	220
Volatile TICs (ug/kg)									
C10H16 Isomer	710J (3)	ND	ND	550J (3)	ND	NA	NA		
Unknown	ND	ND	50J	ND	530J (2)	ND	ND	NA	NA
TCL Semivolatiles (ug/kg)									
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl alcohol	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	3500	7600J	5200J	2600	5000
Naphthalene	15000	13000JD	4400	1800	12000	32000	18000	5300	7000
2-Methylnaphthalene	7200J	4800JD	2000	4400	3500	14000	7100J	ND	2300
Dimethylphthalate	ND	ND	ND	ND	ND	1000J	1200J	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	4900J	1600J	ND	ND
Acenaphthene	24000	21000JD	2700	1900J	2200	ND	ND	ND	ND
Dibenzofuran	20000	16000JD	2600	960J	1600	22000	9200	1600X	2500X
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	35000	290000	3700	1100J	ND	29000	14000	2200	3600
Phenanthrene	300000E	2300000	17000	5600	4500	26000E	85000	1300	26000
Anthracene	60000	480000	2500	1900J	ND	54000	21000	2700	4900
Di-n-butylphthalate	ND	98000JDB	990J	ND	1100	ND	2500J	4300	4100
Fluoranthene	360000E	3000000	23000	11000	6600	28000E	90000	16000	37000E
Benzoic acid	ND	ND			1400JX			ND	ND

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration; compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

TABLE 4-14 (Page 5 of 7)

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT NO.)	4A		4B	5A	5B	1A		1B	
LABORATORY	ENSECO	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-29	SH336035-29DL	SH336035-39	SH336035-30	SH336035-40	SH336035-20MS	SH336035-20MSD	SH3360-30MS	SH3360-30MSD
PARAMETER									
TCL Semivolatiles (ug/kg or ppb) (Cont.)									
Pyrene	330000E	2000000	26000	9800	6000	ND	ND	Y	Y
Butylbenzylphthalate	200000	1400000	2600	5400	2700	4300J	5400J	20000	17000
Benzo(a)anthracene	130000	1100000	12000	4400	3300	100000	33000	6600	18000
Bis(2-ethylhexyl)phthalate	50000	350000	43000BE	13000	46000BE	13000	18000	87000BE	160000BE
Chrysene	140000	1100000	11000	5000	3300	93000	30000	6500	17000
Benzo(b)fluoranthene	200000X	200000XD	12000	6900X	3700	150000X	46000X	6500	17000
Benzo(k)fluoranthene	200000X	200000XD	7300	6900X	2600	150000X	46000X	3800	11000
Benzo(a)pyrene	120000	990000	9100	4600	3200	83000	27000	5500	15000
Indeno(1,2,3-cd)pyrene	29000	310000	4200	ND	1500	26000	13000	2700	6700
Dibenzo(a,h)anthracene	11000J	90000JD	ND	ND	ND	6500J	3400J	ND	2300
Benzo(g,h,i)perylene	22000	230000	3600	ND	1700	20000	11000	2700	5800
Di-n-octylphthalate	ND	ND	1800	ND	2400	ND	ND	7400	3600
Semivolatile TICs (ug/kg)									
C10H16 Isomer	ND	19000JD	ND	5500J	ND	NA	NA	NA	NA
C10H16 Isomer	ND	ND	ND	ND	ND	NA	NA	NA	NA
Benzene proprionic acid	ND	ND	ND	ND	ND	NA	NA	NA	NA
C12H16O2 isomer	ND	ND	ND	ND	ND	NA	NA	NA	NA
4H-Cyclopenta[def] phenanthrene	36000J	30000JD	ND	ND	ND	NA	NA	NA	NA
Hexadecanoic acid	ND	ND	ND	ND	ND	NA	NA	NA	NA
Sulfur, mol. (S8)	200000J	110000JD	ND	382700J (2)	ND	NA	NA	NA	NA
Unknowns	38000J (2)	450000JD (4)	25680J (8)	22900J (6)	72200J (9)	NA	NA	NA	NA
Unknown alkanoic acid	ND	ND	ND	12300J (2)	ND	NA	NA	NA	NA
Unknown branched alkane	ND	ND	ND	ND	ND	NA	NA	NA	NA
C17H12 Aromatic isomer	ND	78000JD (3)	ND	ND	ND	NA	NA	NA	NA
Unknown alkane	130000J (4)	48000JD (3)	8100J (4)	16100J (5)	4800J (2)	NA	NA	NA	NA
Unknown phthalate	ND	ND	ND	11600J (2)	ND	NA	NA	NA	NA
Benzo(j)fluoranthene	15000J	ND	ND	ND	ND	NA	NA	NA	NA
Benzo(e)pyrene	41000J	ND	ND	ND	ND	NA	NA	NA	NA
1-Methyl-1-(methylethyl) benzene	ND	ND	ND	ND	ND	NA	NA	NA	NA
C11H24 Isomer	ND	ND	ND	ND	ND	NA	NA	NA	NA
C10H18 Isomer	ND	ND	ND	ND	ND	NA	NA	NA	NA
Methyl phenanthrene/ anthracene	32000J (2)	15000JD	ND	ND	ND	NA	NA	NA	NA
Docosane	ND	ND	ND	ND	ND	NA	NA	NA	NA

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration; compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

TABLE 4-14 (Page 6 of 7)

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	4A		4B	5A	5B	1A		1B	
LABORATORY	ENSECO	ENSECO	VERSAR	ENSECO	VERSAR	ENSECO	ENSECO	VERSAR	VERSAR
NYSDEC SAMPLE I.D. No.	SH336035-29	SH336035-29DL	SH336035-39	SH336035-30	SH336035-40	SH336035-20MS	SH336035-20MSD	SH3360-30MS	SH3360-30MSD
PARAMETER									
Semivolatile TICs (ug/kg or ppb) (Cont.)									
Tetracosane	ND	ND		ND		NA	NA	NA	NA
C18H12 & C18H10 Aromatic isomers	27000J	22000JD		ND		NA	NA	NA	NA
Pentacosane	ND	ND	ND	ND	ND	NA	NA	NA	NA
Hexacosane	ND	ND		ND		NA	NA	NA	NA
Unknown adipate	ND	ND		ND		NA	NA	NA	NA
Benzo(b)thiophene	ND	ND		ND		NA	NA	NA	NA
1-Methylnaphthalene	ND	ND		2100J		NA	NA	NA	NA
C11H24 Isomer	ND	ND		ND		NA	NA	NA	NA
Bicyclo[2.2.1]heptan-2-one, trimethyl isomer			ND	ND	ND	NA	NA	NA	NA
Dibenzothiophene	14000J	ND		ND		NA	NA	NA	NA
9H-Carbazole	25000J	ND		ND		NA	NA	NA	NA
Benzo[B]naphtho[2,3-D]furan	19000J	40000JD		ND		NA	NA	NA	NA
9H-Fluorene-carbonitrile ~~isomer and unknown alkane~~	23000J	ND		ND		NA	NA	NA	NA
C12H9N Isomer	ND	21000JD		ND		NA	NA	NA	NA
2-Phenylnaphthalene	ND	15000JD		ND		NA	NA	NA	NA
Octanoic acid	ND	ND		3500J		NA	NA	NA	NA
Unknown hydrocarbon	ND	ND	13100J (5)	ND	336000J (9)	ND	ND	NA	NA
Unknown ketone	ND	ND	12800J (3)	ND	8300J (2)	ND	ND	NA	NA
Unknown PAH	ND	ND	7500J (2)	ND	1700J	ND	ND	NA	NA
Unknown substituted benzene	ND	ND	ND	ND	ND	ND	ND	NA	NA
5-Hexen-2-one, 5-methyl	ND	ND	ND	ND	NDL	ND	ND	NA	NA
3-Heptanone, 2,4-dimethyl	ND	ND	ND	ND	ND	ND	ND	NA	NA
Limonene	ND	ND	ND	ND	ND	ND	ND	NA	NA
1,2-Ethanediol, monoacetate	ND	ND	ND	ND	ND	ND	ND	NA	NA
1,4-Methanonapthalene, 1,4-	ND	ND	ND	ND	ND	ND	ND	NA	NA
Heptadecane 2,6-dimethyl	ND	ND	ND	ND	ND	ND	ND	NA	NA
Pesticides/PCBs (ug/kg)									
Dieldrin	ND	ND	26F	ND	33	ND	ND	ND	ND
Aroclor 1242	ND	ND	550	ND	500	ND	ND	3300	3000
Aroclor 1260	ND	ND	240	ND	170	ND	ND	740	1100

Numbers in parentheses indicate number of identified compounds.

ND - Not detected.
NR - Not run.
B - Compound present in blank.

J - Estimated concentration, compound below detection limit.
X - Coeluted.
D - Compound detected in diluted sample.

TABLE 4-14 (Page 7 of 7)

TUXEDO PHASE II TEST PIT DATA SUMMARY

Tuxedo WD Site NYSDEC I.D. No. 336035

SAMPLE LOCATION (TEST PIT No.)	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
LABORATORY	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO	ENSECO
NYSDEC SAMPLE I.D. No.	SH336035-11	SH336035-12	SH336035-13	SH336035-14	SH336035-15	SH336035-16	SH336035-17	SH336035-18	SH336035-19	SH336035-20
PARAMETER										
TCL Metals (ug/kg or ppb)										
Aluminum	6480000	8920000	6000000	6400000	7920	7750000	6670000	5510000	9450000	7530000
Antimony	9100AN	NDN	11800AN	11000AN	13600AN	11100AN	18800N	16300AN	10100AN	16700AN
Arsenic	4200	4300	3900+	11400	6700	8500	18500	4600	4200S	9000S
Barium	741000*	575000*	571000*	684000*	2200000*	311000*	486000*	1700000*	532000*	1120000*
Beryllium	340A	360A	400A	310A	490A	430A	420A	310A	490A	430A
Cadmium	ND	6100*	4600*	1600*	1500*	1700*	2600*	3000*	5300*	4900*
Calcium	49600000	34000000	91700000	54500000	87900000	48900000	80200000	86900000	34600000	57000000
Chromium	42900	46800	25900	37800	29100	27200	23500	30900	83800	49000
Cobalt	8000A	14200	5100A	7500A	6600A	8200A	5500A	5900A	12800	11300A
Copper	1520000*	239000*	44700*	175000*	629000*	106000*	66400*	87900*	236000*	304000*
Iron	18500000	31800000	14100000	27400000	17200000	21900000	16600000	13700000	39800000	35600000
Lead	582000*	868000*	523000*	2160000*	697000*	722000*	511000*	714000*	857000*	1710000*
Magnesium	7230000	7550000	6460000	6640000	8740000	5720000	9340000	8650000	5520000	7850000
Manganese	335000*N	512000*N	295000*N	266000*N	312000N*	336000N*	432000N*	256000N*	704000N*	434000N*
Mercury	1000	2200	700	1100	900	1000	800	700	1600	1900
Nickel	39100	63200	18000	23300	24500	26600	18200	18900	76800	94500
Potassium	1280000	1070000A	1240000A	1230000A	1650000	1200000A	1440000	1440000	784000A	1420000A
Selenium	ND	ND	ND	610A	ND	ND	ND	ND	ND	NDW
Silver	2300A	1300A	8200	1100A	1500A	ND	1600A	1300A	1200A	4400
Sodium	705000A	962000A	326000A	309000A	758000A	410000A	647000A	848000A	368000A	1160000A
Vanadium	29600	43900	56100	32300	33600	22700	32400	21400	48300	55200
Zinc	890000E*	1410000E*	531000E*	1450000E*	1560000E*	534000E*	738000E*	1180000E*	210000E*	3440000E*
Cyanide	1500	ND	ND	ND	1600	1300	680	ND	2000	2100
Total Solids %	78.9	84.4	73.0	76.0	74.4	77.7	73.9	72.2	79.6	70.1
Dioxins (ug/kg or ppb)	[SH336035-21]		[SH336035-22]							
1,2,3,4,6,7,8HCDD	1.5	NR	ND	NR	NR	NR	NR	NR	NR	NR
HCDD	3.1	NR	ND	NR	NR	NR	NR	NR	NR	NR
OCDD	27.0	NR	9.1	NR	NR	NR	NR	NR	NR	NR

ND - Not detected.
A - Below contract required detection limits.
N - Spiked sample recovery not within limits.
E - Reported value is an estimate because of the presence of an interference.
W - Spike for furnace AA not within limits.
S - Value determined by method of standard additions (MSA).
* - Duplicate analyses not within control limits for all values.
+ - Correlation for MSA is less than 0.995.
NR - Not run.

used to preserve railroad ties. Railroad ties were found in large quantities, and creosote, a derivative of coal tar, contains percentage-level concentrations of PAHs and is the most likely source of the levels of the PAHs found in the soils. Petroleum fuels may also have contributed a small percentage of the total PAHs found, but fuel oils generally contain relatively low levels of PAHs with the exception of naphthalene.

4.6.5.5 Pesticides/PCBs. PCBs were detected in all five of the samples analyzed by Versar at concentrations ranging from 670 ug/kg in TP-5B to over 4000 ug/kg in TP-1BMS (the original TP-1B had only 1200 ug/kg). These values, the sum of two detected aroclors, 1242 and 1260, represent relatively low levels and confirm some of the early data collected by NYSDEC. Enseco did not report any detectable levels of PCBs; however, the detection thresholds were 10 to 30 times higher, depending on the aroclor. The pesticide dieldrin was detected by Versar in three of the five samples at concentrations up to 33 ug/kg.

4.6.5.6 Metals. Metals analyses were conducted by Enseco on all the soil samples from both the A and B stations (see Table 4-14). As was found in the August soil sampling, the TCL metal concentrations in the fill are high. The highest metal concentrations were the calcium values, which ranged from 34,000,000 ug/kg in sample TP-1B to 91,700,000 ug/kg in sample TP-2A. In percentage units, these values correspond to 3.4 and 9.2%, respectively, indicating that the soils are composed of nearly 10% calcium. The other metal that occurred at concentrations above a percentage point was iron. Iron values ranged from 1.37% in TP-4B to 3.98% in TP-5A. Aluminum, magnesium, potassium, and zinc were also found in high concentrations (0.1 to 1.0%). Lead, while not found in concentrations equal to the above-mentioned metals, was detected at high levels ranging from 511,000 ug/kg in TP-4A to 2,160,000 ug/kg in TP-2B.

4.6.5.7 Dioxin. Two samples were analyzed by Enseco for the presence of chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (Table 4-14). Sample TP-1A contained 27 ug/kg of the octachlorodibenzo-p-dioxin (OCDD) and 3.1 ug/kg of the heptachlorodibenzo-p-dioxin (HpCDD). Only OCDD was detected in TP-2A, at a concentration of 9.1 ug/kg.

4.6.5.8 Temperature. Temperatures of the fill materials were recorded during the test pit excavation. The results are:

TEST PIT	SAMPLE DEPTH (ft)	TEMPERATURE (°C)
TP-1	13	8.5
TP-2	4-10	16.5
TP-2	10	29.7
TP-3	8	24.5
TP-4	8	32+
TP-4	10	28

It should be noted that because the test pit excavation was conducted during extremely cold weather (0-15°F), these temperatures may not be an accurate representation of the in-place temperature of the fill. The temperature probe maximum temperature was 32°C (89.6°F). These temperatures indicate the high biochemical activity within the landfill, and are ideal for anaerobic decomposition to occur.

4.6.6 Phase II Monitoring Well Data

Seven monitoring wells (Figure 4-7) were installed (Section 3.5) and the groundwater was sampled. The first data set (August 1988) was rejected by NYSDEC (see Appendix F). Resampling occurred on 7 and 8 November 1988. The November data set is used to discuss the landfill's impact on the environment.

4.6.6.1 Volatiles. No volatile organic compounds were detected in groundwater samples (Table 4-15) above the compounds' method detection level; however, some samples contained compounds that were also found in the laboratory blank and are thus considered laboratory contaminants. No volatile organic TICs were detected in any sample.

4.6.6.2 Semivolatiles. No semivolatile compounds above the compounds' analytical detection limit were detected in any groundwater sample. Those compounds detected in the semivolatile TIC analysis (Table 4-15) are below their respective detection limits. Except for three unknown compound groups, the only identified compound detected in more than one sample was dodecanoic (or lauric) acid used in resins, soaps, detergents, cosmetics, insecticides, and food additives. This compound, while reported in EPA's 1983 TSCA inventory (Ref. 12, Appendix A), does not appear to present an environmental threat, given the available health risk information at the present time (Ref. 13, Appendix A).

4.6.6.3 Pesticides/PCBs. No pesticides/PCBs were detected in any groundwater samples analyzed in this sampling.

4.6.6.4 Metals. Twenty-three metals were analyzed in the collected samples (Table 4-15). The following parameters exhibit great variation and concentration ranges:

TABLE 4-15 (page 1 of 2)
November 1988 Monitoring Well (MW) Data Summary

Tukedo WD Site NYSDEC I.D.No. 336035

Parameter	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-6 Duplicate	MW-7
VOLATILE ORGANICS								
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	1 a	ND	1 ab	1 ab	2 ab	4 a	2 a	3 ab
Acetone	ND	ND	ND	ND	ND	10 a	9 a	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	2 a	ND	ND	ND	ND
Chloroform	2 a	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	3 a	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	ND	ND	ND	1 a	ND	ND	ND	ND
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	ND	ND	ND	ND	ND	ND	ND	ND
Tentatively Identified Compounds								
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ester acetic acid	ND	ND	ND	ND	ND	ND	ND	ND
1-Methyl-azetidine	ND	ND	ND	ND	ND	ND	ND	ND
3-methyl-pantane	ND	ND	ND	ND	ND	ND	ND	ND
3,4-Dimethyl-1-pantane	ND	ND	ND	ND	ND	ND	ND	ND
Methyl-cyclohexane	ND	ND	ND	ND	ND	ND	ND	ND
Pyrrolidine	ND	ND	ND	ND	ND	ND	ND	ND
Butyl-cyclopropane	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl-hexane	ND	ND	ND	ND	ND	ND	ND	ND
C8H18 isomer	ND	ND	ND	ND	ND	ND	ND	ND
Unknown C8H18	ND	ND	ND	ND	ND	ND	ND	ND
Ethyl-cyclohexane	ND	ND	ND	ND	ND	ND	ND	ND
2-Methyl-heptane	ND	ND	ND	ND	ND	ND	ND	ND
1-Ethyl-4-methyl-cyclohexane	ND	ND	ND	ND	ND	ND	ND	ND
Unknown	ND	ND	ND	ND	ND	ND	ND	ND
SEMIVOLATILES								
Benzoic Acid	ND	ND	ND	ND	ND	ND	6 a	ND
Dimethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	6 a	ND	ND	ND	ND	ND	ND
Di-n-octylphthalate	ND	ND	ND	ND	ND	ND	ND	ND

All data in micrograms per liter (ug/l or parts per billion (ppb)).
a - Estimated concentration, compound present below method detection level.. b - Found in blank.
ND - Not detected at analytical detection level, see Appendix E for detection levels.

Table 4-15 (page 2 of 2)
November 1988 Monitoring Well (MW) Data Summary

Tuxedo WD Site NYSDEC I.D.No. 336035

Parameter	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-6 Duplicate	MW-7
SEMIVOLATILES (con't)								
Tentatively Identified Compounds								
Bicyclo[2,2,1]heptan-2-one	ND	ND	ND	ND	ND	ND	10 a	ND
4,4-Butylidene-bis[2]phenol	ND	36 a	ND	ND	42 a	ND	32 a	ND
Unknown	ND	ND	ND	42 a (2)	200 a (4)	84 a (4)	68 a	ND
Dodecanoic Acid	ND	ND	ND	ND	ND	110 a	ND	ND
Unknown Hydrocarbon	ND	ND	ND	ND	ND	380 a (6)	ND	ND
Unknown Aromatic	ND	ND	ND	ND	ND	20 a (1)	ND	ND
2-Ethylhexanoic Acid	ND	50 a	ND	ND	ND	ND	ND	ND
1-Methyl-2-pyrrolidine	ND	170 a	ND	ND	ND	ND	ND	ND
2-Cyclohepten-1-one	68 a	ND	ND	ND	ND	ND	ND	ND
PESTICIDES/PCBs								
Not detected	ND	ND	ND	ND	ND	ND	ND	ND
METALS								
Aluminum	(47)	5,430	484	948	200	[187]	[122]	2,970
Antimony	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	(2.9)	ND	(1.7)	(2.1)	(3.8)	26	23	(1.8)
Barium	(4.6)	(71)	(85)	(78)	(87)	(167)	(160)	(75)
Beryllium	ND	(1.8)	ND	ND	ND	ND	ND	(2.7)
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	9,430	11,100	197,000	126,000	315,000	221,000	211,000	172,000
Chromium	ND	10	ND	ND	ND	ND	ND	ND
Cobalt	(6.3)	(22)	(8.8)	(4.0)	(8.8)	(6.2)	(6.0)	(5.4)
Copper	32	64	32	32	64	33	46	27
Iron	162	9,160	804	2,130	3,120	34,400	33,000	5,390
Lead	(1.2)	5.1	ND	ND	ND	ND	ND	(1.5)
Magnesium	(2,530)	6,000	69,900	33,400	101,000	76,500	72,900	55,500
Manganese	(13)	482	8,420	4,970	10,200	12,300	11,800	1,460
Mercury	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	ND	(28)	ND	ND	ND	ND	ND	ND
Potassium	ND	ND	ND	ND	20,100	25,400	23,900	ND
Selenium	ND	ND	ND l	(24)	ND l	ND l	ND l	ND l
Silver	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	44,500	18,300	64,300	31,800	70,500	104,000	99,900	80,400
Thallium	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	(5.8)	(18)	(6.9)	(6.5)	(5.9)	(12)	(11)	(11)
Zinc	53 el	129 el	139 el	191 el	148 el	115 el	80 el	144 el
OTHER PARAMETERS								
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND
Total Recoverable Phenolics	NR	NR	NR	NR	NR	NR	NR	NR
% Solids	NR	NR	NR	NR	NR	NR	NR	NR

All data in micrograms per liter (ug/l or parts per billion [ppb]).

a - Estimated concentration; compound present below method detection level. (5) - Number of compounds in group total. NR - Not run.

ND - Not detected at analytical detection level; see Appendix E for detection levels. l - Value estimated or not reported due to the presence of interference.

e - Spike sample recovery not within control limits. [ ] - Below contract detection limit but above instrument detection level.

PARAMETER	CONCENTRATION RANGE (ug/l) UPGRADIENT (MW-1, MW-2)	DOWNGRADIENT (MW-4, 5, 6, 7)	NYS CLASS GA STANDARD (6NYCRR PART 703.5) ug/l
Aluminum	[47], 5430	[187] to 2970	NS
Arsenic	[2.9], ND	[1.8] to 26	25
Barium	[4.6], [71]	[75] to [167]	1000
Calcium	9430, 11,100	126,000 to 315,000	NS
Cobalt	[6.3], [22]	[4.0] to [8.8]	NS
Copper	32, 64	32 to 64	1000
Iron[a]	162, 9160	804 to 34,400	300
Lead	[1.2], 5.1	ND to [1.5]	25
Magnesium	[2530], 6000	33,400 to 101,000	NS
Manganese[a]	[13], 482	8420 to 12,300	300
Potassium	ND, ND	ND to 25,400	NS
Selenium[b]	ND, ND	ND to [24]	20
Sodium	44,500, 18,300	31,800 to 104,000	NS
Vanadium	[5.8], [18]	[5.9] to [12]	NS
Zinc[b]	53, 129	80 to 191	5000

[] - Below contract detection limit, but above instrument detection level.
ND - Not detected.
NS - No standard.

[a]Combined value not to exceed 500 ug/l.
[b]Most of the data not reported because of interference.

Elevated downgradient levels of arsenic, barium, calcium, iron, magnesium, manganese, potassium, selenium, sodium, and zinc were observed. Only arsenic, iron, manganese, and selenium violate existing New York State Class GA (best usage as potable water supply) standards. Iron and manganese combined violated those standards in one upgradient well (MW-2). These parameters can be attributed to the landfill. (Selenium data may be higher, but the laboratory's analytical equipment had problems or interference during the selenium analysis so these values may be higher than observed.) Iron and manganese can be attributed to metals leaching from metal products under acidic (low pH) conditions. Arsenic can be attributed to pesticides and herbicides, wood preservatives, and alloys of metals (such as copper and lead, electronic products) that may be in the landfill. Selenium could be attributed to electronic components, photocells and solar batteries, ceramics, rubber accelerators and catalysts. Calcium, potassium, and sodium can migrate out of gypsum and plaster-type products. Zinc can leach from auto parts, e.g., batteries.

No cyanides or phenols were detected in any samples.

4.6.6.5 Temperature. Groundwater temperatures were recorded in the monitoring wells during development and sampling in September and November 1988. The results are as follows:

MONITORING WELL	WATER TYPE	TEMPERATURES (°C)	
		SEP 1988	NOV 1988
MW-1	Purge water	12.63	12.43
	Sample	11.2	10.7
MW-2	Purge water	10.66	9.4
	Sample	13.0	10.2
MW-3	Purge water	15.56	17.2
	Sample	12.6	12.9
MW-4	Purge water	17.5	17.9
	Sample	17.4	15.4
MW-5	Purge water	21.98	20.65
	Sample	21.7	18.2
MW-6	Purge water	26.3	24.8
	Sample	22.65	20.3
MW-7	Purge water	14.53	17.93
	Sample	15.7	14.8

Groundwater temperatures are normally between 10 and 13°C (50 and 55°F), which were the temperatures recorded at the two upgradient wells (MW-1 and MW-2). However, the downgradient wells are affected by the heat being produced in the landfill. MW-6 was the warmest at 22.65 to 26.3°C (72.8 to 79.3°F), followed by MW-5 at 21.7 to 21.98°C (71.1 to 71.6°F); the other three wells ranged from 14.53 to 17.9°C (58.2 to 64.2°F). The landfill has a significant impact on the downgradient groundwater, most notably in the vicinity of MW-5 and MW-6. The recorded differences between the purge water and the sample are likely caused by the sampling procedures; the temperature of the samples was not taken immediately, but after 5-10 min, which allowed for some cooling of the water.

4.6.7 Phase II Surface Water Data

Five surface water samples were collected (Figure 4-7) in August 1988 and analyzed. Resampling occurred on 7 and 8 November 1988 (Table 4-16). One August 1988 sampling location (SW-5) could not be resampled in November because of a change in river stage. The November 1988 data set (Appendix E) is used to discuss the landfill's impact on the Ramapo River (surface water).

4.6.7.1 Volatiles. No volatile organics were present above analytical detection limits. No volatile organic TICs were identified.

4.6.7.2 Semivolatiles. No semivolatiles or semivolatile TIC compounds were detected in any samples.

4.6.7.3 Pesticides/PCBs. No pesticides/PCBs were detected in any samples from the Ramapo River water.

4.6.7.4 Metals. Twenty-three metals were evaluated in each sample (Table 4-16). The following table illustrates the detected metals' influence on water quality:

TABLE 4-16 (page 1 of 2)
November 1988 Surface Water (SW) Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	SW-1	SW-2	SW-3	SW-4	SW-5
VOLATILE ORGANICS					
Methylene Chloride	ND	2 a	3 a	ND	NS
Acetone	ND	2 a	ND	ND	NS
1,1-Dichloroethene	ND	ND	ND	ND	NS
1,2-Dichloroethene (total)	ND	ND	ND	ND	NS
Toluene	ND	ND	ND	ND	NS
Styrene	ND	ND	ND	ND	NS
Xylenes (total)	ND	ND	ND	ND	NS
Tentatively Identified Compounds					
None detected	ND	ND	ND	ND	NS
SEMIVOLATILES					
Benzoic Acid	ND	ND	ND	ND	NS
Phenanthrene	ND	ND	ND	ND	NS
Di-n-butylphthalate	ND	ND	ND	ND	NS
Fluoranthene	ND	ND	ND	ND	NS
Chrysene	ND	ND	ND	ND	NS
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	NS
Di-n-octylphthalate	ND	ND	ND	ND	NS
Benzo(b)fluoranthene	ND	ND	ND	ND	NS
Tentatively Identified Compounds					
1,1,2,2,-Tetrachloroethane	ND	ND	ND	ND	NS
Unknown	ND	ND	ND	ND	NS
Unknown substituted hydrocarbon	ND	ND	ND	20 a (1)	NS
Unknown aromatic	ND	ND	ND	ND	NS
Unknown aromatic	ND	ND	ND	ND	NS
Unknown phthalate	ND	ND	ND	ND	NS
PESTICIDES/PCBs	ND	ND	ND	ND	NS

All data in micrograms per liter (ug/l or parts per billion (ppb))
a - Estimated concentration, compound present below method detection level. b - Found in blank. (3) - Number of compounds in group total.
ND - Not detected at analytical detection level, see Appendix E for detection levels. NR - Not run.
NS - SW-5 location could not be resampled.

TABLE 4-16 (page 2 of 2)
November 1988 Surface Water (SW) Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	SW-1	SW-2	SW-3	SW-4	SW-5
METALS					
Aluminum	[135]	223	[169]	[99]	NS
Arsenic	ND	[1.9]	ND	ND	NS
Barium	[14]	[14]	[15]	[15]	NS
Beryllium	ND	[1.8]	ND	ND	NS
Cadmium	ND	ND	ND	ND	NS
Calcium	17,000	17,000	17,000	30,400	NS
Chromium	ND	ND	ND	ND	NS
Cobalt	ND	[4.0]	[3.0]	[2.8]	NS
Copper	32	32	32	30	NS
Iron	294	369	321	341	NS
Lead	[1.1]	[2.4]	[1.3]	[3.2]	NS
Magnesium	[4,660]	[4,730]	[5,000]	8,100	NS
Manganese	53	48	43	102	NS
Potassium	ND	ND	ND	ND	NS
Selenium	ND	[3.4]	[2.5]	ND	NS
Sodium	23,800	24,400	23,700	32,900	NS
Zinc	47 el	125 el	136 el	63 el	NS
OTHER PARAMETERS					
Cyanide	ND	ND	ND	ND	NS
Total recoverable phenolics	NR	NR	NR	NR	NS
% Recoverable solids	NR	NR	NR	NR	NS

All data in micrograms per liter (ug/l or parts per billion (ppb)).
e - Spike sample recovery not within control limits. NR - Not run. NS - SW-5 location could not be resampled.
ND - Not detected at analytical detection level, See Appendix E for detection levels.
l - Value estimated or not reported due to the presence of interference. [ ] - Below contract detection limit but above instrument detection level.

PARAMETER	CONCENTRATION RANGE (ug/l) UPSTREAM (SW-4)	BACKGROUND[a] (SW-3)	DOWNSTREAM (SW-1, SW-2)	NYS CLASS A STANDARD (6NYCRR PART 701.14) ug/l
Aluminum	[99]	[169]	[135], 223	100
Arsenic	ND	ND	ND, [1.9]	50
Barium	[15]	[15]	[14], [14]	1000
Beryllium	ND	ND	ND, [1.8]	11 or 1100[b]
Calcium	30,400	17,000	17,000, 17,000	NS
Cobalt	[2.8]	[3.0]	ND, [4.0]	5
Copper	30	32	32, 32	200
Iron	341	321	294, 369	300
Lead	[3.2]	[1.3]	[1.1], [2.4]	50
Magnesium	8100	[5000]	[4600], [4730]	35,000
Manganese	102	43	53, 48	300
Selenium	ND	[2.5]	ND, [3.4]	10
Sodium	32,900	23,700	23,800, 24,400	NS
Zinc[c]	63	136	47,125	300

[] - Below contract detection limit, but above instrument detection level.
ND - Not detected.
NS - No standard.

[a]Sample taken 30 ft east of Conrail tracks to determine effect on standing water from the track bed.
[b]For hardness less than or equal to 75,000 ppb, value should be 11 ppb; greater than 75,000 ppb, value should be 1100 ppb.
[c]Estimated because of interference.

Only zinc downstream concentrations are markedly above upstream values. Aluminum and iron are the only parameters violating the New York State surface water standards. Both aluminum and iron were near or above the surface water standards in the upstream samples, indicating an existing upstream source elevating these two parameters. Metal leaching from the landfill may be responsible for the downstream increase. Arsenic, beryllium, cobalt, copper, and selenium downstream concentration values are slightly above upstream values. The remaining metals group data are also mostly below the reportable detection limit and must be noted as such.

No cyanide or phenols were detected in any surface water sample.

4.6.8 Phase II River Sediment Data

Ramapo River sediments were collected (Figure 4-7) in August 1988. Sediment sampling locations were resampled on 7 and 8 November 1988 (Table 4-17) and analyzed (Appendix E) to replace the August 1988 data set.

4.6.8.1 Volatiles. No volatile organic compounds were present in any sample above its detection limit. Two compounds (methylene chloride and acetone) were found in the laboratory blanks as well as the samples, demonstrating that these compounds are not present in the samples but a result of laboratory contamination. Instrument carryover contamination was present in each volatile organic TIC scan.

4.6.8.2 Semivolatiles. Semivolatile compounds were present in all downstream samples below their respective method detection levels, except one compound. Fluoranthene is present in RS-1 at 560 ug/kg. SWS-3 contained fluoranthene at 820 ug/kg, but the concentration was estimated.

Semivolatile organic TICs are present in every sample. Two samples are identified by chemical abstract service number: benzo(e)pyrene and 2,3,5-trimethylheptane. Benzo(e)pyrene is found in gasoline lubricating oils, used motor oils, asphalts, coal tars, and crude oils. 2,3,5-trimethylheptane is found in gasoline. Unknown aldol products are found in each sample. Aldol condensation products can be the result of discrete compounds that, through sample extraction and digestion, combine to form a condensation product.

4.6.8.3 Pesticides/PCBs. No pesticides/PCBs were detected in any sample.

TABLE 4-17 (page 1 of 2)
November 1988 River Sediment (RS) Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	RS-1 (Downstream)	RS-2 (Downstream)	SWS-3 (Background)	RS-4 (Upstream)
VOLATILE ORGANICS				
Methylene Chloride	16 b	49 b	41 b	12 b
Acetone	23 b	150 b	38 ab	42 b
Carbon disulfide	ND	ND	ND	ND
1,2-Dichloroethene (total)	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND
Benzene	ND	ND	ND	3 a
Toluene	ND	ND	ND	ND
Xylenes (total)	ND	ND	ND	ND
Tentatively Identified Compounds				
Trichlorofluoromethane	ND	ND	ND	ND
alpha-Pinene	ND	ND	ND	NR
Hexamethylcyclotrisiloxane	ND	ND	ND	NR
Instrument artifact	25 ab	53 ab	310 ab	26 ab
SEMIVOLATILES				
Benzoic Acid	ND	ND	ND	ND
2-Methylnaphthalene	76 a	ND	ND	ND
Diethylphthalate	ND	ND	ND	ND
4-Bromophenyl-phenylether	ND	ND	ND	ND
Phenanthrene	280 a	180 a	ND	ND
Di-n-butylphthalate	ND	ND	ND	ND
Fluoranthene	560	400 a	820 a	ND
Pyrene	450 a	400 a	850 a	ND
Benzo(a)anthracene	350 a	230 a	480 a	ND
Chrysene	490 a	480 a	600 a	ND
Bis(2-ethylhexyl)phthalate	130 a	680 a	650 a	ND
Di-n-octylphthalate	ND	ND	ND	ND
Benzo(b,k)fluoranthene	1,500 x	780 ax	1,640 ax	ND
Benzo(a)pyrene	260 a	230 a	420 a	ND
Naphthalene	85 a	ND	ND	ND
Anthracene	ND	ND	490 a	ND
Dibenzofuran	63 a	ND	ND	ND

All data in micrograms per kilogram (ug/kg or parts per billion (ppb)).
a = Estimated concentration, compound present below method detection level. b = Found in blank.
ND = not detected at analytical detection level, see Appendix E for detection levels. NR = Not run.
x = Indistinguishable isomers.

TABLE 4-17 (page 2 of 2)
November 1988 River Sediment (RS) Data Summary

Tuxedo WD Site NYSDEC I.D. No. 336035

Parameter	RS-1 (Downstream)	RS-2 (Downstream)	SWS-3 (Background)	RS-4 (Upstream)
SEMIVOLATILES (con't)				
Tentatively Identified Compounds				
2,3,5-Trimethylheptane	ND	3,000 a	4,700 a	ND
Benzo(e)pyrene	230 a	ND	ND	ND
Unknown aldol	1,980 aj (2)	1,800 aj (1)	2,300 aj (1)	2,230 bj (2)
Blank contaminant	1,650 ab (2)	2,540 ab (2)	4,980 ab (3)	2,150 ab (3)
Unknown hydrocarbon	1,250 a (3)	19,180 a (9)	20,250 a (8)	3,040 a (4)
Unknown	510 a (1)	5,400 a (1)	16,080 a (9)	ND
PESTICIDES/PCBs				
Endosulfan sulfate	ND	ND	ND	ND
METALS				
Aluminum	4,320,000 f	23,900,000 f	17,200,000 f	16,100,000 f
Antimony	ND	ND	ND	ND
Arsenic	6,600	(7,100)	(6,500)	(2,600)
Barium	72,000	(181,000)	(96,000)	(46,000)
Beryllium	700	(2,300)	(1,600)	(600)
Cadmium	ND	ND	ND	ND
Calcium	2,180,000	5,680,000	8,030,000	(1,280,000)
Chromium	8,100	34,000	25,000	25,000
Cobalt	(3,600)	(15,000)	(12,000)	(5,400)
Copper	57,000 f	95,000 f	95,000	15,000 f
Iron	24,200,000	31,100,000	22,500,000	29,400,000
Lead	42,000 f	91,000 f	82,000	12,000 f
Magnesium	1,630,000 i	5,950,000 i	4,360,000 i	3,380,000 i
Manganese	215,000	626,000	154,000	192,000
Mercury	190	1,800	1,900	ND
Nickel	(11,000)	(41,000)	(26,000)	14,000
Potassium	ND	ND	ND	ND
Selenium	ND e	ND e	ND e	ND e
Silver	ND e	ND e	ND e	ND e
Sodium	ND	(2,510,000)	ND	(552,000)
Thallium	ND	ND	ND	ND
Vanadium	(15,000)	(45,000)	41,000	38,000
Zinc	81,000	414,000	328,000	74,000
OTHER PARAMETERS				
Cyanide	ND	ND	ND	ND
Total Recoverable Phenolics	NR	NR	NR	NR
% Solids	60	17	25	70

All data in micrograms per kilogram (ug/kg or parts per billion (ppb)).
a = Estimated concentration, compound present below method detection level. b = Found in blank. (8) = Number of compounds in group total.
ND = Not detected at analytical detection level, see Appendix E for detection levels. NR = not run.
e = Spike sample recovery not within control limits.
f = Lab QC duplicate analysis not within control limits. ( ) = below contract detection limit but above instrument detection level.
i = Value estimated or not reported due to the presence of interference.

4.6.8.4 Metals. Twenty-three metals were evaluated (Table 4-17) in the river sediment samples.

New York State does not have soil or sediment standards. Therefore, an upstream sample (RS-4) was collected as a basis to compare what metal concentrations may be migrating on site and contributing to downstream concentrations. Another upstream sample (SWS-3) was collected to determine the influence of the railroad tracks and bed on sediment quality. Parameters that increased to a maximum at RS-2, then decreased below the upstream sample, are aluminum, chromium, cobalt, iron, magnesium, nickel, sodium, and vanadium. Parameters that reached their maximum concentration at RS-2 and decreased but are still above the upstream values are arsenic, barium, beryllium, calcium, copper, lead, manganese, mercury, and zinc. Only calcium and mercury concentrations were higher in SWS-3 than RS-2, suggesting that either the railroad or an upstream source may be contributing to downstream concentrations. The general concentration pattern appears to be an increase in downstream sediment concentrations to a maximum at RS-2, then a decrease at RS-1.

Arsenic, barium, copper, lead, and zinc are commonly found in the environment in background concentration soils and bedrock (Ref. 14, Appendix A). However, they are found in higher downstream concentration, suggesting landfill influence.

4.7 CONCLUSIONS

4.7.1 Air Quality

Ambient air OVA readings indicate the presence of volatile organics at the site. Concentrations vary between 0 and 70 ppm. Site perimeter readings do not indicate off-site migration of volatile organics. OVA readings taken at vents indicate elevated readings of volatile organics and methane. It is suspected that those vapors may be migrating toward and across the property line, constituting an off-site release of contaminants.

Ambient HNU readings varied between background and 5 ppm. Moisture, in the form of humidity, severely affected the HNU's performance during trenching operations. HNU readings taken near an on-site culvert and vents gave a maximum reading of (approximately) 400 ppm.

Ambient hydrogen sulfide measurements taken with a Neotronics Exotox 40 gas indicator did not show high concentrations migrating off site. During intrusive investigation (trenching), resulting ambient air concentrations increased to 20 ppm downwind of one trench. Hydrogen sulfide measurements taken next to an on-site culvert produced the following readings: 7 July 1988, 100-300 ppm; 27 July 1988, >200 ppm. During MW-6 installation (north of the culvert and between the toe of the landfill and the railroad tracks) hydrogen sulfide concentrations were between 0 and 6 ppm. While few analytical data exist to define hydrogen sulfide migrating off site, concentrations sufficient to be detected by the human population (0.003 ppm) still migrate off site (across Route 17).

While methane is not considered a contaminant, its presence in the landfill presents potential for ignition and, at worst case, explosion. Methane is commonly produced at sanitary landfills. Its presence during trenching suggests past generation. Follow-up field reading at trench vents suggests continued generation.

4.7.2 Geophysical

The geophysical data illustrate suspected depth to bedrock (50 to 60 ft in some areas) and the nature of the fill. The data interpretation was extended beyond the geophysical company's interpretation to gain more knowledge of the fill. The data indicate an area of high moisture content in the bottom-central portion of the landfill.

4.7.3 Soil Gas

Soil gas data show that at least low levels of contamination from petroleum-related volatiles are distributed throughout most of the fill. High contamination occurs in the central and south-central portion of the landfill. These contaminants are found in such products as gasoline and coal tars. The ethylene volatile fraction indicates solvents (such as used in dry cleaning operations) permeating most of the southern half of the site.

High concentrations of hydrogen sulfide were detected in nine out of 10 soil sampling points chosen for further evaluation. Landfill concentrations were >2000 ppm, indicating large quantities of hydrogen sulfide in the landfill beneath the cap material. Gypsum ($CaSO_4$ $2H_2O$) decays and produces hydrogen sulfide under anaerobic conditions. The area is a possible source for continued hydrogen sulfide gas production. Data are incomplete at this time to determine hydrogen sulfide contours over the entire landfill.

4.7.4 Trenching

Landfill samples collected during the trenching portion of the Phase II investigation show elevated levels of semivolatile organic compounds.

Semivolatile compound analyses indicate high PAH concentrations from the creosote and coal tars associated with railroad tie preservatives. Railroad ties were uncovered during trenching. Dibenzofuran was detected in elevated concentrations in these samples. Dibenzofurans are associated with coal tars and are found in asphalts, roofing material, and hazardous materials. No chlorinated phenols were detected. Since compounds that contain PCDF were not found at the site, it is unlikely that PCDFs will be found at the site.

High metals concentrations are observed and can be connected with the materials dumped on site. The samples are not EP toxic, reactive, or ignitable; however, the waste had high lead leachate and the presence of petroleum makes the waste borderline ignitable.

4.7.5 Test Pits

The testing and analyses indicate that the waste contains high levels of semivolatiles and metals as a result of the landfilling, and are in general agreement with the trench sample data. One sample failed the EPA test for EP toxicity - lead (greater than 5000 mg/l).

The presence of the volatile organic compounds (VOCs) supports previous sample data except that concentrations are lower than would be expected based on the soil gas data. The presence of higher VOC contamination at a depth greater than the depth at which the waste material was sampled cannot be ruled out. The VOC data indicate the presence of hazardous compounds on site, but do not cause the samples to fail the TCLP toxicity tests.

PCBs and pesticides were detected in levels consistent with earlier analyses, but indicate relatively low levels of contamination.

The dioxin analyses indicate the presence of octachlorodibenzo-p-dioxin (OCDD) and heptachlorodibenzo-p-dioxin (HpCDD), which are not the carcinogenic dioxin called 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD). Using the equivalency factors listed in Table 4-18 for HpCDD and OCDD compounds (Ref. 15, Appendix A), the converted

TABLE 4-18

TCDD EQUIVALENT CONCENTRATIONS

Tuxedo WD Site NYSDEC I.D. No. 336035

CONGENER	TEF[a]	TP-1A SH336035-21 ACTUAL CONC. (ug/kg)	TP-1A SH336035-21 EQUIVALENT CONC. (ug/kg)	TP-2A SH336035-22 ACTUAL CONC. (ug/kg)	TP-2A SH336035-22 EQUIVALENT CONC. (ug/kg)
2,3,7,8-TCDD	1.0	ND	-	ND	-
ΣTCDD	0.01	ND	-	ND	-
1,2,3,7,8-PeCDD	0.1	ND	-	ND	-
ΣPeCDD	0.01	ND	-	ND	-
1,2,3,6,7,8-HxCDD	0.1	ND	-	ND	-
1,2,3,7,8,9-HxCDD	0.1	ND	-	ND	-
ΣHxCDD	0.01	ND	-	ND	-
ΣHpCDD	0.001	3.1	0.0031	ND	-
ΣOCDD	0.001	27.0	0.0270	9.1	0.0091
Total Equivalent TCDD Conc. (ug/kg)			0.0301		0.0091

Source: Ref. 15, Appendix A.

[a]TEF - TCDD equivalent factors.

concentrations for samples TP-1A and TP-2A would be 0.0301 ug/kg (parts per billion) and 0.0091 ug/kg, respectively. These converted concentrations represent what the equivalent concentration would be if the dioxin was TCDD. The Center for Disease Control and EPA have adopted a 1.0 ug/kg (parts per billion) action level for TCDD; NYSDEC has also adopted this level. The levels detected at Tuxedo are 30 to 100 times lower than this action level and do not present a significant threat to the environment or human health. However, this conclusion is based on the assumption that the two samples are an accurate representation of the average concentration over the entire site. Statistically, it is questionable whether this is a valid assumption. Table 4-19 indicates the presence of various types of dioxins in normal, everyday materials. The concentrations found in the Tuxedo soils are higher than these values and indicate the possibility of sources other than these materials.

4.7.6 Groundwater

At this time volatile and semivolatile organics were determined not to have been detected in the groundwater monitoring wells. Metal contamination is observed in the data, indicating contamination is beginning to migrate off site. The groundwater temperature also indicates that the landfill is leaching into the groundwater. The metals may be more leachable because soil and landfill pH is low. Metals, organics, and other parameters specific to landfills should be collected and analyzed every quarter to detect any parameter trend early so additional remedial actions can be discussed or implemented.

4.7.7 Surface Water

No organics were detected. Metals were not significantly above background samples. Downstream North Jersey Water Company data

TABLE 4-19

CONCENTRATIONS OF PCDF AND PCDD IN PAPER (ppb)[a]

Tuxedo WD Site NYSDEC I.D. No. 336035

CONGENER	NEWSPRINT	LABORATORY FILTER	COFFEE FILTER	COSMETIC TISSUE	RECYCLED SCRAP PAPER
2,3,7,8-TCDF	-	0.004	0.0057	0.013	0.013
TCDF	0.0026	12	0.010	0.039	0.026
2,3,7,8-TCDD	-	0.0003	0.0010	0.0011	0.0006
TCDD	<0.0004	0.0020	0.0010	0.0063	0.0088
1,2,3,7,8-PeCDF	-	-	-	0.0004	-
2,3,4,7,8-PeCDF	-	-	-	0.0004	-
PeCDF	<0.0004	0.0095	0.0037	0.0095	0.0028
1,2,3,7,8-PeCDD	-	0.0002	-	0.0006	0.0009
PeCDD	0.0016	0.016	0.0021	0.033	0.048
2,3,4,6,7,8-HxCDF	-	0.0001	0.0002	-	0.0002
HxCDF	0.0008	0.0020	0.0012	0.0029	0.0032
1,2,3,6,7,8-HxCDD	0.0012	0.0032	-	0.012	0.048
1,2,3,7,8,9-HxCDD	-	0.0015	-	0.0042	0.019
HxCDD	0.0077	0.023	0.0021	0.079	0.335
HpCDF	0.0018	0.0011	0.0003	0.0029	0.0015
HpCDD	0.0043	0.0042	0.0010	0.015	0.037
OCDF	0.0019	0.0003	-	0.0024	0.0015
OCDD	0.037	0.0064	0.0019	0.056	0.058

Source: Ref. 13, Appendix A.

[a]The sum values include the toxic congeners.

(Table 4-5) show a slight increase over upstream data. Like groundwater, the surface water exhibits a slight increase in metals, probably from the landfill.

4.7.8 River Sediment

Several semivolatile compounds and TICs were detected in elevated concentrations in downstream sediments. These compounds are associated with petroleum products, suggesting landfill influence. Metals found in concentrations above the upstream sample suggest landfill influence. Calcium and mercury were higher in the sample collected next to the railroad tracks, suggesting that the railroad may be influencing that sample or that the landfill may be influencing the sediments in that vicinity as well as the downstream locations.

4.8 DISCUSSION

The Tuxedo Waste Disposal Site should have accepted only construction and demolition wastes. NYSDEC inspection records of the site and observations of the waste materials in the trenches show that the site was used to dispose of non-C&D wastes. There are allegations that hazardous wastes were also dumped at the site, although the Phase II investigation did not discover any pure product or drums of hazardous wastes. Based on the data from the Phase II investigation, LMS concludes the following about the site:

4.8.1 H_2S

The production of H_2S from the landfill is a major nuisance to the neighbors, town, and travelers on Route 17 or the New York State Thruway by the site. The impact on sensitive environments may be affected as well (Ref. 16, Appendix A). H_2S is produced from the anaerobic decomposition of foodstuffs and other materials in sanitary landfills and of gypsum wallboard in C&D landfills. The Tuxedo landfill is peculiar because of the amount of gas and the speed with which it forms. The amount is related to the large size of the landfill; the speed is probably related to treatment of the wastes before disposal. Normally, wallboard requires a certain amount of time to decompose: first, because chunk pieces have to be broken down, second, because the landfill must be anaerobic, which occurs either through decomposition or saturated conditions. Observations of the waste samples noted no wallboard chunks; however, the materials did appear to have been ground and were blackened. It was concluded that the majority of the materials dumped at the site were ground, most likely by large grinders at transfer stations. Grinding wallboard or plaster from demolition of houses would pulverize the material into powder, which would then readily and quickly decompose to produce H_2S. The large amounts of petroleum compounds would help turn the site anaerobic without saturation by rainwater.

The petroleum compounds act as a readily usable carbon source for soil bacteria to metabolize. This greatly increases soil microbial activity. Rapid metabolism by soil microbes causes a depletion of oxygen just below the ground surface even though unsaturated conditions may exist there. In effect, the bacteria are utilizing the oxygen faster than it can diffuse from the atmosphere. The end result is anaerobic conditions very close to the ground surface in the unsaturated zone.

The soil gas data and other H_2S readings indicate that the landfill is continuing to produce H_2S. The cover material does appear to restrict the release of gases, as indicated by the high H_2S readings in the soil gas; however, with no release points, vents are created to relieve the pressure of the gases being produced. The volume or duration of H_2S production was not investigated in this

Phase II and should be studied in future investigations of the site.

4.8.2 Nature of Wastes

Non-C&D wastes were dumped at this site; however, the complete nature or content of the materials is not known. The only analytical information to directly characterize the waste is from the analyses of the samples from the three 18-ft-deep trenches and five 10-ft-deep test pits. Detection of high concentrations of contaminants in leachate samples or downgradient groundwater monitoring well samples can confirm the presence of hazardous waste at a site, but this has not occurred as yet at the Tuxedo site. The Tuxedo landfill is likely to be too new to have developed significant leachate that would migrate and be detected in downgradient wells. Also, the trench samples are only from the top 20 ft of the landfill, representative of the third lift at trench T-3 and the second lift at trenches T-1 and T-2. It is not known what was buried in the first lift or in the pits dug at the bottom.

For that portion of the landfill sampled, the samples indicate large amounts of petroleum products in the wastes. These included coal tars, gasoline fractions, and many unknown petroleum hydrocarbons. The soil gas analysis also verified the presence of the petroleum products. Based on the extent and concentration of the PAHs and associated chemicals, the landfill accepted petroleum-contaminated wastes/soils. The high lead concentration in the wastes and EP toxicity tests also point to disposal of gasoline-contaminated soil, probably from the excavation of spills at gasoline stations. One sample failed the EPA EP toxicity test for lead. Other PAH wastes such as oil tank sludges may also have been dumped.

No free product or buried drums were found in the trench samples. However, both the trench samples and soil gas analyses indicate the presence of 1,2-dichloroethylene, trichloroethylene, and tetrachloroethylene, volatile organic compounds used in many industries, particularly dry cleaning. These ethylene fractions are considered hazardous substances and are found together because they represent different stages of decomposition. These compounds are present throughout the landfill, with highest concentrations in the middle. The concentration and extent indicate that the compounds were disposed of at the site and are not coincidental with wastes, i.e., it was not from a few bottles of household cleaners. Again, it can only be hypothesized on what or how these hazardous substances were disposed, and where the chemicals came from is unknown. Three possibilities are (1) "cocktailing" of C&D wastes, i.e., dumping of liquid wastes in C&D waste or mixing ground C&D waste with material contaminated with liquid wastes at transfer stations; (2) C&D wastes from a dry cleaning or other facility that used the compounds; or (3) contaminated soil from cleanup of spills of the compounds.

Some pesticides and chemicals used as fumigants were found in the wastes, but small amounts are likely contributed by incidental dumping, i.e., household products, treated wood, or soil treatments routinely used around homes or buildings.

4.8.3 Impact on Groundwater

There appears to be a clear correlation between the high metals concentrations found in the landfill, the high readings in the downgradient wells, and the slight increase downstream in the Ramapo River. The metals are the first chemicals to leach out because of the amounts present in the landfill and they likely are soluble under the anaerobic, acid conditions in the fill. Organics (volatiles, base neutrals) are found in lower quantities and are less soluble; the petroleum compounds are also insoluble. We believe that the metals found in the groundwater are the first indication that the landfill has started to leach chemicals. The landfill is too new or not sufficiently saturated to leach out the organics or petroleum compounds; however, it appears to be only a matter of time before these chemicals also leach into the groundwater. It is likely that the lower portions of the landfill may be saturated, and these areas may be the cause of the reported leaching. The high groundwater temperatures indicate this possibility; MW-5 and MW-6 are installed in the low point of the landfill and have the highest temperatures.

Since the shallow groundwater in this area flows directly into the Ramapo River, all chemicals found in the groundwater will eventually end up in the river. The metals data in the river show a slight indication of this; dilution by the river flow is the reason the impact is not more significant.

4.8.4 Threat to Public Health

At this time the Tuxedo WD Site does not appear to be an immediate threat to the general public health. Low levels of H_2S are present on and off the site, as evidenced by meter readings and widespread odor complaints, and many residents and travelers are therefore exposed to low levels of H_2S. This Phase II investigation did not review any possible long-term health hazard associated with low levels of H_2S. However, due to the severity of the noxious odors, the widespread impact, and the long duration the residents have had to endure the odors, the physical and psychological well-being of the residents in the area has probably been impacted. One potential hazard is the open culvert exiting the landfill near the railroad tracks. Very high concentrations of H_2S have been recorded at this opening, and if a person or an animal was in the culvert or on the ground next to the opening, the concentrations of H_2S at times could be life-threatening.

The methane production, although not an immediate danger, is also potentially troublesome. At some of the vents the methane may be in sufficient quantities to be ignitable. The larger concern is the potential for fire at the landfill. The combination of methane and petroleum compounds could fuel a large underground landfill fire, if the landfill was somehow set on fire. Since the landfill is freely accessible to anyone, the possibility of an accidental or deliberately set fire exists.

Since the one groundwater well near the landfill (antique store) is no longer using its well, and the groundwater is not used as a direct water supply, the metals contamination does not pose an immediate threat to public drinking water. The Ramapo River is a Class A river and used for drinking water supply some 3 miles downstream; however, at this time the dilution of the contaminated groundwater appears to minimize the effect on the river. The threat to the river is not immediate, but unless the leachate is corrected, the potential exists for contamination of the river.

CHAPTER 5

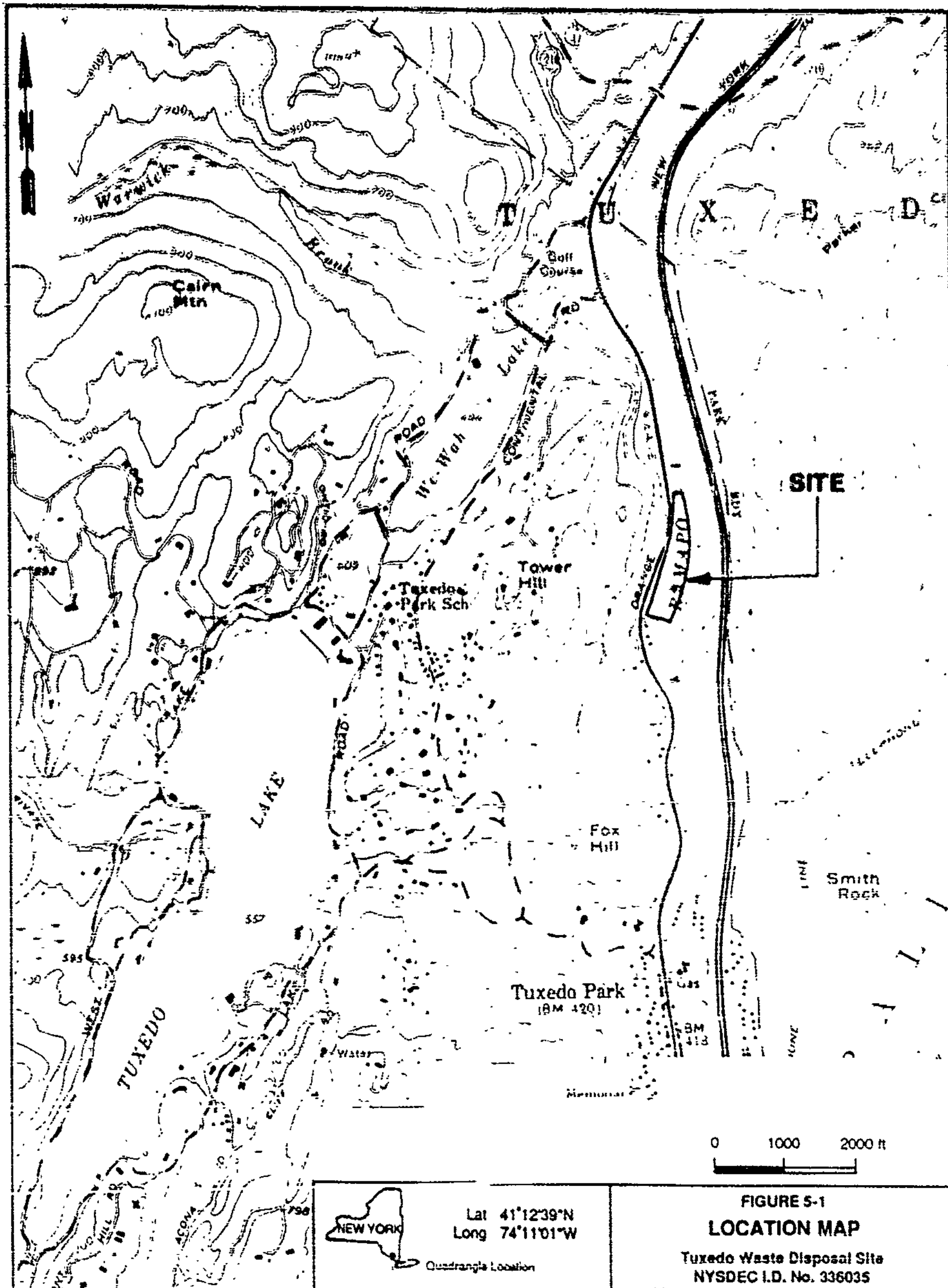
CHAPTER 5

FINAL APPLICATION OF THE HAZARD RANKING SYSTEM

5.1 NARRATIVE SUMMARY

The Tuxedo Waste Disposal (WD) Site covers approximately 12 acres in the Town of Tuxedo, Orange County, New York. Construction and demolition (C&D) and non-C&D material were deposited as three lifts in the property's natural depression from the end of February 1987 to the beginning of October 1987. Mr. Frank Sacco, as manager, operated the landfill operation on the property, which is owned by Renard Barone, Esq., and Mr. Sarkis Khourouzian. The operator disposed of approximately 500,000 yd^3 of C&D and non-C&D material on the site. This included tires, railroad ties, automobile parts, paper and cardboard, hospital paper refuse, and white goods. According to tests conducted by NYSDEC and LMS during this Phase II investigation, soil, groundwater, and possibly surface water are contaminated. The source of the contaminants is believed to be coal tar, gasoline, and petroleum hydrocarbon products in the landfill. The site is located east of New York State Route 17 and west of the Ramapo River, north of the Town of Tuxedo. The site is bounded on the south by Georgia Institute of Technology Foundation property and on the north by Johnson's Antiques. The operator and owner have been issued numerous 6 NYCRR Part 360 violations. A temporary restraining order was issued on 7 October 1987 to close the site. A 23 March 1988 court decree continues the legal action to close the landfill permanently. Preliminary cover material was graded on site in April 1988. No further cleanup actions have been implemented.

5.2 LOCATION MAP



Source: USGS Topographic Map Sloatsburg, NY-NJ.

FIGURE 5-1

LOCATION MAP

Tuxedo Waste Disposal Site
NYSDEC I.D. No. 336035
1988 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

5.3 UPDATED HRS WORKSHEETS

HRS COVER SHEET

Facility Name: Tuxedo Waste Disposal Site

Location: Town of Tuxedo, Orange County, NY

EPA Region: II

Person(s) in charge of the facility: Renard Barone, Esq. (owner)
Tuxedo, NY
Sarkis Khourouzian (owner)
Sloatsburg, NY

Name of Reviewer: Mark G. Creager **Date:** 1 March 1989

General description of the facility:
(For example: landfill, surface impoundment, pile, container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action; etc.)

Landfill contains construction and demolition (C&D) and non C&D debris. Located in Tuxedo, Orange County, New York. Landfill borders NYS Route 17 on the west and Conrail railroad tracks to the east (the Ramapo River is immediately east of the railroad tracks). The NYS Thruway and Harriman State Park are adjacent to the Ramapo River. To the west beyond the Village of Tuxedo Park is Sterling Forest. The Village begins within a 1/4 mile west of the site. 30 ft north of the site is an antique store that uses a private well. Most of the Village (90%) uses municipal water supplied from Tuxedo Lake (1980 census 3069 people). Evidence of release to environment confirmed by all routes. Groundwater and surface water show metal contamination. Air contaminated primarily by hydrogen sulfide.

Scores: S_M = 29.98 (S_{GW} = 38.78 S_{SW} = 11.96 S_A = 32.31)

S_{FE} = 28.13

S_{DC} = 25.00

GROUNDWATER ROUTE WORK SHEET

RATING FACTOR	ASSIGNED VALUE (circle one)	MULTIPLIER	SCORE	MAXIMUM SCORE	REFERENCE (section)
1 OBSERVED RELEASE	0 (45)	1	45	45	3.1
If observed release is given a score of 45, proceed to line 4					
If observed release is given a score of 0, proceed to line 2					
2 ROUTE CHARACTERISTICS					3.2
Depth of Aquifer of Concern	0 1 2 3	2		6	
Net Precipitation	0 1 2 3	1		3	
Permeability of the Unsaturated Zone	0 1 2 3	1		3	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score			–	15	
3 CONTAINMENT	0 1 2 3	1	–	3	3.3
4 WASTE CHARACTERISTICS					3.4
Toxicity/Persistence	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 TARGETS					3.5
Ground Water Use	0 1 (2) 3	3	6	9	
Distance to Nearest Well/Population Served	0 4 6 8 10 / 12 16 18 (20) / 24 30 32 35 40	1	20	40	
			26	49	
6 If line 1 is 45, multiply 1 x 4 x 5					
If line 1 is 0, multiply 2 x 3 x 4 x 5			22,230	57,330	
7 Divide line 6 by 57,330 and multiply by 100					

S_{gw} = 38.78

SURFACE WATER ROUTE WORK SHEET

RATING FACTOR	ASSIGNED VALUE (circle one)	MULTIPLIER	SCORE	MAXIMUM SCORE	REFERENCE (section)
1 OBSERVED RELEASE	0 (45)	1	45	45	4.1
If observed release is given a value of 45, proceed to line 4					
If observed release is given a value of 0, proceed to line 2					
2 ROUTE CHARACTERISTICS					4.2
Facility Slope and Intervening Terrain	0 1 2 3	1		3	
1-yr 24-hr Rainfall	0 1 2 3	1		3	
Distance to Nearest Surface Water	0 1 2 3	2		6	
Physical State	0 1 2 3	1		3	
Total Route Characteristics Score			–	15	
3 CONTAINMENT	0 1 2 3	1	–	3	4.3
4 WASTE CHARACTERISTICS					4.4
Toxicity/Persistance	0 3 6 9 12 15 (18)	1	18	18	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
Total Waste Characteristics Score			19	26	
5 TARGETS					4.5
Surface Water Use	0 1 2 (3)	3	9	9	
Distance to a Sensitive Environment	(0) 1 2 3	2	Ø	6	
Population Served/ ~~Distance to Water~~ Intake Downstream	(0) 4 6 8 10 / 12 16 18 20 / 24 30 32 35 40	1	Ø	40	
Total Targets Score			9	55	
6 If line 1 is 45, multiply 1 X 4 X 5 / If line 1 is 0, multiply 2 X 3 X 4 X 5			7,695	64,350	
7 Divide line 6 by 64,350 and multiply by 100		S_{sw} = 11.96			

AIR ROUTE WORK SHEET

	RATING FACTOR	ASSIGNED VALUE (circle one)	MULTIPLIER	SCORE	MAXIMUM SCORE	REFERENCE (section)
1	OBSERVED RELEASE	0 (45)	1	45	45	5.1
	DATE AND LOCATION: 11/87, near landfill vents/7/88 near MW-6					
	SAMPLING PROTOCOL: USEPA Method 624 Air/HNU					
	If line [1] is 0, then Sa = 0. Enter on line [5]					
	If line [1] is 45, then proceed to line [2]					
2	WASTE CHARACTERISTICS					5.2
	Reactivity and Incompatibility	0 1 (2) 3	1	2	3	
	Toxicity	0 1 2 (3)	3	9	9	
	Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
		Total Waste Characteristics Score		12	20	
3	TARGETS					5.3
	Population Within 4-Mile Radius	0 9 12 15 (18) 21 24 27 30	1	18	30	
	Distance to Sensitive Environment	(0) 1 2 3	2	0	6	
	Land Use	0 1 2 (3)	1	3	3	
		Total Targets Score		21	39	
4	Multiply [1] X [2] X [3]			11,340	35,100	
5	Divide line [4] by 35,100 and multiply by 100		S_A =	32.31		

WORKSHEET FOR COMPUTING S_M

	S	S^2
GROUNDWATER ROUTE SCORE (S_{gw})	38.78	1503.89
SURFACE WATER ROUTE SCORE (S_{sw})	11.96	143.04
AIR ROUTE SCORE (S_A)	32.31	1043.94
$S^2_{gw} + S^2_{sw} + S^2_A$		2690.87
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_A}$		51.87
$\sqrt{S^2_{gw} + S^2_{sw} + S^2_A} / 1.73$ (S_M)		29.98

FIRE AND EXPLOSION WORK SHEET

RATING FACTOR	ASSIGNED VALUE (circle one)	MULTIPLIER	SCORE	MAXIMUM SCORE	REFERENCE (section)
1 CONTAINMENT	1 (3)	1	3	3	7.1
2 WASTE CHARACTERISTICS					7.2
Direct Evidence	0 (3)	1	3	3	
Ignitability	0 1 2 (3)	1	3	3	
Reactivity	(0) 1 2 3	1	0	3	
Incompatibility	0 1 (2) 3	1	2	3	
Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
	Total Waste Characteristics Score		9	20	
3 TARGETS					7.3
Distance to Nearest Population	0 1 2 3 (4) 5	1	4	5	
Distance to Nearest Building	0 1 (2) 3	1	2	3	
Distance to Sensitive Environment	(0) 1 2 3	1	0	3	
Land Use	0 1 2 (3)	1	3	3	
Population Within 2-Mile Radius	0 1 2 (3) 4 5	1	3	5	
Buildings Within 2-Mile Radius	0 1 2 (3) 4 5	1	3	5	
	Total Target Score		15	24	
4 Multiply [1] x [2] x [3]			405	1,440	
5 Divide line [4] by 1,440 and multiply by 100		S_{FE} =	28.13		

DIRECT CONTACT WORK SHEET

	RATING FACTOR	ASSIGNED VALUE (circle one)	MULTIPLIER	SCORE	MAXIMUM SCORE	REFERENCE (section)
1	OBSERVED INCIDENT	0 (45)	1	45	45	8.1
	If line 1 is 45, proceed to line 4 If line 1 is 0, proceed to line 2					
2	ACCESSIBILITY	0 1 2 3	1	–	3	8.2
3	CONTAINMENT	0 15	1	–	15	8.3
4	WASTE CHARACTERISTICS TOXICITY	0 1 2 (3)	5	15	15	8.4
5	TARGETS					8.5
	Population Within a 1-Mile Radius	0 1 (2) 3 4 5	4	8	20	
	Distance to a Critical Habitat	(0) 1 2 3	4	Ø	12	
	Total Targets Score			8	32	
6	If line 1 is 45, multiply 1 X 4 X 5 If line 1 is 0, multiply 2 X 3 X 4 X 5			5,400	21,600	
7	Divide line 6 by 21,600 and multiply by 100		S_{DC} =	25.00		

5.4 UPDATED HRS DOCUMENTATION RECORDS

DOCUMENTATION RECORDS
FOR
HAZARD RANKING SYSTEM

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. As briefly as possible summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference that will make the document used for a given data point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: Tuxedo Waste Disposal Site

LOCATION: Town of Tuxedo, Orange County, New York

DATE SCORED: 1 March 1989

PERSON SCORING: Mark G. Creager

PRIMARY SOURCE(S) OF INFORMATION (e.g., EPA region, state, FIT, etc.):

New York State Department of Environmental Conservation (NYSDEC), Albany, New York

- Central Office, Division of Hazardous Waste Remediation/Bureau of Hazardous Site Control (DHWR/BHSC)
- 1988 NYSDEC Phase II Investigation

GROUND WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected (5 maximum):

Aluminum
Arsenic
Iron
Magnesium
Manganese

Rationale for attributing the contaminants to the facility:

PARAMETER	UPGRADIENT MW-1	DOWNGRADIENT MAXIMUM CONCENTRATION (Well)
Aluminum	[47]	2,970 (MW-7)
Arsenic	[2-9]	2,626 (MW-6)
Iron	162	34,400 (MW-6)
Magnesium	[2530]	101,000 (MW-5)
Manganese	[13]	12,300 (MW-6)

Ref. 1

All data in micrograms per liter (ug/l).
[ ] - below contract detection limit but above instrument detection level.
Assigned Value = 45

***

2 ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

No apparent confining layer exists between the overburden and the underlying bedrock aquifer on site. Although a confining layer may be present in other locations, it is not continuous within a 3-mile radius. For HRS scoring purposes, the overburden and bedrock are considered to be a single hydrological unit.

Depth(s) from the ground surface to the highest seasonal level of the saturated zone [water table(s)] of the aquifer of concern:

9.3 ft. In 0 to 20 ft category
Ref. 3

Assigned Value = 3

Depth from the ground surface to the lowest point of waste disposal/storage:

Approximately 50 to 65 ft
Ref. 4

Net Precipitation

Mean annual or seasonal precipitation (list months for seasonal):

46 in.
Ref. 5

Mean annual lake or seasonal evaporation (list months for seasonal):

30.5 in.
Ref. 5

Net precipitation (subtract the above figures):

15.5 in.
Assigned Value = 3

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Glacial outwash deposits
Ref. 6

Permeability associated with soil type:

10^{-3} to 10^{-5} cm/sec
Assigned Value = 2

Physical State

Physical state of substances at time of disposal (or at present time for generated gases):

Solids
Powdered and fine materials (crushed gypsum board)
Ref. 7
Assigned Value = 2

***

3 CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

No linear or leachate collection system; landfill surfaces encourage ponding; no runoff control.
Ref. 8

Method with highest score:

Landfill with no containment system
Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

IN GROUNDWATER (Ref. 1)		IN WASTE (Ref. 9)	
1,2-dichloroethene	Arsenic	Anthracene	Naphthalene
Trichloroethene	Iron	Bis (2-ethylhexyl) phthalate	Phenanthrene
Tetrachloroethene	Magnesium	Chrysene	Phenol
Aluminum	Manganese	Dibenzofuran	Pyrene
	Selenium	Fluorene	Cadmium
			Chromium
			Dieldrin

Compound with highest score:

Several with highest score. They are:

Tetrachloroethene, arsenic, iron, manganese, dibenzofuran, cadmium, chromium, and dieldrin
Assigned Value = 18

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

1-10 tons

Basis of estimating and/or computing waste quantity:

It is estimated that the site contains 500,000 tons of fill material (Ref. 10). Phase II analytical data define areas of extensive fill contamination. However, it cannot be clearly documented that hazardous substances are characteristic of the entire fill. Hazardous substances may have been mixed with C&D material off site or dumped on site. In the HRS context the given quantity is unknown, so the lowest non-zero category is used.

Assigned Value = 1

***

5 TARGETS

Ground Water Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

Drinking water with municipal water from alternate, unthreatened sources presently available.
Ref. 10
Assigned Value = 2

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Approximately 50 to 100 ft north of fill.
Ref. 11

Distance to above well or building:

In the less than 2000 ft category
Assigned Value = 4

<u>Population Served by Ground Water Wells Within a 3-Mile Radius</u>

Identified water-supply well(s) drawing from <u>aquifer(s) of concern</u> within a 3-mile radius and populations served by each:

Private wells scattered throughout area. Municipal water in various areas. Most of Tuxedo and vicinity is on a municipal system (approximately 90%).

NON-MUNICIPAL COMMUNITY WELLS		REF.
NYU Housing Sterling Forest	120 people	12
Southfield Heights Apartments	200 people	12
100 Private Wells (estimated)	380 people	13
Total	700 people	

<u>Computation of land area irrigated</u> by supply well(s) drawing from <u>aquifer(s) of concern</u> within a 3-mile radius, and conversion to population (1.5 people per acre):

None Known

Total population served by ground water within a 3-mile radius:

700 people. In 101 to 1000 category

Assigned Value = 2
Matrix Value = 20

SURFACE WATER ROUTE

1 OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

Barium, calcium, copper, mercury, and zinc.

Rationale for attributing the contaminants to the facility:

PARAMETER	UPGRADIENT RS-4	DOWNGRADIENT MAXIMUM CONCENTRATION (SAMPLE No.)
Barium	[46,000]	181,000 (2)
Calcium	1,280,000	5,680,000 (2)
Copper	15,000	95,000 (2)
Mercury	100 (NB)	1,800 (2)
Zinc	74,000	414,000 (2)

All data in micrograms per kilogram (ug/kg).
[] - Below contract detection limit but above instrument detection level.
HRS allows sediment data to be used with surface water route.
Lead not included, could be from a petroleum product.
All data from Ref. 1.

Assigned Value = 45.

***

2 ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility in percent:

4.7%
Ref. 14

Name/description of nearest downslope surface water:

Ramapo River, approximately 130 ft east of the site
Ref. 14

Average slope of terrain between facility and above-cited surface water body in percent:

7.69%
Ref. 14

Is the facility located either totally or partially in surface water?

Partially. On-site pond was filled with gravel and fill material placed over it.
Ref. 15
Assigned Value = 3

Is the facility completely surrounded by areas of higher elevation?

No
Ref. 14

1-Year 24-Hour Rainfall in Inches

2.6 in.
Ref. 5
Assigned Value = 2

Distance to Nearest Downslope Surface Water

130 ft east of landfill
Ref. 14
Assigned Value = 3

Physical State of Waste

Solid
Powder or fine material
Ref. 7
Assigned Value = 2

***

3 CONTAINMENT

Method(s) of waste or leachate containment evaluated:

Landfill has adequate cover
Landfill diversion system unsound (No diversion system)
Ref. 8

Method with highest score:

Landfill diversion unsound
Assigned Value = 3

4 WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Barium, calcium, copper, mercury, and zinc
Ref. 1

Compound with highest score:

Barium, copper, mercury, and zinc. All score 18
Assigned Value = 18

Hazardous Wastes Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

1-10 tons

Basis of estimating and/or computing waste quantity:

It is estimated that the site contains 500,000 tons of fill material (Ref. 10). Phase II analytical data define areas of extensive fill contamination. However, it cannot be clearly documented that hazardous substances are characteristic of the entire fill. The hazardous substances may have been mixed with C&D material off site or dumped on site. In the HRS context the greater quantity is unknown, so the lowest non-zero category is used.

Assigned Value = 1

***

5 TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

Drinking water
Ref. 16
Assigned Value = 3

Is there tidal influence?

No

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Greater than 2 miles
Assigned Value = 0

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Black Ash Swamp 1.06 miles ESE
Ref. 17
Assigned Value = 0

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

Greater than 2 miles
Assigned Value = 0

Population Served by Surface Water

Location(s) of water-supply intake(s) with 3 miles (free-flowing bodies) or 1 mile (static water bodies) downstream of the hazardous substance and population served by each intake:

Greater than 3 miles
Ref. 13
Assigned Value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre):

None known
Ref. 13

Total population served:

0
Assigned Matrix Value = 0

Name/description of nearest of above water bodies:

Ramapo River
Ref. 8

Distance to above-cited intakes, measured in stream miles:

Greater than 3 miles

AIR ROUTE

1 OBSERVED RELEASE

Contaminants detected:

Toluene
Ethylbenzene
Tetrachloroethene
Hydrogen sulfide

Date and location of detection of contaminants:

PARAMETER	DATE	LOCATION	REF.
Toluene	17, 18 Nov 1987	Vents on landfill	18
Ethylbenzene	17, 18 Nov 1987	Vents on landfill	18
Tetrachloroethene	17, 18 Nov 1987	Vents on landfill	18
Hydrogen sulfide	24 Jul 1988	Monitoring Well 6	19

Methods used to detect the contaminants:

PARAMETER	METHOD
Toluene	EPA Method 624 Air
Ethylbenzene	EPA Method 624 Air
Tetrachloroethene	EPA Method 624 Air
Hydrogen sulfide	HNU photoionization detector

Rationale for attributing the contaminants to the site:

PARAMETER	UPWIND DOWN-WIND	AMBIENT BACK-GROUND	MAXIMUM CONCENTRATION	REF.
Toluene	ND	ND	16,000 ug/m^3 (SS-4)	18
Ethylbenzene	ND	ND	8,800 ug/m^3 (SS-5)	18
Tetrachloroethene	ND	ND	5,700 ug/m^3 (SS-5)	18
Hydrogen sulfide		0	6 ppm (around MW-6)	19

2 WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

All compounds = 0
Ref. 20

Most incompatible pair of compounds:

Group 4A with Group 4B (in Group 18) present and may pose a future hazard.
Ref. 19
Assigned Value = 2

Toxicity

Most toxic compound:

Hydrogen sulfide
Ref. 20
Assigned Value = 3

Hazardous Waste Quantity

Total quantity of hazardous waste:

1 to 10 tons

Basis of estimating and/or computing waste quantity:

It is estimated that the site contains 500,000 tons of fill material (Ref. 10). Phase II analytical data define areas of extensive fill contamination. However, it cannot be clearly documented that hazardous substances are characteristic of the entire fill. The hazardous substances may have been mixed with C&D material off site or dumped on site. In the HRS context the toluene, ethylbenzene, and tetrachlorethene quantity is unknown, so the lowest non-zero category is used. Hydrogen sulfide was generated on site (Ref. 21). Its quantity is: 6 ppm = $6/10^6$ x 500,000 tons = 3 tons. The overall waste category is still the lowest non-zero category.

Assigned Value = 1

3 TARGETS

Population Within 4-Mile Radius

Circle radius used, give population, and indicate how determined:

0 to 4 mi 0 to 1 mi 0 to 1/2 mi (0 to 1/4 mi)

DISTANCE (mi)	POPULATION	HRS VALUE
0-0.25	11.4	18
0-0.5	84	15
0-1.0	440	15
0-4.0	5672	18

Ref. 22
Assigned Value = 18

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

Greater than 2 mi
Assigned Value = 0

Distance to 5-acre (minimum) fresh-water wetland, if 1 mile or less:

Greater than 1 mi.
Ref. 17
Assigned Value = 0

Distance to critical habitat of an endangered species, if 1 mile or less:

Greater than 1 mi
Assigned Value = 0

Land Use

Distance to commercial/industrial area, if 1 mile or less:

100 ft north of site. In the less than 0.25 mile category.
Ref. 11
Assigned Value = 3

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

600 ft East, Harriman State Park. In the less than 0.25 mi category.
Ref. 23
Assigned Value = 3

Distance to residential area, if 2 miles or less:

1 apartment 100 ft north, houses within 1000 ft south.
In the less than 0.25 mi category
Ref. 23
Assigned Value = 3

Distance to agricultural land in production within past 5 years, if 1 mile or less:

None unknown
Ref. 23
Assigned Value = 0

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

None Known
Ref. 22
Assigned Value = 0

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

None Known
Ref. 8
Assigned Value = 0

FIRE AND EXPLOSION

1 CONTAINMENT

Hazardous substances present:

Hydrogen sulfide
Methane
Toluene
Ethylbenzene
Tetrachloroethene

Type of containment, if applicable:

No containment or segregation
Assigned Value = 3

* * *

2 WASTE CHARACTERISTICS

Direct Evidence

Type of instrument and measurements:

DATE	LOCATION	INSTRUMENT	PARAMETER	READING	REF.
17, 18 Nov 1987	Vents near center of landfill	Teldar Air Bag Method EPA 624A	Toluene (ug/m^3) Ethylbenzene (ug/m^3) Tetrachloro-ethene (ug/m^3)	11,000 8,000 5,700	18
17 Jul 1988	Culvert mouth (SE edge of landfill)	Exotex 40	%LEL $\%O_2$ ppm H_2S	>100 10.1 100 to 130	19
27 Jul 1988	Culvert mouth (SE edge of landfill)	Exotex 40	%LEL $\%O_2$ ppm H_2S	>100 4.2 >200	19

(continued)

DATE	LOCATION	INSTRUMENT	PARAMETER	READING	REF.
Jul 1988	SSP-5 Northern end of landfill	Field GC	Hydrogen sulfide (ppm)	732	24
Jul, Aug, Dec 1988	Various soil gas points	Draeger Tube	Hydrogen sulfide (ppm)	>2000	25
9 Aug 1988	Trench 1	OVA w/wo methane filter	Methane (ppm)	>1000	7

Assigned Value = 3

Ignitability

Compound used:

Methane
Ref. 7, 20
Assigned Value = 3

Reactivity

Most reactive compound:

All compounds = 0
Ref. 20
Assigned Value = 0

Incompatibility

Most incompatible pair of compounds:

Group 4A with Group 4B (in Group 1B) present, and may pose a future hazard.
Ref. 20
Assigned Value = 2

* * *

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

1 to 10 tons

Basis of estimating and/or computing waste quantity:

It is estimated that 500,000 tons of C&D material are present at the landfill. Hazardous substances have been detected (see above). Sufficient delineation of those substances generated on-site is lacking (hydrogen sulfide and methane). It is not documented whether the other substances were mixed with the waste off-site or dumped on-site. For HRS scoring purposes, the lowest non-zero category is used.

Assigned Value = 1

* * *

3 TARGETS

Distance to Nearest Population

50 to 100 ft north. In the 51 to 200 ft category
Ref. 11
Assigned Value = 4

Distance to Nearest Building

50 to 100 ft North. In 51 to 200 ft category
Ref. 11
Assigned Value = 2

Distance to Sensitive Environment

Distance to wetlands:

5580 ft ESE. In greater than 100 ft category
Ref. 17
Assigned Value = 0

Distance to critical habitat:

Greater than 0.5 mi
Assigned Value = 0

Land Use

Distance to commercial/industrial area, if 1 mile or less:

50 to 100 ft north. In the less than 0.25 mi category
Ref 11
Assigned Value = 3

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

600 ft test (Harriman State Park). In the less than 0.25 mi category.
Ref. 23
Assigned Value = 3

Distance to residential area, if 2 miles or less:

50 to 100 ft north. In the less than 0.25 mi category
Ref. 11
Assigned Value = 3

Distance to agricultural land in production within past 5 years, if 1 mile or less:

Greater than 1 mi
Ref. 23
Assigned Value = 0

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

Greater than 2 mi.
Ref. 23
Assigned Value = 0

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

No
Ref. 8
Assigned Value = 0

Population Within 2-Mile Radius

From USGS Topographic Map estimate 1999, category 1001-3000
Value = 3

3000. In the 1001 to 3000 category
Ref. 26
Assigned Value = 3

Buildings Within 2-Mile Radius

From USGS Topographic Map estimate 526, category 261-791
Value = 3

789. In the 261 to 790 category.
Ref. 26
Assigned Value = 3

DIRECT CONTACT

1 OBSERVED INCIDENT

Date, location, and pertinent details of incident:

DATE	LOCATION	DETAILS
27 Aug 1987	Landfill vicinity residents	Town supervisor received complaints of "horrible" odor
26 Dec 1987	Landfill vicinity	Strong odors
29 Jan 1988	School near landfill	Children have complained of feeling sick
16 Feb 1988	Landfill vicinity	Throat, esophagus, and bronchial irritation. Silver tarnishes faster.

All notice hydrogen sulfide smell.
Ref. 27
Assigned Value = 45

* * *

2 ACCESSIBILITY

Describe type of barrier(s):

No barrier
Assigned Value = 3

* * *

3 CONTAINMENT

Type of containment, if applicable:

Landfill cover is less than 2 ft; vents are also present
Ref. 7
Assigned Value = 15

* * *

4 WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Hydrogen sulfide (Ref 3, 26)
Barium, calcium, copper, mercury, and zinc. (Ref. 1)

Compound with highest score:

All
Ref. 20
Assigned Value = 3

* * *

3 TARGETS

Population within one-mile radius

440. In 101 to 1000 category
Ref. 26
Assigned Value = 2

Distance to critical habitat (of endangered species)

Greater than 1 mi
Assigned Value = 0

5.5 HRS REFERENCES

HRS REFERENCES

[1] November 1988 NYSDEC Phase II Data (Appendix E in this report).

[2] NYSDEC Phase II Field Investigation (Appendix A of this report).

[3] NYSDEC Phase II Monitoring Well Installation Field Notes (Ref. 3 in Appendix A in this report).

[4] Estimates From Prefill Topographic Map (Figure 4-1 in this report).

[5] Rainfall and Evaporation Maps.

[6] Section 4.3 in this report (Geology).

[7] NYSDEC Phase II Trenching Field Notes (Ref. 2 in Appendix A in this report).

[8] LMS Site Inspection (Section 4.6.1 in this report).

[9] December 1988 NYSDEC Phase II Test Pit Data (Appendix I in this report).

[10] Comparison of Pre- and Postfill Topography. (Section 4.2 and Figures 4-1 and 4-2 in this report).

[11] Sample Location Map (Figure 4-7 in this report).

[12] New York State Atlas of Community Water System Sources. 1982. New York State Dept. of Health, Division of Environmental Protection, Bureau of Public Water Supply Protection. 79p.

[13] 7 April 1988. EPA Preliminary Assessment (Form 2070-12) in Appendix B of this report.

[14] Postfill Topographic Map (Figure 4-2 in this report).

[15] Interview with NYSDEC/DEE forest ranger (Ref. 7 in Appendix A in this report).

[16] 6 NYCRR Environmental Conservation (Ref. 9 in Appendix A in this report).

[17] New York State Wetlands Map.

HRS REFERENCES
(Continued)

[18] 7, 18 November 1987 NYSDEC-collected samples (Table 4-2 and Ref. 1 in Appendix C in this report).

[19] 1988 NYSDEC Phase II monitoring well sampling field notes (Ref. 4 in Appendix A in this report).

[20] HRS Users Manual.

[21] Brunner, D.R., and D.J. Keller. 1972. Sanitary Landfill Design and Operation. EPA SW-65ts, 58p.

[22] Air Route population determination map.

[23] 1988 NYSDEC Phase II Location Map (Figure 5-1 in this report).

[24] 1988 NYSDEC Phase II soil gas data (Section 4.6.3 and Appendix H in this report).

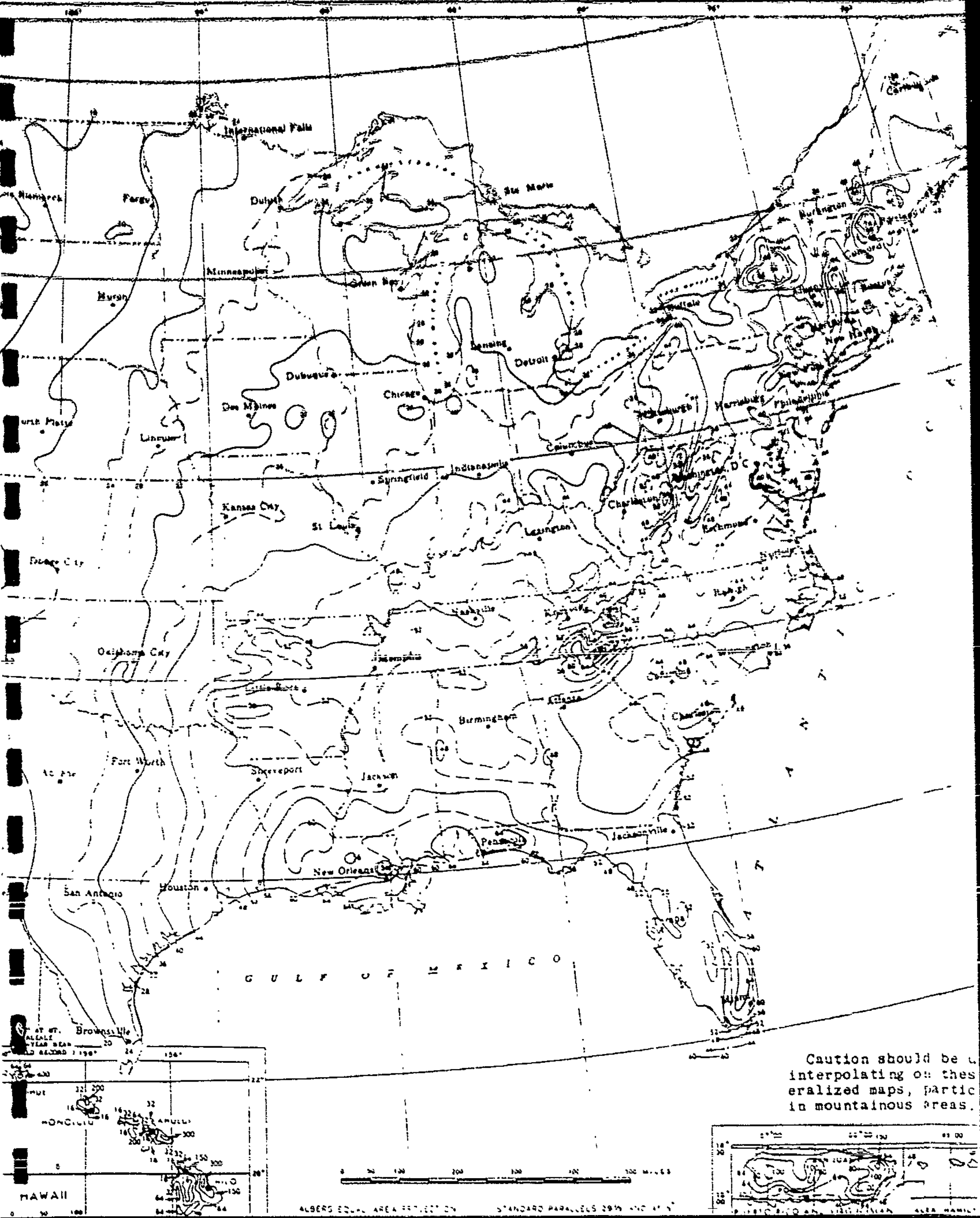
[25] 1988 NYSDEC Phase II soil gas data (Figure 4-12 in this report).

[26] LMS-prepared EPA Site Inspection Report (Section 5.6 in this report).

[27] Various complaint letters.

REFERENCE 5

NNUAL TOTAL PRECIPITATION (inches)



Caution should be u
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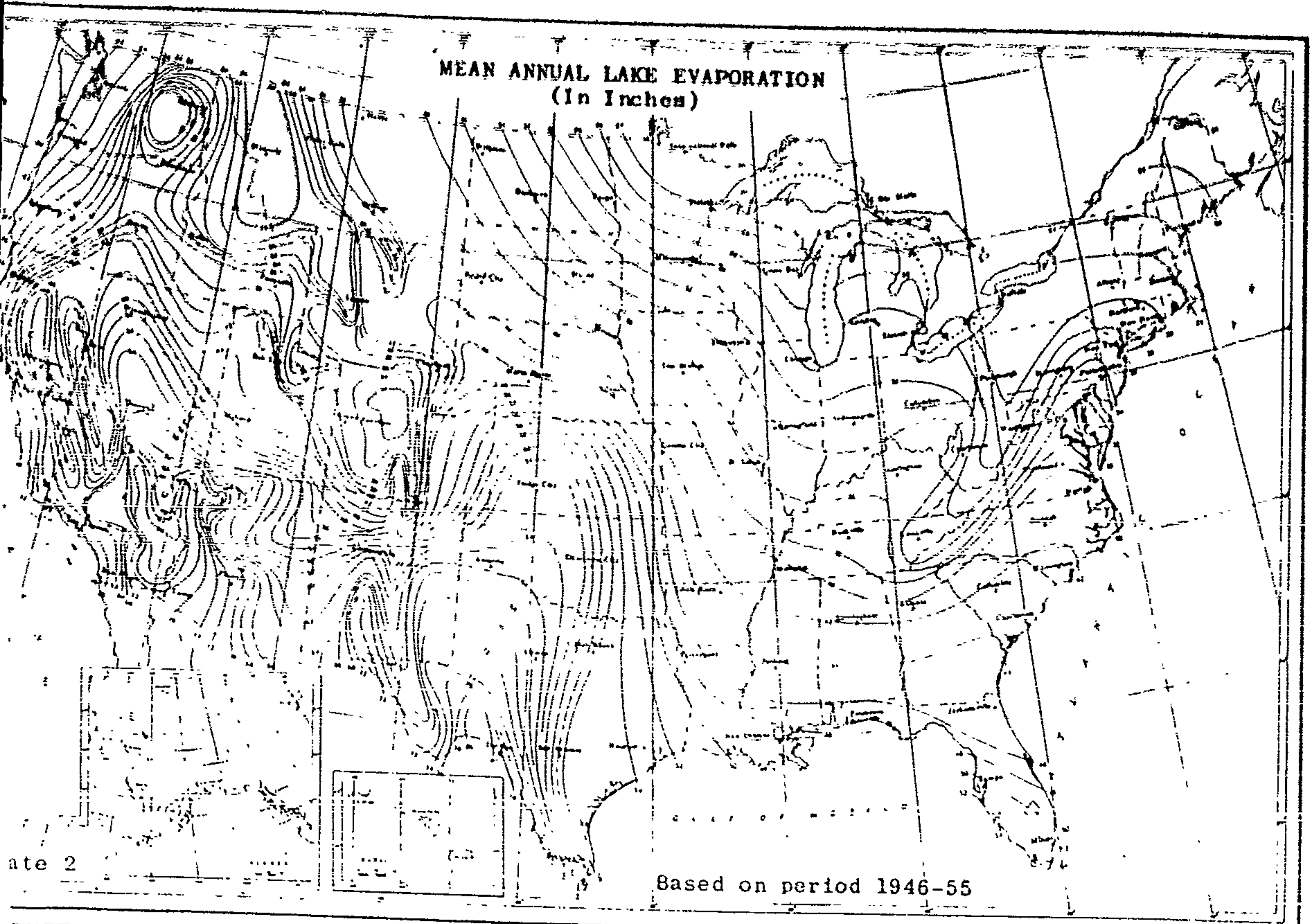
in mountainous areas.

KE EVAPORATION



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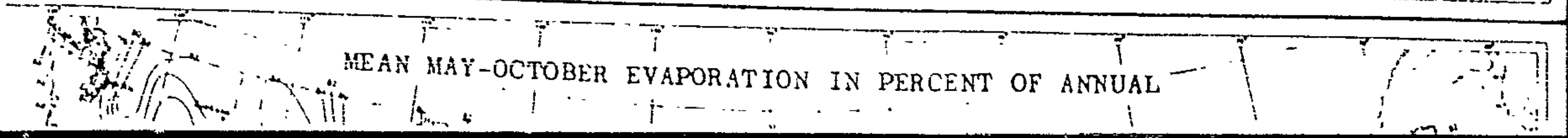
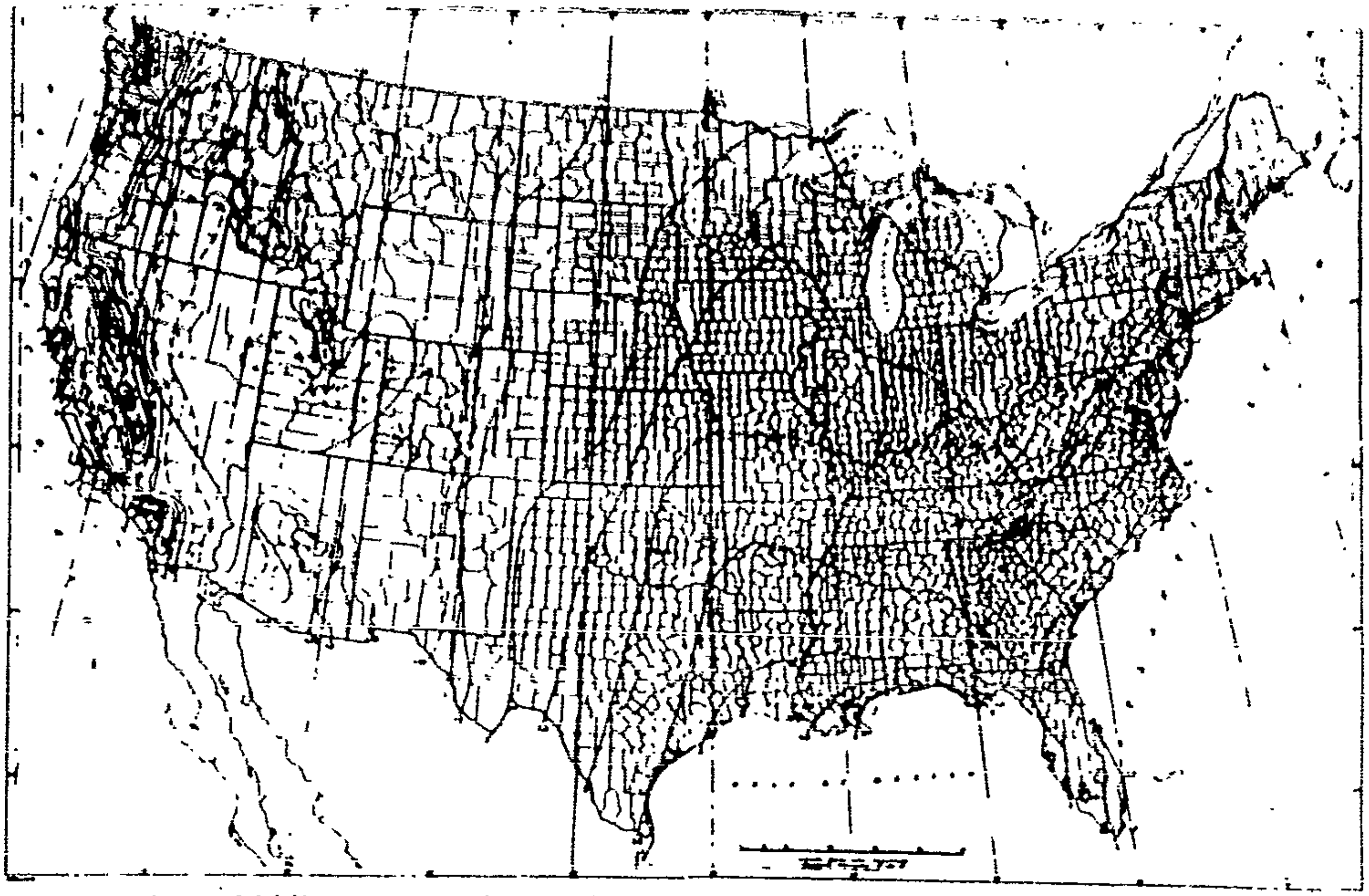




Source: Rainfall Frequency Atlas of the United States, Technical Paper No. 40, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C., 1961.

FIGURE 8
1-YEAR 24-HOUR RAINFALL
(INCHES)

REFERENCE 12

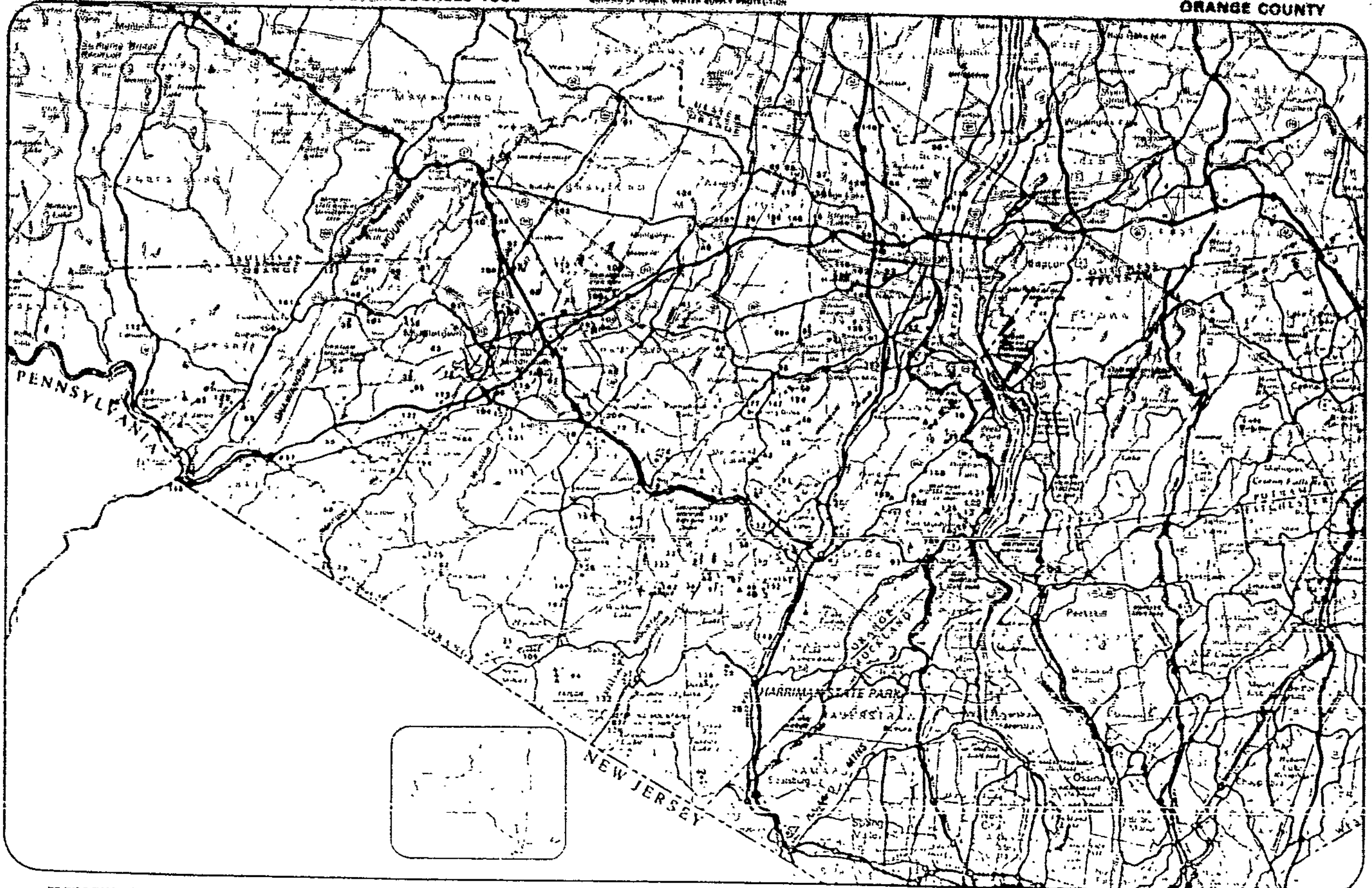
New York State Atlas of
Community Water System Sources
1982

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

LOCATION OF COMMUNITY WATER SYSTEM SOURCES-1982

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL PROTECTION
BUREAU OF PUBLIC WATER SUPPLY PROTECTION

ORANGE COUNTY



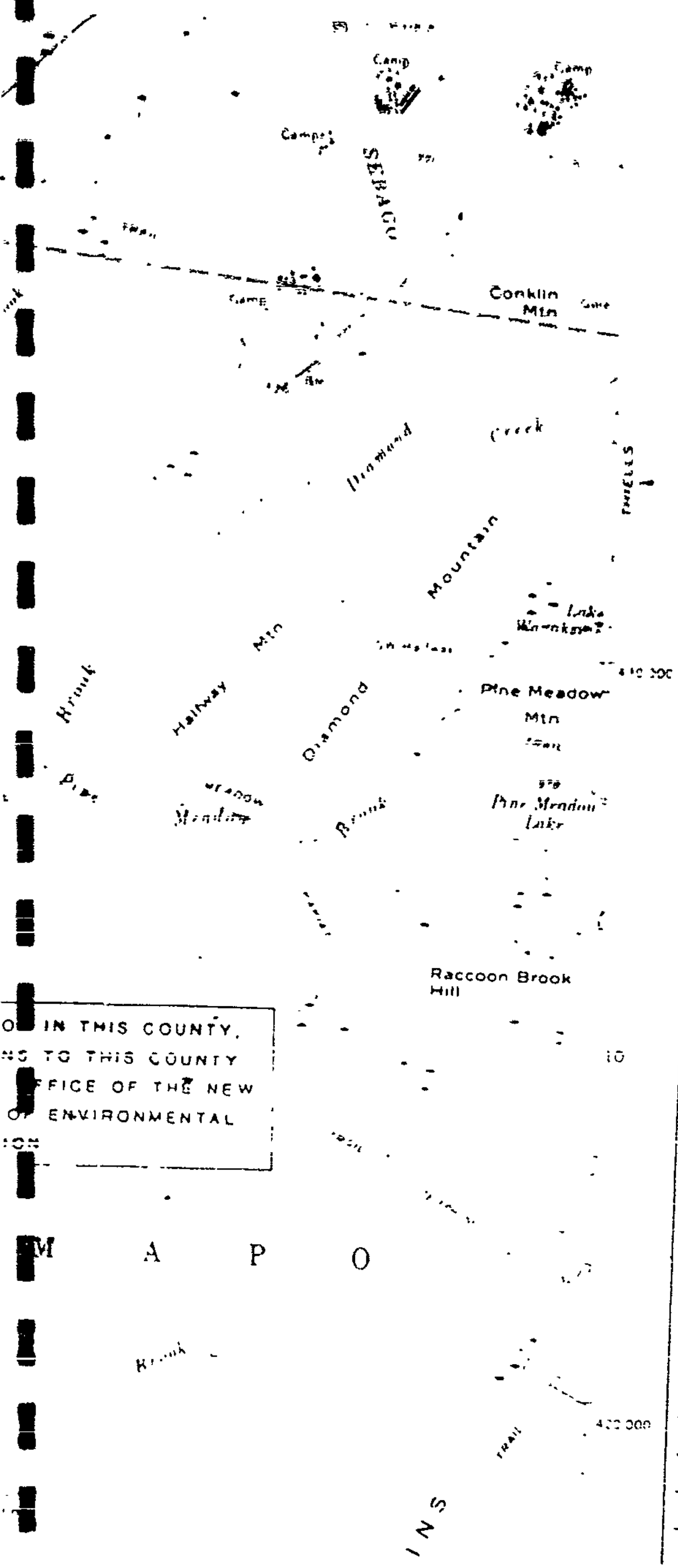
SCALE 1:250 000

NORTH

ORANGE COUNTY

ID NO	COMMUNITY WATER SYSTEM	POPULATION	SOURCE
	Municipal Community		
1	Arden Farms Dairy Company	60	Echo Lake
2	Arrow Park, Inc.	NA	Wells
3	Beaver Dam Lake Development	463	Wells
4	Bellvale Park Water District	100	Wells
5	Blooming Grove Water District #1	2000	Wells
6	Blooming Grove Water District #2 Oxford Heights	80	Wells
7	Blooming Grove Water District #3	200	Wells
8	Chester Village	1910	Walton Lake, Wells
9	Cornwall-on-Hudson, Main Line	3104	Aloe Meadow Reservoir, Arthurs, Tamarac, & Sphagnum Ponds
10	Cornwall-on-Hudson, Mt. Line	300	Upper Reservoir
11	Deer Park Manor	400	Wells
12	Denton Hills	130	Wells
13	Drew Road Association	90	Wells
14	Eurich Heights	300	Wells
15	Fleetwood Manor - Holiday Park	225	Wells
16	Florida Water Works	2000	Glenmere Lake
17	Forest Knolls	400	Wells
18	Goshen Village	5000	Goshen Reservoir
19	Goshen Water District #2 (Arcadia Hills)	750	Wells
20	Goshen Water District #1	500	Wells
21	Greater Display & Wire Forming	75	Wells
22	Greenwood Lake Village	2150	Wells
23	Harriman Village	1000	Wells
24	Hidden Valley Estates	200	Wells
25	Highland Falls Village	5500	Bog Meadow Pond
26	Hill Lake Estates	40	Wells
27	Hillcrest Heights	75	Wells
28	Hillside Acres	80	Wells
29	Indian Hill	2000	Indian Hill
30	J. Ludlam Water Supply	15	Wells
31	Keystone Park	150	Wells
32	King Tract	200	Wells
33	Kiryas Joel	2500	Wells
34	Lake Hill Farms Water District	160	Wells
35	Lake Linda	30	Wells
36	Lake Vue Park Water District	160	Wells
37	Lakewood Homes	60	Wells
38	Lincoln Park	32	Wells
39	Loretes Lake	150	Wells
40	Maple Brook	160	Wells
41	Maybrook Village	2500	Wells
42	Merriwold Water Company	1600	Wells
43	Middletown City	21454	Monhagen, Highland & Shawangunk Lakes
44	Monroe Hills Estates	120	Wells
45	Monroe Village	6000	Lake Mombasha
46	Monroe Water District #1 (High Ridge)	NA	Lake Mombasha
47	Monroe Water District #2 (Sterling Manor)	90	Wells
48	Montgomery Village	2120	Wells
49	Mountain Lodge Park Development	1600	Wells
50	Mountain View Estates	350	Wells
51	New Vernon Estates	150	Wells
52	New Windsor Consolidated Water District	12000	Wells
53	Newburgh City	23438	Lake Washington
54	Newburgh Consolidated Water District	9000	Chadwick Lake
55	Orange Lake Development Company	20	Wells
56	Orchard Hill	176	Wells
57	Orchard Hill Water District	80	Wells
58	Orchard Lake Park	250	Wells
59	Painted Apron Village	18	Wells
60	Pleasant Hill	150	Wells
61	Pine Bush Water District	1500	Wells
62	Pine Island Water Company	50	Wells
63	Port Jervis City	8500	Reservoirs
64	R. Sudbury Lake Acres	60	Wells
65	Robin Meadows	126	Wells
66	Rural Ridge Water District	300	Wells
67	Schaller Water Supply	25	Wells
68	Scotchtown Park	160	Wells
69	Scott Acres	120	Wells
70	Skyview Hills	450	Wells
71	Slate Hill (Ocean)	40	Wells
72	Squirrel Hills	78	Wells
73	Star Industries	NA	Wells
74	Stone Hedge Water Company	160	Wells
75	Sugar Loaf Hills	125	Wells
76	Surrey Meadow Water District	300	Wells
77	Tappan Homes	936	Wells
78	Tuxedo Park Village	1000	Wee-Wah Lake
79	Unionville Village	576	Wells
80	Walden Village	5500	Wells
81	Wallkill Heights	48	Wells
82	Wallkill Water District #1	12000	Wells
83	Walton Lake Estates	900	Wells
84	Warwick Village	4320	Warwick Reservoir
85	Washingtonville Village	NA	Wells
86	Wawayanda Development Corporation	125	Wells
87	West Side Greenwood Lake Water District	1800	Wells
88	Whittier Farms	120	Wells
89	Wickham Village	1100	Wells
90	Woodbury Water District #1	4900	Wells
91	Woodbury Water District #6 (Amber Park)	360	Wells
92	Woodland Acres	100	Wells
	Non Municipal Community		
93	Bear Mountain State Park (Rockland Co. Page 74)		Turkey Lake, Queensboro Lake
94	Bel Air Trailer Park	59	Wells
95	Brittany Terrace	150	Wells
96	Butler Mobile Homes	200	Wells
97	Campbell Water Supply	15	Wells
98	Candlestick Mobile Park	225	Wells
99	Castle High Trailer Park	110	Wells
100	Crystal Run Village Inc	[illegible]	Wells
101	Decker's Bungalow Colony	30	Wells
102	Dombal Trailer Park	70	Wells
103	Dunnean's Place	20	Wells
104	Doodletown Water System (Rockland Co. Page 74)		Queensboro Lake
105	Fair Road Farm	15	Wells
106	Fair Lawn Mobile Village	20	Wells
107	Fairview Hospital	45	Wells
108	Fancher Trailer Court	55	Wells
109	Federal Correctional Institute	500	Wells
110	Gilson Trailer Park	16	Wells
111	Goshen Center for Boys	250	Wells
112	Greenwood Mobile Home Court	125	Wells
113	H A Harris, Inc	35	Wells
114	Hampton Realty Trailer Park	21	Wells
115	Hill and Dale Mobile Home Park	55	Wells
116	Hilltop Haven Trailer Park	54	Wells
117	Hogencamps Trailer Court	6	Wells
118	Holiday Mobile Park Inc	225	Wells
119	Hudson Valley Trailer Park	25	Wells
120	Hudson View Terrace (Lower Section)	120	Wells
121	Hudson View Terrace (Upper Section)	150	Wells
122	Huguenot Estates East	125	Wells
123	K & M Mobile Home Park	46	Wells
124	Kaytake Lodge	30	Wells
125	Kimball Farms	81	Wells
126	Lage Country Homes	NA	Wells
127	Lamplight Village	260	Wells
128	M G W Realty	NA	Wells
129	Mary Crest Convent	[illegible]	Wells
130	Mason's Trailer Park & Apartments	60	Wells
131	Mid-Hudson Psychiatric Center	400	Reservoir
132	Mid-Lake Park	15	Wells
133	Mid-Orange Correctional Facility	1200	Wells
134	[illegible]	100	Wells
135	Mt Airy Trailer Court	240	Wells
136	Mt Hope Foundation-Residence	45	Wells
137	Mt Orange Trailer Park	40	Wells
138	NYU Housing Sterling Forrest	129	Wells
139	Old B-W Realty Corp	30	Wells
140	Otisville Rehabilitation Center	NA	Bear Swamp Reservoir
141	Pine Grove Trailer Park	250	Wells
142	Pius XII School	95	Wells
143	Rock Terrace Trailer Park	110	Wells
144	Schefeick Trailer Park	38	Wells
145	Silver Stream Trailer Court	105	Wells
146	Sleepy Hollow Mobile Park	690	Wells
147	Sees Water Supply	25	Wells
148	South Maple Estates	60	Wells
149	Southfields Heights Apartments	200	Wells
150	Spruce Lodge	350	Wells
151	St Patrick's Villa Group	62	Wells
152	St Patrick's Semi-Military Academy	122	Wells
153	Stoney Ford Trailer Park	30	Wells
154	Sunset Haven	NA	Wells
155	Sunset Trailer Court	36	Wells
156	Thompsons Trailer Court	35	Wells
157	Tri-State Trailer Park	35	Wells
158	U S M A - Stony Lonesome System	12000	Long Pond, Stilwell Lake
159	US Military Academy Lusk System	NA	Popolopen Lake, Queensboro Lake
160	Valley View Park	150	Wells
161	Walden Mobile Home Association	16	Wells
162	Walters Trailer Village	225	Wells
163	Warwick Garden Apartments	11	Wells
164	Wawayanda Trailer Park	15	Wells

REFERENCE 17



New York State Freshwater Wetlands Map

Orange County
Map 25 of 26

This map was promulgated, pursuant to Article 24 of the Environmental Conservation Law (The Freshwater Wetlands Act) on March 25, 1987 by the Commissioner of New York State Department of Environmental Conservation.

LEGEND

(outline symbol)	Approximate wetland boundary
U	Upland inclusion
AA-00	Wetland identification code

NOTES

This map indicates the approximate location of the actual boundaries of wetlands regulated according to the Freshwater Wetlands Act.

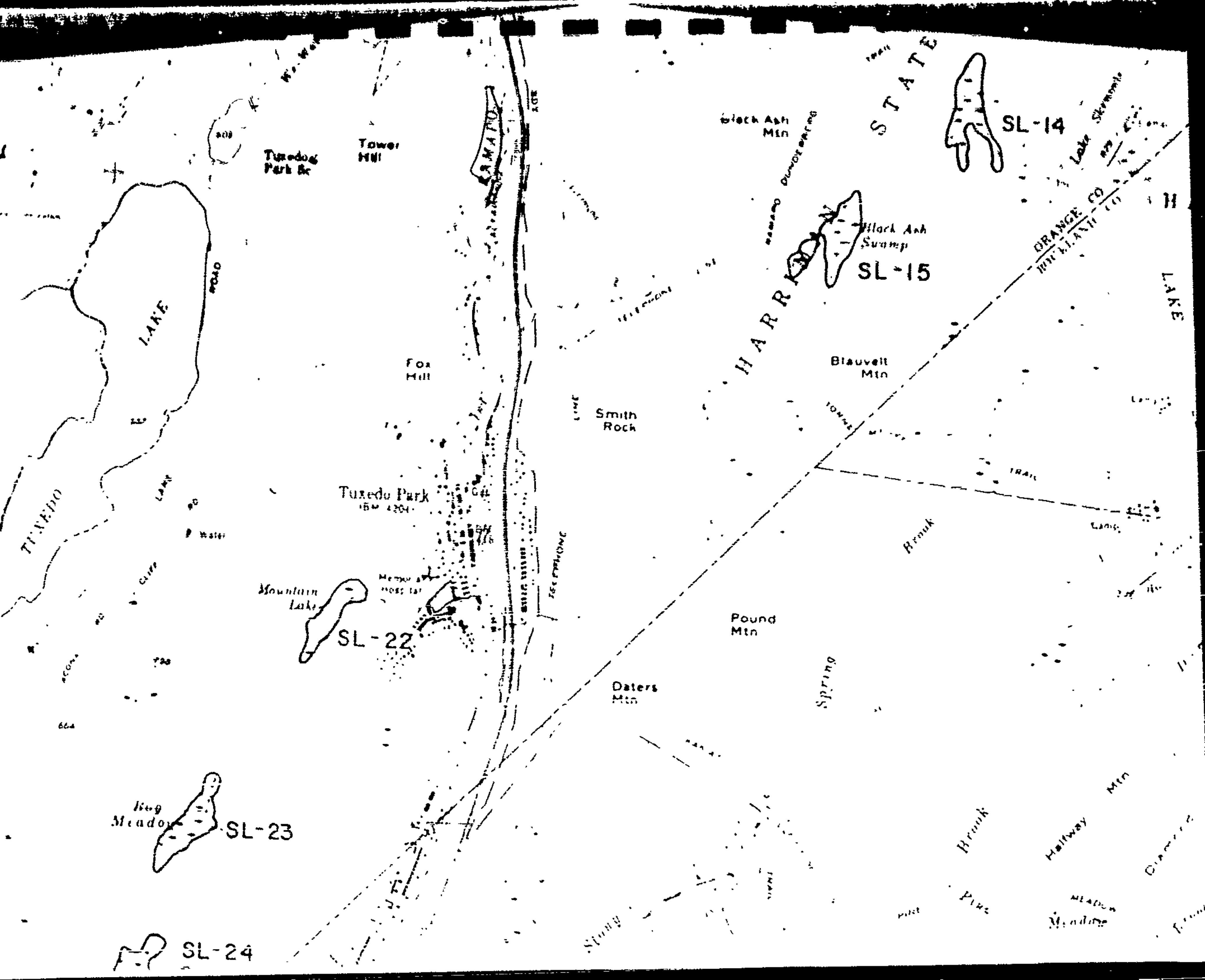
Map information other than the wetland boundaries was prepared by the New York State Department of Transportation and the United States Geological Survey. The additional information provided on the map is for reference only. Marsh symbols do not necessarily indicate the location of a regulated wetland.

Adjacent areas of the regulated wetlands are those areas within [illegible] feet of the boundary of the wetland. These areas are subject to regulation pursuant to the Freshwater Wetlands Act but are not delineated on this map. An adjacent area may be extended by special order of the Commissioner of the New York State Department of Environmental Conservation or the local regulatory authority.

Copies of Freshwater Wetlands Maps are available from the regional offices of the Department of Environmental Conservation. Maps are available for inspection at these offices and local government clerk's offices.

REVISIONS

Date	Wetland #	Description of change



Black Ash Mtn
STATE
SL-14
Tower Hill
Tuxedo Park Sc
LAKE
Black Ash Swamp
SL-15
HARRIMAN
ORANGE CO
ROCKLAND CO
LAKE
Blauvelt Mtn
Fox Hill
Smith Rock
TUXEDO
Tuxedo Park
Brook
Mountain Lake
SL-22
Pound Mtn
Daters Mtn
Spring
Bog Meadow
SL-23
Brook
Halfway
Mtn
Pine
Meadow
SL-24

REFERENCE 20

United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response

EPA

DIRECTIVE NUMBER: 9355.0-3

TITLE: Uncontrolled Hazardous Waste Site Ranking System - A Users Manual

APPROVAL DATE: 07/16/82

EFFECTIVE DATE: 07/16/82

ORIGINATING OFFICE: OERR/OPM

☒ FINAL

☐ DRAFT

STATUS:

REFERENCE (other documents):

OSWER OSWER OSWER

E DIRECTIVE DIRECTIVE D

R 7685

REFERENCE 21

Sanitary Landfill Design and Operation

This report (SW-65ts) was written by
DIRK R. BRUNNER and DANIEL J. KELLER

U.S. ENVIRONMENTAL PROTECTION AGENCY
1972

CHAPTER 2

solid waste decomposition

A knowledge of solid waste decomposition processes and the many influences they exert is essential to proper sanitary landfill site selection and design.

Solid wastes deposited in a landfill degrade chemically and biologically to produce solid, liquid, and gaseous products. Ferrous and other metals are oxidized; organic and inorganic wastes are utilized by microorganisms through aerobic and anaerobic synthesis. Liquid waste products of microbial degradation, such as organic acids, increase chemical activity within the fill. Food wastes degrade quite readily, while other materials, such as plastics, rubber, glass and some demolition wastes, are highly resistant to decomposition. Some factors that affect degradation are the heterogeneous character of the wastes, their physical, chemical, and biological properties, the availability of oxygen and moisture within the fill, temperature, microbial populations, and type of synthesis. Since the solid wastes usually form a very heterogeneous mass of nonuniform size and variable composition and other factors are complex, variable, and difficult to control, it is not possible to accurately predict contaminant quantities and production rates.

Biological activity within a landfill generally follows a set pattern. Solid waste initially decomposes aerobically, but as the oxygen supply is exhausted, facultative and anaerobic microorganisms predominate and produce methane gas, which is odorless and colorless. Temperatures rise to the high mesophilic-low thermophilic range (60 to 150F) because of microbial activity. Characteristic products of aerobic decomposition of waste are carbon dioxide, water, and nitrate. Typical products of anaerobic decomposition of waste are methane, carbon dioxide, water, organic acids, nitrogen, ammonia, and sulfides of iron, manganese, and hydrogen.

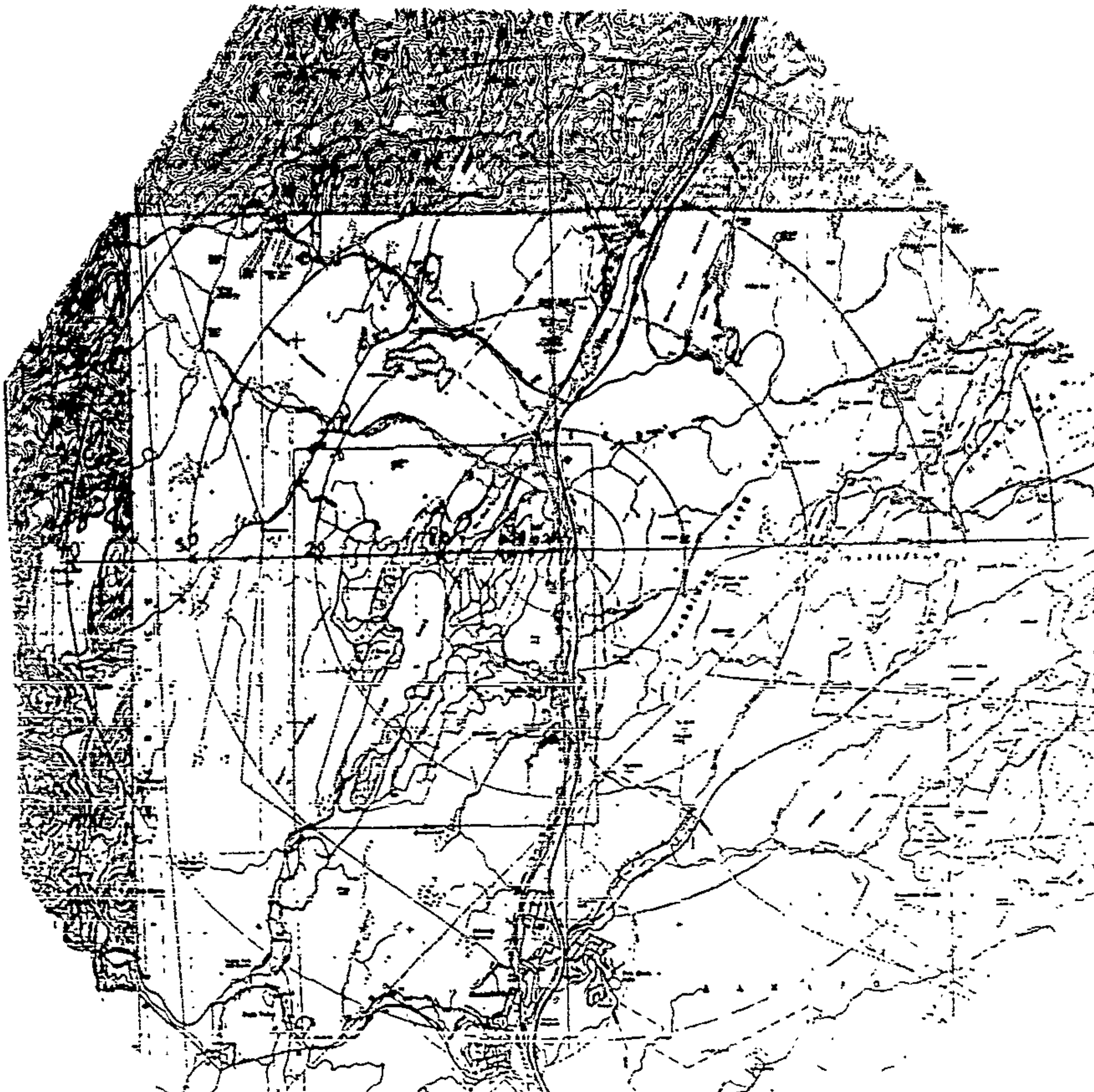
Leachate

Groundwater or infiltrating surface water moving through solid waste can produce leachate, a solution containing dissolved and finely suspended solid matter and microbial waste products. Leachate may leave the fill at the ground surface as a spring or percolate through the soil and rock that underlie and surround the waste.

Composition of leachate is important in determining its potential effects on the quality of nearby surface water and groundwater. Contaminants carried in leachate are dependent on solid waste composition and on the simultaneously occurring physical, chemical, and biological activities within the fill. Identification of leachate composition has been the object of several laboratory lysimeter and field studies.[1-4]

The chemical and biological characteristics of leachate were determined in two studies conducted over a period of time with solid waste of the same general type at both sites (Table 1). The data exhibit a significant range of values. As an example, pH of the leachate investigated in study A was found to vary between 6.0 and 6.5[1] while pH in study B varied between 3.7 and 8.5.[2] Chloride varied from 96 to 2,350 mg per liter in study A and from 47 to 2,340 in study B. Although the leachates for the two studies were similar in many respects, there were differences which further indicate the variability of leachate composition with time for individual sites and between sites. For example, mean sulfate concentrations were 614 mg per liter for study A, ranging from 730 near the start of the

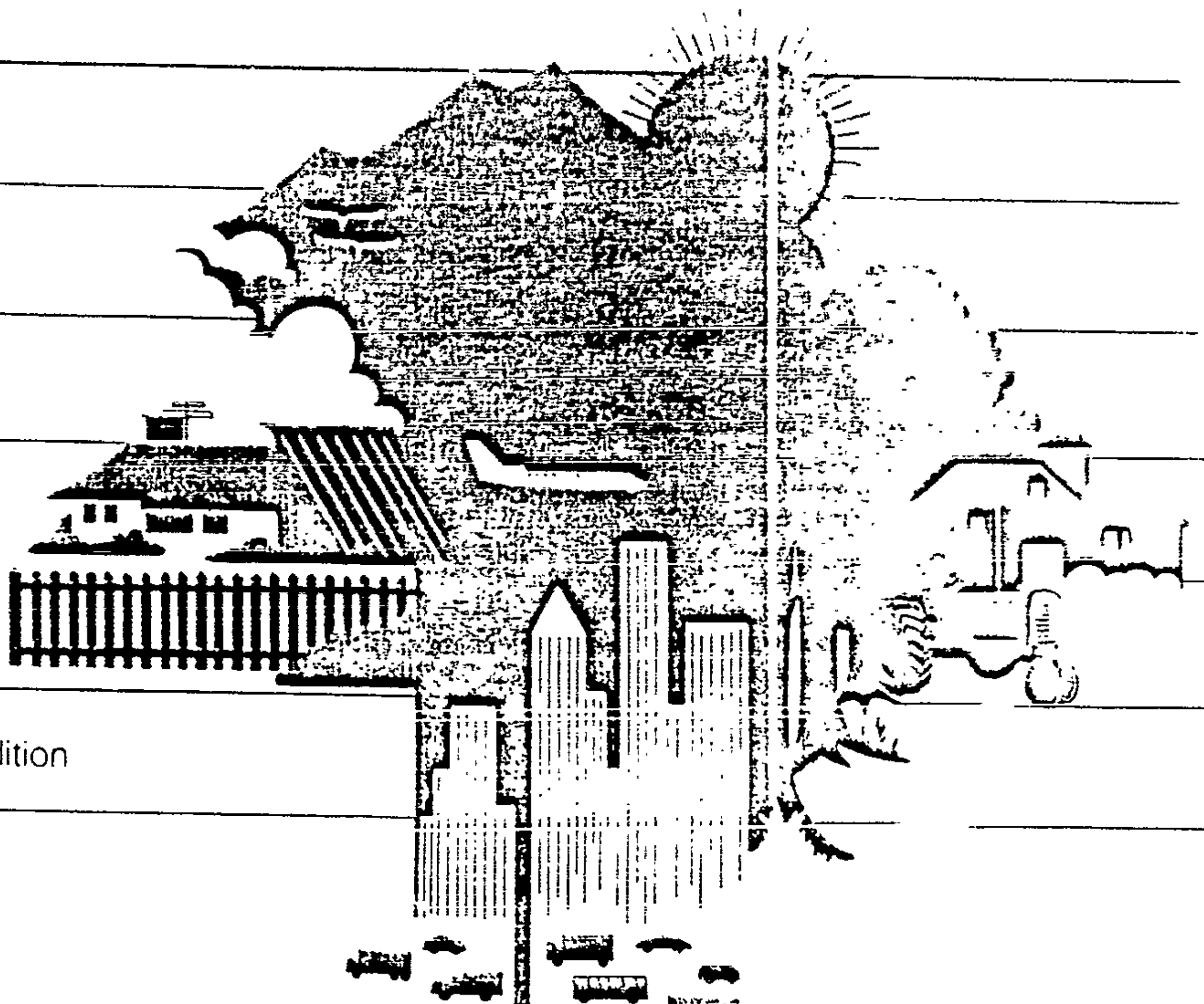
REFERENCE 22



A Statistical Abstract Supplement

County and City Data Book

1983



10th Edition

U.S. Department of Commerce BUREAU OF THE CENSUS

Table D. Places — Area, Population, Income, and Housing—Con.

State and place code	State and place (county name)	Land area, 1980 (Sq. mi.)	Population, 1980 (Apr. 1): Total persons	Percent: Change, 1970-1980	Percent: Black	Percent: Spanish origin	Percent: 65 yrs and over	Percent: High school grad. (adults)	Percent: Below poverty level	Money income, 1979: Per capita (Dol.)	Money income, 1979: Median household (Dol.)	Total housing units	Occupied housing units, 1980 (Apr. 1): Owner occupied: Total	Owner occupied: Percent	Owner occupied: Median value (Dol.)	Median gross rent (Dol.)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
6219	Porter town (Niagara)	32.5	7 251	-2.4	.4	.5	9.5	77.7	4.1	7 802	21 295	2 531	2 269	89.6	47 400	[illegible]
6228	Portland town (Chautauqua)	34.5	4 433	16.6	.9	1.3	11.5	61.0	12.3	6 079	16 071	1 879	1 534	78.0	32 800	[illegible]
6237	Portville town (Cattaraugus)	34.8	4 486	6.5	.7	.7	8.6	73.6	9.9	6 018	15 760	1 635	1 496	78.2	34 400	[illegible]
6246	Potsdam town (St. Lawrence)	105.8	17 411	4.5	.7	.5	7.5	73.0	21.0	4 663	13 040	4 912	4 568	58.1	35 400	[illegible]
6264	Poughkeepsie town (Dutchess)	41.3	39 549	-3.7	3.6	1.6	8.5	77.5	5.0	8 341	22 202	12 799	12 401	72.3	48 100	[illegible]
6273	Pound Ridge town (Westchester)	21.8	4 009	9.7	1.8	1.7	7.9	92.7	3.3	16 937	37 792	1 447	1 290	89.7	140 000	[illegible]
6354	Putnam Valley town (Putnam)	40.7	8 994	72.7	.6	1.2	9.1	77.8	4.7	8 465	24 756	2 950	2 887	82.5	63 400	[illegible]
6363	Queens borough (Queens)	108.6	1 891 325	-4.8	18.8	13.9	14.9	63.1	11.4	7 549	17 026	740 129	711 840	38.1	52 500	[illegible]
6372	Queensbury town (Warren)	62.4	18 978	30.8	.5	.6	11.0	73.8	6.8	7 161	18 068	7 614	6 448	73.9	43 800	[illegible]
6381	Ramapo town (Rockland)	61.1	89 060	19.1	8.8	3.0	8.0	78.5	9.0	8 430	24 788	27 765	26 888	64.0	69 300	[illegible]
6390	Randolph town (Cattaraugus)	34.9	2 689	-1.1	.2	.1	14.7	71.6	13.0	5 605	14 700	958	889	75.5	20 000	[illegible]
6426	Red Hook town (Dutchess)	30.5	8 351	10.0	1.4	1.3	11.7	71.6	8.1	6 410	17 494	2 887	2 611	74.5	44 000	[illegible]
6462	Rhinebeck town (Dutchess)	39.3	7 082	24.8	1.8	2.4	20.8	70.4	6.6	7 152	17 990	2 581	2 389	66.4	48 100	[illegible]
6471	Richfield town (Otsego)	32.5	2 606	.2	-	-	15.6	62.9	10.9	5 392	13 307	1 322	920	74.0	27 300	[illegible]
6465	Richland town (Oswego)	56.4	5 594	6.1	.1	.3	12.6	63.7	13.0	5 513	15 557	2 434	1 950	67.7	30 700	[illegible]
6498	Richmond town (Ontario)	44.0	2 703	40.4	.4	.3	11.4	71.6	6.5	7 103	18 462	1 516	948	80.4	41 500	[illegible]
6516	Ridgeway town (Orleans)	47.2	7 276	1.0	3.1	2.2	12.0	61.1	9.5	6 672	16 679	2 792	2 611	69.9	31 500	[illegible]
6525	Riga town (Monroe)	35.1	4 209	16.0	1.9	.6	7.6	77.6	4.0	8 162	22 770	1 574	1 482	89.9	40 300	[illegible]
6534	Ripley town (Chautauqua)	47.6	3 279	10.1	-	.3	10.6	66.4	10.1	5 076	14 583	1 244	1 077	75.3	26 300	[illegible]
6543	Riverhead town (Suffolk)	67.4	20 243	7.1	13.3	1.2	19.3	60.8	11.0	6 880	15 862	9 188	7 497	76.3	44 400	[illegible]
6597	Rochester town (Ulster)	65.7	5 344	35.4	.6	2.0	12.9	62.6	14.3	5 777	13 319	3 360	1 972	73.1	34 500	[illegible]
6561	Rockland town (Sullivan)	96.2	4 707	7.3	.2	1.5	17.0	59.7	14.8	5 391	12 046	2 737	1 482	67.9	30 300	[illegible]
6597	Rose town (Wayne)	33.6	2 684	13.5	1.0	1.2	11.1	61.3	12.1	5 466	15 643	971	856	85.9	24 900	[illegible]
6615	Rosendale town (Ulster)	20.9	5 933	9.4	.2	.7	12.3	57.9	8.7	6 094	14 632	2 464	2 087	74.9	37 400	[illegible]
6633	Rotterdam town (Schenectady)	36.8	29 451	-4.7	.3	.7	13.5	70.0	3.9	7 172	19 061	10 429	10 292	86.6	36 500	[illegible]
6651	Royalton town (Niagara)	70.2	7 769	5.3	1.2	.3	10.0	67.9	6.2	6 923	19 744	2 654	2 470	85.6	38 202	[illegible]
6660	Rush town (Monroe)	30.6	3 001	-8.7	.9	-	8.9	81.1	1.5	8 752	25 625	969	936	84.6	57 900	[illegible]
6696	Rutland town (Jefferson)	47.7	2 685	9.7	.8	1.2	8.4	67.8	10.2	5 715	16 293	924	840	78.3	30 600	[illegible]
6705	Rye town (Westchester)	11.9	38 896	-10.0	9.3	10.7	14.5	65.2	7.7	9 210	19 884	14 546	14 239	55.6	64 500	[illegible]
6723	Salina town (Onondaga)	18.1	3 064	5.1	-	.9	14.8	57.7	13.6	5 034	12 646	1 180	1 087	70.6	20 500	[illegible]
6759	Sand Lake town (Rensselaer)	14.5	37 400	-2.3	.2	1.0	10.3	73.1	4.3	7 383	19 132	13 751	13 370	[illegible]	[illegible]	[illegible]
6777	Sandy Creek town (Oswego)	36.5	1 027	20.2	.6	[illegible]	8.7	75.0	8.0	6 711	19 157	2 700	2 561	[illegible]	[illegible]	[illegible]
6780	Sanford town (Broome)	47.2	3 222	23.1			12.1	62.6	14.0	5 851	14 081	2 030	1 059	60.6	[illegible]	[illegible]
6795	Saranac town (Clinton)	54.4	2 635	4.2	-	2.7	12.2	65.5	10.1	5 418	14 064	1 422	675	[illegible]	[illegible]	[illegible]
6822	Saratoga town (Saratoga)	[illegible]	3 389	5.4	-	.6	8.9	67.5	6.1	5 173	15 684	1 157	1 066	66.2	[illegible]	[illegible]
6831	Sardinia town (Erie)	42.4	4 595	9.2	-	.2	11.3	63.6	9.4	5 715	14 729	2 049	1 613	74.0	[illegible]	[illegible]
6840	Saugerties town (Ulster)	[illegible]	2 792	11.5	-	.2	8.5	62.9	6.2	4 175	17 181	962	857	81.6	[illegible]	[illegible]
6843	Scarsdale town (Westchester)	65.9	17 275	6.0	.7	1.0	12.7	67.4	8.7	6 463	16 677	7 307	5 226	74.9	34 [illegible]	[illegible]
6867	Schaghticoke town (Rensselaer)	7.6	17 650	-8.2	1.6	1.3	10.7	94.1	1.8	22 950	57 698	5 433	5 381	91.1	[illegible]	[illegible]
6876	Schodack town (Rensselaer)	52.9	7 094	14.1	.3	.3	9.7	68.5	7.9	6 356	19 347	2 331	2 243	84.1	[illegible]	[illegible]
6885	Schoharie town (Schoharie)	83.8	11 345	1.3	.8	.7	11.4	69.9	7.3	7 095	19 226	4 052	3 902	78.6	40 [illegible]	[illegible]
6894	Schroeppel town (Oswego)	30.7	3 107	.5	-	.3	13.7	64.9	13.7	5 542	13 703	1 190	1 084	[illegible]	34 [illegible]	[illegible]
6903	Schuyler Falls town (Clinton)	44.2	8 916	12.1	.7	.5	6.9	65.0	10.5	6 127	17 478	2 884	2 437	78.5	34 [illegible]	[illegible]
6921	Schuyler town (Herkimer)	41.9	2 886	2.8	-	-	9.0	66.7	7.7	6 130	16 804	1 065	1 023	87.4	34 [illegible]	[illegible]
6930	Scriba town (Oswego)	36.5	4 184	45.1	-	-	4.4	58.5	12.7	4 973	14 342	1 384	1 359	75.2	33 [illegible]	[illegible]
6966	Seneca Falls town (Seneca)	41.0	5 455	50.7	-	.5	5.8	65.3	7.3	6 668	20 251	2 052	1 795	78.2	[illegible]	[illegible]
6984	Seneca town (Ontario)	50.2	2 749	-2.1	.2	-	19.7	78.0	7.1	6 784	18 430	958	901	51.4	[illegible]	[illegible]
6993	Sennett town (Cayuga)	25.3	9 886	-.1	.7	.6	12.0	68.0	8.3	6 812	16 724	3 802	3 531	67.8	[illegible]	[illegible]
7002	Shandaken town (Ulster)	25.5	2 561	.3	-	-	12.7	78.2	5.2	7 294	21 250	931	845	85.2	[illegible]	[illegible]
7020	Shawangunk town (Ulster)	119.1	2 912	12.3	.9	.3	19.2	55.8	13.6	5 758	11 705	2 796	1 167	72.6	[illegible]	[illegible]
7038	Shelby town (Orleans)	56.1	8 186	42.4	4.5	3.2	11.4	71.4	14.1	5 802	16 153	2 273	2 427	[illegible]	18 [illegible]	[illegible]
7047	Sheldon town (Wyoming)	45.2	5 361	-.1	7.6	.8	14.5	59.4	12.1	6 356	16 165	1 850	[illegible]	[illegible]	[illegible]	[illegible]
7056	Sherburne town (Chenango)	46.5	2 644	15.2	.1	.1	8.8	67.4	5.0	5 923	17 971	877	790	82.5	[illegible]	[illegible]
7074	Sheridan town (Chautauqua)	44.8	3 657	2.2	.2	.7	12.6	65.1	12.9	5 799	14 855	1 330	1 235	73.6	[illegible]	[illegible]
7083	Sidney town (Delaware)	37.8	2 659	3.2	.8	.9	12.7	67.1	9.5	6 917	16 730	726	668	53.4	[illegible]	[illegible]
7110	Skaneateles town (Onondaga)	54.0	6 856	-1.8	.1	.2	14.3	71.7	9.4	6 309	14 758	2 797	2 583	66.0	21 [illegible]	[illegible]
7119	Smithtown town (Suffolk)	47.1	7 795	-.4	-	.8	11.7	81.5	4.2	9 080	21 513	3 083	2 705	80.4	49 100	[illegible]
7137	Sodus town (Wayne)	54.0	116 663	1.7	.8	1.8	8.5	79.9	4.0	8 149	27 314	32 781	31 995	87.2	[illegible]	[illegible]
7164	Somers town (Westchester)	57.8	9 485	8.4	9.5	.5	10.8	57.8	12.4	6 309	16 751	4 017	3 245	74.1	30 [illegible]	[illegible]
7182	Somerset town (Niagara)	30.5	13 130	39.7	2.1	1.4	11.0	84.0	3.6	10 385	30 765	4 517	4 002	92.1	80 [illegible]	[illegible]
7191	Southampton town (Suffolk)	37.7	2 701	.9	1.5	-	10.6	70.6	6.0	5 903	19 048	1 018	835	84.2	26 [illegible]	[illegible]
7200	Southeast town (Putnam)	142.4	42 849	19.1	8.7	1.5	18.8	73.1	8.5	9 614	16 668	28 362	16 613	75.1	[illegible]	[illegible]
7219	Southold town (Suffolk)	32.6	11 415	15.2	.3	[illegible]	10.6	77.5	[illegible]	8 711	27 857	4 066	3 826	74.5	66 [illegible]	[illegible]
7227	Southport town (Chemung)	54.0	19 172	14.1	4.3	1.2	23.2	72.7	6.4	5 258	15 122	[illegible]	7 467	80.2	[illegible]	[illegible]
7236	Spencer town (Tioga)	46.7	11 586	-3.3	1.0	.9	12.7	69.5	6.2	6 703	15 554	4 346	4 166	83.1	31 [illegible]	[illegible]
7272	St. Johnsville town (Montgomery)	50.3	2 633	19.0	1.3	1.9	1.8	70.1	12.1	5 462	14 809	1 024	979	74.8	31 [illegible]	[illegible]
7308	Stafford town (Genesee)	31.3	2 508	.9	.2	-	10.1	76.7	4.4	7 310	20 563	[illegible]	835	81.5	[illegible]	[illegible]
7326	Stanford town (Dutchess)	49.7	3 319	33.9	1.0	2.7	13.8	75.3	6.9	7 461	19 631	1 314	1 030	76.8	[illegible]	[illegible]
7344	Starkey town (Yates)	33.5	2 868	3.1	.5	1.8	15.8	65.6	10.9	5 746	13 440	1 396	1 355	72.9	[illegible]	[illegible]
7353	Staten Island borough (Richmond)	58.7	352 121	19.2	7.3	5.5	10.0	68.5	8.2	7 576	21 204	119 300	114 574	63.4	[illegible]	[illegible]
7371	Sterling town (Cayuga)	48.4	3 301	27.5	.2	-	10.8	62.3	14.9	5 797	15 566	1 540	1 119	81.3	23 [illegible]	[illegible]
7389	Stillwater town (Saratoga)	43.2	6 318	25.7	.3	1.4	9.5	50.8	7.2	6 023	17 169	2 517	2 090	79.4	35 [illegible]	[illegible]
7407	Stockholm town (St. Lawrence)	97.7	3 876	2.2	-	.3	8.0	62.3	11.2	5 730	16 429	1 229	1 135	83.4	31 [illegible]	[illegible]
7416	Stockport town (Columbia)	12.9	2 847	22.5	.8	.7	12.0	55.6	9.1	6 152	15 038	1 072	957	74.0	32 [illegible]	[illegible]
7443	Stony Point town (Rockland)	27.8	12 835	1.1	.5	3.4	8.1	55.9	3.2	7 272	23 704	3 581	3 700	92.1	[illegible]	[illegible]
7470	Sullivan town (Madison)	73.6	13 371	11.7	.1	.2	8.1	66.6	9.9	6 402	18 217	4 733	4 368	87.0	[illegible]	[illegible]
7497	Sweden town (Monroe)	22.8	14 959	29.8	8.5	1.8	[illegible]	57.9	22.9	5 362	18 139	4 329	4 155	[illegible]	15 [illegible]	[illegible]
7533	Thompson town (Sullivan)	37.2	13 550	18.7	12.9	5.2	12.2	56.6	[illegible]	5 472	12 969	[illegible] 824	5 072	57.3	[illegible]	[illegible]
7569	Ticonderoga town (Essex)	39.1	5 436	-6.9	-	.3	13.9	55.4	14.5	5 335	15 090	2 272	1 835	74.4	[illegible]	[illegible]
7578	Tioga town (Tioga)	50.5	4 432	22.4	-	.2	9.2	55.4	5.7	6 257	15 485	1 649	1 500	84.2	35 [illegible]	[illegible]
7605	Tonawanda town (Erie)	18.6	91 269	-14.9	.7	.5	12.3	75.6	4.9	7 943	20 019	34 018	33 345	74.5	39 900	[illegible]
7641	Trenton town (Oneida)	46.5	4 449	.5	.1	.3	9.1	77.9	7.4	6 376	16 409	1 571	1 491	92.0	37 200	[illegible]
7650	Triangle town (Broome)	40.1	2 618	14.6	.1	-	9.1	69.1	9.7	5 873	15 333	966	873	75.4	34 500	[illegible]
7722	Tuxedo town (Orange)	47.4	3 069	3.4	.3	1.8	9.8	84.4	3.5	12 506	25 035	1 168	1 090	55.1	78 500	376
7749	Ulster town (Ulster)	27.9	12 319	5.2	1.7	.7	10.6	67.6	7.2	7 428	18 220	4 939	4 463	73.2	38 100	270
7758	Ulysses town (Tompkins)	32.8	4 666	2.7	.1	.3	11.7	78.2	8.0	6 511	15 215	1 844	1 699	75.8	40 600	226
7767	Unadilla town (Otsego)	47.3	4 020	4.1	.2	1.2	12.9	69.2	9.7	6 301	14 386	1 684	1 483	79.4	31 500	206
7776	Union town (Broome)	34.9	61 179	-5.1	.9	.8	13.5	70.1	7.1	7 287	16 913	24 402	23 269	63.1	41 200	217
7785	Union Vale town (Dutchess)	37.8	2 658	56.2	5.9	2.4	8.8	79.6	4.0	8 952	22 537	892	786	79.5	60 000	308
7794	Urbana town (Steuben)	44.4	2 902	10.7	-	-	10.7	67.9	6.3	6 624	14 803	1 394	1 061	79.1	33 800	212

See footnotes at end of table D.

REFERENCE 27

The Town of Tuxedo

BOX 725, TUXEDO PARK, NEW YORK 10987

RECEIVED
VILLAGE OF TUXEDO PARK

AUG 27 1987

SUPERVISOR
JOHN J. McCARTHY
914 351 2205

TOWN BOARD
ERNEST K. BARTH
ELIZABETH A. EBERLING
PATRICIA A. FLANAGAN
WILLIAM J. IANNONE

TOWN CLERK
VIRGINIA L. MARSH
914 351 4411

TOWN JUSTICES
RAY A. BARONE
J. RICHARD VINGRILLO
914 351 5655

SUPERINTENDENT OF HIGHWAYS
CHARLES G. JONES
914 351 2594

TOWN COUNSEL
TERRY RICE, Esq.
914 357 2669

TOWN ENGINEER
MICHAEL J. SINANSKY

ASSESSOR
FRANKLIN D. STEIN
914 351 5602

Ray A. Barone
P.O. Box 655
Tuxedo, NY 10987

RE: Landfill - Route 17

Dear Ray;

I have received a number of complaints from the residents in the vacinity of the landfill operation on route 17 and from residents from other sections of town regarding a "horrible" odor coming from the landfill. I have also received complaints and concerns over an alledged "tank" type truck entering the dump site. I would request that you please respond to these complaints and by copy of this memo am enforming the Town Engineer and Town Attorney.

I would appreciate hearing back from you as soon as possible.

Sincerely,

John J. McCarthy
Supervisor

JJM:dp

CC: P. J. Corless, P.E.
Terry Rice, Esq.

The second sentence of the letter reads, "DEC has completed its testing of the fill brought on to the site by the defendants and has determined it to be at least an industrial waste based on the lab results which indicate low levels of...PCB's and....PAH's."

It is incorrect to state in any way that "testing of the fill brought on to the site" has been completed. No testing that I am aware of to date has been conducted and fully reported so as to provide a Full program of evaluation for the unknown material deposited illegally, their odor, thermal effects, steaming, nor their long range interaction under thermal influence. None of this has been evaluated by the tests referenced in the first paragraph of the letter. Those tests treated only the cover material, placed contrary to court requirements and DEC specification, and sought only two classes of chemical compounds. These have now been newly introduced to the site since adjacent properties of virgin soil show no trace of PCB or PAH compounds.

To refer to the fill charater as "at least an industrial waste" is to invert the semantic. The cover fill is illegal and should be characterized as at best an hazardous industrial waste and at worst a material combination which has no place alongside the Ramapo river in any case. All this is even more so for the materials in the core of the dump.

It is an inconceivable conclusion to make convenient either your agenda or that of the DEC, at the cost of the people of Tuxedo and others, by designating the site an "inactive hazardous waste" site. No hazardous waste site is inactive in consequence. Given its special geology and location, long range consequence here must be avoided by by action now rather than any after-the-fact superfund cure. This case demands action.

It is my professional view that the technical determination of the DEC " that the best way to solve the terrible odors which are still emenating from the site is by the immediate use of clean cover material..." is entirely inappropriate in this case and will prove so if implemented. Moreover, it only buries the real crime deeper and compromises the essential final effort to have the site cleared.

The defendants have already claimed to have covered 75% of the site to order. If cover is effective, then present odor is one fourth of the dump yield by benefit of such cover. Yet, Tuxedo residents can testify that route 17 is barely passable, and those living and working nearest the dump find it unbearable and unhealthy. There are also those with active business establishments which are impacted. Both the fault and the cure are to be found in the body of the dump. It cannot now be effectively sealed against either its atmospheric release nor its long range chemistry and leaching behavior. It must be removed.

The DEC is seriously mistaken in its technical recommendations in this case. Its testing program, which the letter recites as including boring and monitoring wells and consuming 12 months may be appropriate elsewhere but it is not so as the sole present initiative in this case. It is immediately necessary to make a bulldozer cut through the dump to depth of original soil and underlying bedrock. This will fully define the need for early remedial action based on evaluation and test of material exposed.

Any delay and superfund costs benefit only the violators who know this and have already made their profit. Delays will make them yet more difficult to reach with their responsibility. That responsibility is

Residents have continued to complain of various odors emanating from the site. School children have complained of feeling sick at the school near the dump site and the material in the dump appears ready to spontaneously burst into flame with the ground temperature rising daily. DEC has prepared a report of the materials in the dump but has refused to give the Village or Town a copy. However, the materials are clearly toxic.

Help has been sought from DEC, the Attorney General's Office, State Senator Eugene Levy, State Assembly person Mary McPhillips and Congressman Benjamin Gillman but to no avail. The Town and Village have been compelled to file their own lawsuit and have been advised by counsel that they will probably end up paying for the cleanup by municipal revenues.

See FSB about who wrote this and where it went 1/29/88

ANTHONY KAROLYI

The most Honorable
Governor Mario Cuomo
The State Capitol,
Albany, New York.

Tuxedo Park, N.Y.
16 February, 1988

Dear Governor Cuomo,

We attach great hope to the possibility that you will involve your high office in the matter outlined in this letter; otherwise it could become a disastrous precedent involving noxious waste dumping in the State of New York.

A demolition and construction land-fill site in our community, the township of Tuxedo, has been illegally used by it'sowner and/or operator as a dumping ground for -as yet unidentified chemicals- industrial wastes, sewer sludgeand garbage bags of all colors including RED, which are said to contain hospital refuse.

The resulting stench emanating from this site permeates the community. Hot gasses and steam issueing from it have created a health hazard causing serious irritation to the throat, esophagus and bronchial tubes to many, including myself. The fact that silver is tarnishingmuch faster than formerly, and being discolored to an unusual gilt or pewtery clor, leads us to believe that the presence of harmful chemicals in our air is damaging our health as well as our property.

Since the 21 January '88, hearings have been held in Goshen, N.Y. by Judge S. Barret Hickman to determine whether the temporary injunction against operating this dumping site, should be made permanent.

The foregoing deals with the damage to our community, Tuxedo. However, even more is at stake: the dumping ground in question is only 200 feet away from the Ramapo River, which provides water to 100.000 residents in downstream Rockland County...AND 500.000 people in northern New Jersey. Therefore, this dump must not only be shut down permanently, but it's contents must be removed.

Individual greed must be prevented from endangering public health and safety.

Please HELP us! admiringly yours,

Josette D. Karolyi

Josette D. Karolyi

P.s.
To facilitate your review of this matter, the following are copied:
D.E.C. Commissioner Thomas Vorling, Albany, N.Y.
D.E.C. Commissioner Paul Kelleher, New Paltz, N.Y.
Attorney General of N.Y., Robert Abrams, 120 B'dway, N.Y.C.
N.Y.State Senator Eugene Levy
U.S.Senator Alfonso D'Amato, Washington, D.C.
U.S.Senator Daniel Moynihan, Washington, D.C.

5.6 UPDATED EPA POTENTIAL HAZARDOUS WASTE SITE, SITE INSPECTION REPORT (FORM 2070-13)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common or descriptive name of site)			02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER	
Tuxedo Waste Disposal Site			NYS Route 17	
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 COUNTY**	**07 COUNTY CODE / 08 CONG DIST**
Tuxedo Park	NY	10987	Orange	087 / NY22

09 COORDINATES: LATITUDE 41° 12' 36" N — LONGITUDE 074° 11' 02" W

10 TYPE OF OWNERSHIP (Check one): ■ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
6 16 88 (MONTH DAY YEAR)	☐ ACTIVE ■ INACTIVE	2/87 (BEGINNING YEAR) 10/87 (ENDING YEAR) ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR ______ ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR ______
X E. STATE ■ F. STATE CONTRACTOR LMS Engineers (Name of firm) ☐ G. OTHER ______ (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO.
Edward A. Maikish	Environmental Engineer	LMS Engineers	(914 735-8300
09 OTHER INSPECTORS	**10 TITLE**	**11 ORGANIZATION**	**12 TELEPHONE NO.**
Kevin McGuinness*	Hydrogeologist	LMS Engineers	(914 735-8300
John Guzewich	Field Program Supervisor	LMS Engineers	(914 735-8300
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO.
			( )
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
■ PERMISSION ☐ WARRANT	1400	Partly cloudy, light wind (0-10 mph) and 80°F

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)		03 TELEPHONE NO.
Mike Komoroske	NYSDEC/DHWR/BHSC		(518) 457-0639

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
E.A. Maikish		LMS Engineers	914/735-8300	12 / 8 / 88 (MONTH DAY YEAR)

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)
- ■ A. SOLID
- ■ B. POWDER, FINES
- ☐ C. SLUDGE
- ☐ D. OTHER ______ (Specify)
- ☐ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)
- TONS ______
- CUBIC YARDS 500,000
- NO. OF DRUMS ______

03 WASTE CHARACTERISTICS (Check all that apply)
- ■ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ■ D. PERSISTENT
- ☐ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☐ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☐ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE	-		Waste is C&D and Non-C&D
OLW	OILY WASTE	-		material. Hazardous waste is
SOL	SOLVENTS	-		suspected, but not documented.
PSD	PESTICIDES	-		
OCC	OTHER ORGANIC CHEMICALS	unknown		
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS	unknown		

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
MES	Lead	7439-92-1	Landfill	5130	ug/l
PSD	Heptachlorodibenzodioxin	35822-46-9	"	3.1	ug/kg
"	Octachlorodibenzodioxin	3268-87-9	"	27	"
"	Dieldrin	60-57-1	"	3300	"
OCC	Ethylbenzene	100-41-4	"	60	"
"	Toluene	108-88-3	"	160	"
"	Xylene (total)	1330-20-7	"	260	"
"	Acenaphthene	83-32-9	"	46,000	"
"	Anthracene	120-12-7	"	60,000	"
"	Chrysene	218-01-9	"	140,000	"
"	Dibenzofuran	132-64-9	"	40,000	"
"	Fluorene	86-73-7	"	52,000	"
"	Fluoranthene	206-44-0	"	360,000	"
"	Naphthalene	91-20-3	"	270,000	"
"	Phenanthrene	85-01-8	"	300,000	"
"	Hydrogen sulfide	7783-06-4	"	>2000	ppm

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS	Not applicable		FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1987 Cassidy Survey/1988 Caruso Survey
1988 NYSDEC Phase II investigation analytical results

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: NY | 02 SITE NUMBER: new

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ■ A GROUNDWATER CONTAMINATION — 02 ■ OBSERVED (DATE 11/29/88) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 310 — 04 NARRATIVE DESCRIPTION
Metals above background observed in downgradient wells.

01 ■ B SURFACE WATER CONTAMINATION — 02 ■ OBSERVED (DATE 11/29/88) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED unknown — 04 NARRATIVE DESCRIPTION
1 semi-volatile and 2 metals observed above background rivers sediments. Surface water samples (by both NYSDEC & water company) did not indicate river water contamination at this time. Downstream samples show slightly elevated metal values (from NYSDEC and water company).

01 ■ C CONTAMINATION OF AIR — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 3400 — 04 NARRATIVE DESCRIPTION
Hydrogen sulfide has drifted off-site. NYS Rt. 17 next to landfill.

01 ■ D FIRE EXPLOSIVE CONDITIONS — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 12 — 04 NARRATIVE DESCRIPTION
One trench sample data failed ignitability test; methane gas produced/venting from site.

01 ■ E DIRECT CONTACT — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED unknown — 04 NARRATIVE DESCRIPTION
Site is not fenced or enclosed. Trespassers could be affected.

01 ■ F CONTAMINATION OF SOIL — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 AREA POTENTIALLY AFFECTED 12 (Acres) — 04 NARRATIVE DESCRIPTION
Landfill directly overlies overburden.

01 ■ G DRINKING WATER CONTAMINATION — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED 4 — 04 NARRATIVE DESCRIPTION
Well 50-100 ft. from fill. Water has tested negative in April 1988.

01 ☐ H WORKER EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE ______) ☐ POTENTIAL ☐ ALLEGED
03 WORKERS POTENTIALLY AFFECTED ______ — 04 NARRATIVE DESCRIPTION
N/A

01 ■ I POPULATION EXPOSURE/INJURY — 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED unknown — 04 NARRATIVE DESCRIPTION
Local population could be affected by air release. Population > 3 miles downstream could be affected if leachate migrates into adjacent river.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ■ J. DAMAGE TO FLORA 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Possible damage to food chain plants in Ramapo River.

01 ■ K. DAMAGE TO FAUNA 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (include name(s) of species)

Contamination migration could increase and affect Ramapo River trout as well as other downstream fauna.

01 ■ L. CONTAMINATION OF FOOD CHAIN 02 ☐ OBSERVED (DATE ______) ■ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

If leachate migrates into Ramapo River, a NYS class A River and trout stream, contamination could occur.

01 ■ M. UNSTABLE CONTAINMENT OF WASTES 02 ■ OBSERVED (DATE Summer '88) ☐ POTENTIAL ☐ ALLEGED
(Spills, Runoff, Standing liquids, Leaking drums)
03 POPULATION POTENTIALLY AFFECTED unknown 04 NARRATIVE DESCRIPTION

Part of landfill not covered.

01 ■ N. DAMAGE TO OFFSITE PROPERTY 02 ■ OBSERVED (DATE Summer '88) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Landfilling occurred on property to south, without permission to owner.

01 ☐ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs 02 ☐ OBSERVED (DATE ______) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

N/A.

01 ■ P. ILLEGAL/UNAUTHORIZED DUMPING 02 ■ OBSERVED (DATE 3/6/87) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Operator violated C&D exemption by accepting non C&D wastes.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

Landfill over water main, may damage water main or contaminate supply if flow stopped.

III. TOTAL POPULATION POTENTIALLY AFFECTED: 3400

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

1989 NYSDEC Phase II report

EPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE: NY | 02 SITE NUMBER: new

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A NPDES				
☐ B UIC				
☐ C AIR				
☐ D RCRA				
☐ E RCRA INTERIM STATUS				
☐ F SPCC PLAN				
☐ G STATE (Specify)				
☐ H LOCAL (Specify)				
☐ I OTHER (Specify)				
■ J NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A SURFACE IMPOUNDMENT		
☐ B PILES		
☐ C DRUMS, ABOVE GROUND		
☐ D TANK, ABOVE GROUND		
☐ E TANK, BELOW GROUND		
X F LANDFILL	500,000	yds. 3
☐ G LANDFARM		
☐ H OPEN DUMP		
☐ I OTHER (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A INCENERATION
- ☐ B UNDERGROUND INJECTION
- ☐ C CHEMICAL/PHYSICAL
- ☐ D BIOLOGICAL
- ☐ E WASTE OIL PROCESSING
- ☐ F SOLVENT RECOVERY
- ☐ G OTHER RECYCLING/RECOVERY
- ☐ H OTHER (Specify)

05 OTHER

X A BUILDINGS ON SITE

06 AREA OF SITE

12 (Acres)

07 COMMENTS

The site operated as a landfill under 6 NYCRR Part 360 exemption for C&D landfills. No permits were required, if only C&D wastes were accepted.

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A ADEQUATE, SECURE ☐ B MODERATE ☐ C INADEQUATE, POOR X D INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC

Landfill does not have bottom liner, no leachate collection system, no run-off control.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: X YES ☐ NO

02 COMMENTS

Portion of waste not capped, site has little access restriction.

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Site history from NYSDEC forest ranger.
Site visits.
6 NYCRR Part 360
Phase II Investigation

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	new

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL
COMMUNITY	A ☒	B ☐
NON-COMMUNITY	C ☐	D ☒

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A ☐	B ☐	C ☐
D ☐	E ☐	F ☒

03 DISTANCE TO SITE

A 1.5 (mi)

B 0.0189 (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING

☒ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available)

☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available)

☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 310

03 DISTANCE TO NEAREST DRINKING WATER WELL 0.0189 (mi)

04 DEPTH TO GROUNDWATER	05 DIRECTION OF GROUNDWATER FLOW	06 DEPTH TO AQUIFER OF CONCERN	07 POTENTIAL YIELD OF AQUIFER	08 SOLE SOURCE AQUIFER
9-18 (ft)	East toward Ramapo R.	9.5-19.5 (ft)	2-8 (gpd)	☐ YES ☒ NO

09 DESCRIPTION OF WELLS (Including useage, depth, and location relative to population and buildings)

One well to north of site at an antique store. Other wells are scattered within a [illegible] mile radius. Municipal lake water serves most of the area.

10 RECHARGE AREA		11 DISCHARGE AREA	
☒ YES ☐ NO	COMMENTS limited	☒ YES ☐ NO	COMMENTS to Ramapo River

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ A. RESERVOIR, RECREATION, DRINKING WATER SOURCE

☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES

☐ C. COMMERCIAL, INDUSTRIAL

☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME	AFFECTED	DISTANCE TO SITE
Ramapo River	☐	0.018 (mi)
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A [illegible] (NO. OF PERSONS)	B 3000 (NO. OF PERSONS)	C 3400 (NO. OF PERSONS)

02 DISTANCE TO NEAREST POPULATION 0.0189 (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 790

04 DISTANCE TO NEAREST OFF-SITE BUILDING 0.0189 (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

Village (Town of Tuxedo) 1 mile to south, otherwise parklands to the east and northwest.

SEPA

POTENTIAL HAZARDOUS WASTE SITE SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION
01 STATE: NY | 02 SITE NUMBER: new

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☒ A 10^{-6} – 10^{-8} cm/sec ☐ B 10^{-4} – 10^{-6} cm/sec ■ C 10^{-4} – 10^{-3} cm/sec ☐ D GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B RELATIVELY IMPERMEABLE (10^{-4} – 10^{-6} cm/sec) ■ C RELATIVELY PERMEABLE (10^{-2} – 10^{-4} cm/sec) ☐ D VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK: 0-70 (ft)

04 DEPTH OF CONTAMINATED SOIL ZONE: 0-70 (ft)

05 SOIL pH: ______

06 NET PRECIPITATION: 46 (in)

07 ONE YEAR 24 HOUR RAINFALL: 2.6 (in)

08 SLOPE — SITE SLOPE: 4.76 % | DIRECTION OF SITE SLOPE: NE | TERRAIN AVERAGE SLOPE: 7.69 %

09 FLOOD POTENTIAL — SITE IS IN a YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE A ______ (mi) OTHER B 1.5 (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species): < 1 (mi)

ENDANGERED SPECIES: timber rattler[b]

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS, NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS — PRIME AG LAND	AGRICULTURAL LANDS — AG LAND
A 0.0189 (mi)	B 0.15 (mi)	C > 2 (mi)	D > 2 (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

The site is located in the Ramapo River Valley. Tower Hill lies to the west. The site lies partially on the hill slope and partially in the valley. The hills of Harriman State Park lie to the east.

[a]Northern portion of site is in 500 year flood plain. Southern portion of site is outside the 500 year flood plain.

[b]New York State endangered, not Federal.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

USGS Topographic Map, Sloatsburg, NY-NJ
1988 Caruso Survey

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	new

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	16	RECRA, Buffalo/Compuchem	3/89
SURFACE WATER	23	RECRA, Buffalo/Compuchem/Water Dept.	3/89
WASTE	16	RECRA/York/ Versar/ Enseco/Compuchem	3/89
AIR	15	NYSDOH/Albany	3/89
RUNOFF	-		
SPILL	-		
SOIL	15	RECRA/Compuchem/NYSDOH, Albany	3/89
VEGETATION	-		
OTHER	45	35 field samples/Analytics'10 Galston	3/89

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS
OVA, HNU	Field monitoring of undisturbed site-varied between Ø and 15 ppm
	Field monitoring during trenching varied between Ø and 1000 ppm
	Culvert mouth on southeastern edge of fill indicated 100%
	LEL, 400 ppm VO, and 100-130 ppm H_2S

IV. PHOTOGRAPHS AND MAPS

01 TYPE ■ GROUND ■ AERIAL

02 IN CUSTODY OF LMS Engineers (Name of organization or individual)

03 MAPS ■ YES ☐ NO

04 LOCATION OF MAPS LMS Engineers, Pearl River, NY

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

Non-NYSDEC Phase II samples are listed in the Phase II report under Chapter 4, Section 4.5 Other Data.

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC
Phase II investigation
NYSDOH

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
Renard Barone, Esq.		P.O. Box 656		Tuxedo	NY	10987
Sarkin Khourouzian				Sloatsburg	NY	

PARENT COMPANY (If applicable)

08 NAME	09 D+B NUMBER	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
Thruway Asphalt Co., Inc.				unknown		
Anthony Cucolo				unknown		
Tuxedo Park Associates				Tuxedo Park	NY	10987

IV. REALTY OWNER(S) (If applicable; list most recent first)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Brief title history from Plaza Material Corp., Yonkers, NY

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	Frank Sacco
02 D+B NUMBER	
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	
04 SIC CODE	
05 CITY	
06 STATE	
07 ZIP CODE	
08 YEARS OF OPERATION	
09 NAME OF OWNER	

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME	Materials Transport Service
11 D+B NUMBER	
12 STREET ADDRESS (P.O. Box, RFD #, etc.)	1025 Sawmill River Road
13 SIC CODE	
14 CITY	Yonkers,
15 STATE	NY
16 ZIP CODE	

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE	08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 NAME	11 D+B NUMBER	12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE	14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Enforement action records, EPA Form 2070-12

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NY	new

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	new

II. PAST RESPONSE ACTIVITIES

01 ☐ A. WATER SUPPLY CLOSED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ D. SPILLED MATERIAL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ E. CONTAMINATED SOIL REMOVED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ■ F. WASTE REPACKAGED 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
Hazardous substances are suspected to have been mixed off-site with C&D and non C & D waste.

01 ☐ G. WASTE DISPOSED ELSEWHERE 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ H. ON SITE BURIAL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
Hazardous substances are suspected to have been mixed off-site with C&D and non C&D mixture.

01 ☐ I. IN SITU CHEMICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ J. IN SITU BIOLOGICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ K. IN SITU PHYSICAL TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ L. ENCAPSULATION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ M. EMERGENCY WASTE TREATMENT 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ N. CUTOFF WALLS 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ P. CUTOFF TRENCHES/SUMP 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ Q. SUBSURFACE CUTOFF WALL 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	new

II. PAST RESPONSE ACTIVITIES (Continued)

01 ☐ R. BARRIER WALLS CONSTRUCTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ■ S. CAPPING/COVERING — 02 DATE 10/87 & 4/88 03 AGENCY ______
04 DESCRIPTION
Cover material trucked in to suppress hydrogen sulfide odors.

01 ☐ T. BULK TANKAGE REPAIRED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ U. GROUT CURTAIN CONSTRUCTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ V. BOTTOM SEALED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ W. GAS CONTROL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ X. FIRE CONTROL — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
No history.

01 ☐ Y. LEACHATE TREATMENT — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ Z. AREA EVACUATED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
No history.

01 ☐ 1. ACCESS TO SITE RESTRICTED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
No restriction.

01 ☐ 2. POPULATION RELOCATED — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION
None known.

01 ☐ 3. OTHER REMEDIAL ACTIVITIES — 02 DATE ______ 03 AGENCY ______
04 DESCRIPTION

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC history reports.

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NY	new

II. ENFORCEMENT INFORMATION

01 PAST REGULATORY/ENFORCEMENT ACTION ☒ YES ☐ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

A NYSDEC forest range began issuing violation 18 March 1987 and continued throughout April and May. The state granted a 10/87 temporary restraining order against the owners/operators. A March 1988 state ruling continues the TRO until NYSDEC resolves the potential site hazard problem.

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

NYSDEC forest ranger
NYSDEC/DEE

CHAPTER 6

CHAPTER 6

RECOMMENDED ADDITIONAL INVESTIGATION OR REMEDIAL ALTERNATIVES

This chapter presents recommendations for remediation and additional studies for the Tuxedo WD Site. Three types of recommendations are presented: (1) immediate remediation for the relief of the most pressing concerns, (2) additional studies or continued monitoring that may fill in missing data, and (3) remedial and feasibility studies (RI/FS) that address long-term actions to be taken at the site.

6.1 IMMEDIATE REMEDIATION

The conclusions presented in Chapter 4 indicate that the landfill does not pose an immediate hazard to the general public. The hydrogen sulfide produced and released does create a nuisance condition for the town and local population. The methane production should also be contained or controlled to prevent a landfill fire. The major potential chemical contamination problem concerning the landfill will occur if it becomes saturated and the leachate releases contaminants to surface waters or groundwater.

The gas and leachate can be addressed immediately by two actions: additional cover with gas venting and treatment, and diversion of the intermittent stream.

6.1.1 Additional Cover

It is recommended that an additional 2-ft layer of impermeable cover be installed over the entire landfill. The cover should be graded so water will not pond but rather flow off the landfill.

All naturally forming vent areas should be covered and sealed. The existing culvert should also be sealed or removed. The additional cover will prevent seepage into the fill, thus reducing the leachate and limiting the additional production of hydrogen sulfide.

Since the additional cover will seal off the landfill, venting will be required to release the buildup of gases produced in the landfill. The vented gases will need to be collected and treated before the nuisance odor associated with the hydrogen sulfide can be reduced.

The installation of 2 ft of impermeable cover over the 12-acre site, with grading, will require approximately 40,000 yd^3 of cover material and cost approximately $750,000. Venting and treatment will require an engineering review and design, at a cost of approximately $50,000, to select the best location, types of vents, and treatment method. The cost of venting and treatment will depend on the design and should be estimated when the design is completed.

6.1.2 Stream Diversion

To reduce the amount of water flowing into the landfill we recommend that the intermittent stream/drainage entering from the south be rerouted around the landfill (to the south). This will require a brief investigation to determine the best route (to avoid trenching through bedrock), trenching and layering of pipe, and backfilling of the existing drainage route. The cost is estimated at $30,000 to $40,000.

6.2 ADDITIONAL STUDIES OR MONITORING

The Tuxedo WD Site Phase II investigation provided information to characterize the wastes in the landfill and indicates the nature of contaminants released off site at this time. The investigation was not able to answer all questions, and additional studies are required to answer those still unresolved. Continuing monitoring at the site is also needed.

6.2.1 Additional Studies

The Phase II results indicate the need for the following additional studies:

- MW-1 and MW-2 as drilled are not true upgradient wells; MW-1 is too close to the landfill and likely contaminated by it, and MW-2 is an upgradient confined bedrock well and not an upgradient overburden well. One additional well should be installed, possibly with the assistance of geophysics, at a location that will monitor the upgradient overburden groundwater.

- Allegations have been made that more hazardous wastes have been disposed of at this landfill than the Phase II investigation detected. The investigation was able to touch only the surface of the landfill and monitor what has leached out; it provides little information on the waste at or near the bottom. The trenches were only 18-20 ft deep at best in areas where the landfill was 50-70 ft deep, and the soil gas monitored the gases under the cover soils. Unfortunately, few studies can address these questions without a major engineering and excavation program.

  One possible study would be an additional soil gas survey with a closer grid and vertical distribution. A closer grid may define or pinpoint areas of contaminants. Vertical soil gas profiles, at 10, 20, 30, and 40 ft or deeper, may provide some answers concerning vertical profiles of wastes. It may also be possible to suck up a leachate sample if a soil probe encounters water within the layer. Such a survey will depend on the ability to drill a 1/2 to 5/8-in. hole to the stated depths without hitting obstructions (trees, wood, tires, etc.). There will likely be many false starts and holes. Also, drilling could punch a hole in any buried drums at the fill, thereby releasing the contents or creating an explosive condition. Contractor liability is a major question in such cases.

On behalf of NYSDEC, LMS has investigated the possibility of deep trenching or drilling into the Tuxedo landfill to characterize the deep buried wastes. At the present level of investigation these options were not considered feasible. Any type of deep trenching would have the following problems:

- Odor - Deep trenching would release additional gases from the landfill and make the odor problem worse. Obviously, the larger or deeper the hole, the greater the problem.

- Size - To reach the bottom of the landfill would require an extremely large hole with sloped sides or cribbed/reinforced side walls. Both efforts would be a major engineering/excavation project and require a full engineering design.

- Location - Because of the effort involved, deep trenching would likely be limited to only one location; therefore, if the "hot spot" is missed, the effort may be wasted.

- Cost - A rough cost estimate would be $250,000 to $500,000.

Any type of drilling would have the following problems:

- Method - There is no easy method to drill through a C&D landfill. A mud rotary drill is unacceptable due to mud contamination problems and may not even be feasible; an air rotary drill is possible, but may create problems with explosion and fire (because of the methane) and contamination problems if a hot spot or drum is hit.

- Sample - Although drilling allows sampling of many locations, the samples are not visible nor are they undisturbed. A drill may go right through a hot spot or drum without anyone realizing it.

- Liability - As discussed above, drilling through an unknown site is not recommended. Major liability problems must be resolved before drilling.

- Costs - A rough estimate is $50,000 to $100,000 for five test holes.

6.2.2 Monitoring

LMS recommends that the monitoring wells and surface water be sampled routinely as a check on the migration of contaminants off site. Monthly sampling should be scheduled for those parameters observed as high during the Phase II investigation (metals, base neutrals, PAHs) and parameters typically monitored at industrial and sanitary landfills (pH, BOD, COD, conductivity, alkalinity, DO, nitrogen, TOC, etc.). The latter group can be used as indicator parameters that signal the beginning of a release from the landfill. Because the landfill parameters can generally be assessed quickly (in a week), it will allow time to resample for a full TCL. Annually or twice annually, the samples should be analyzed for the full TCL.

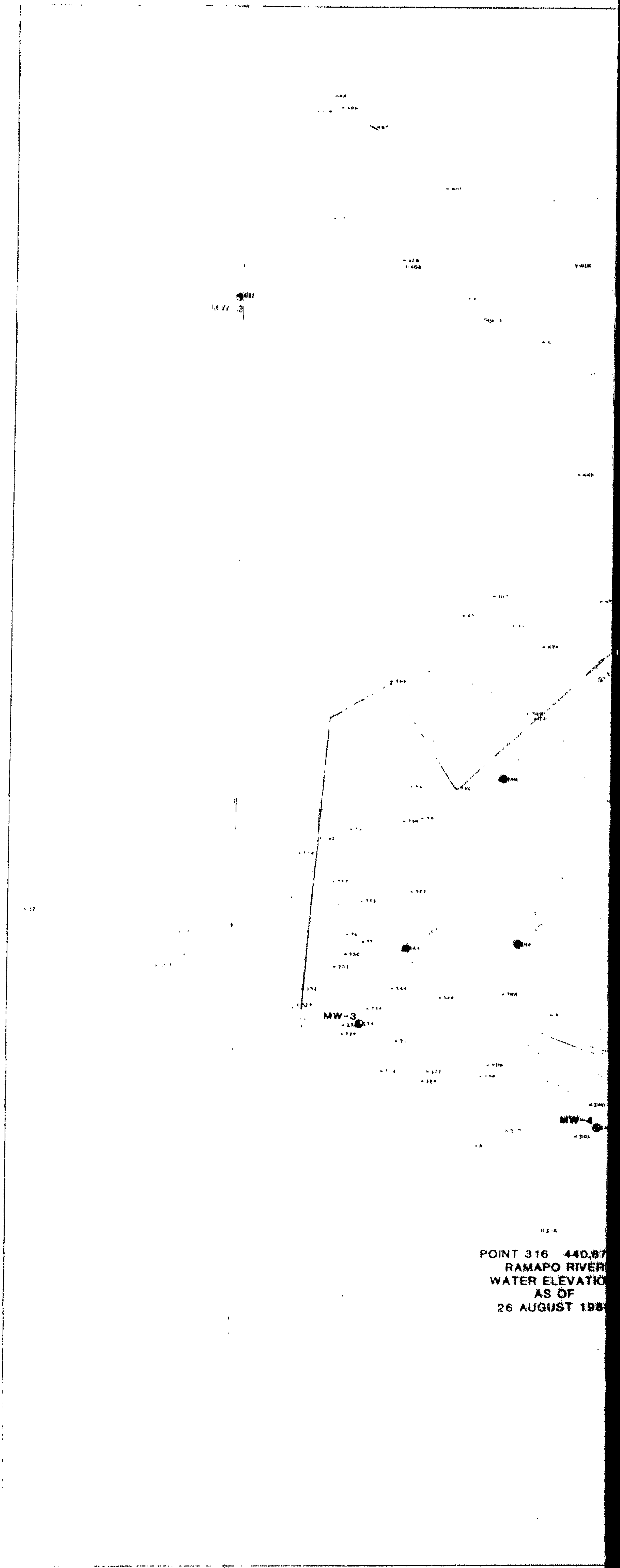
6.3 RI/FS INVESTIGATION

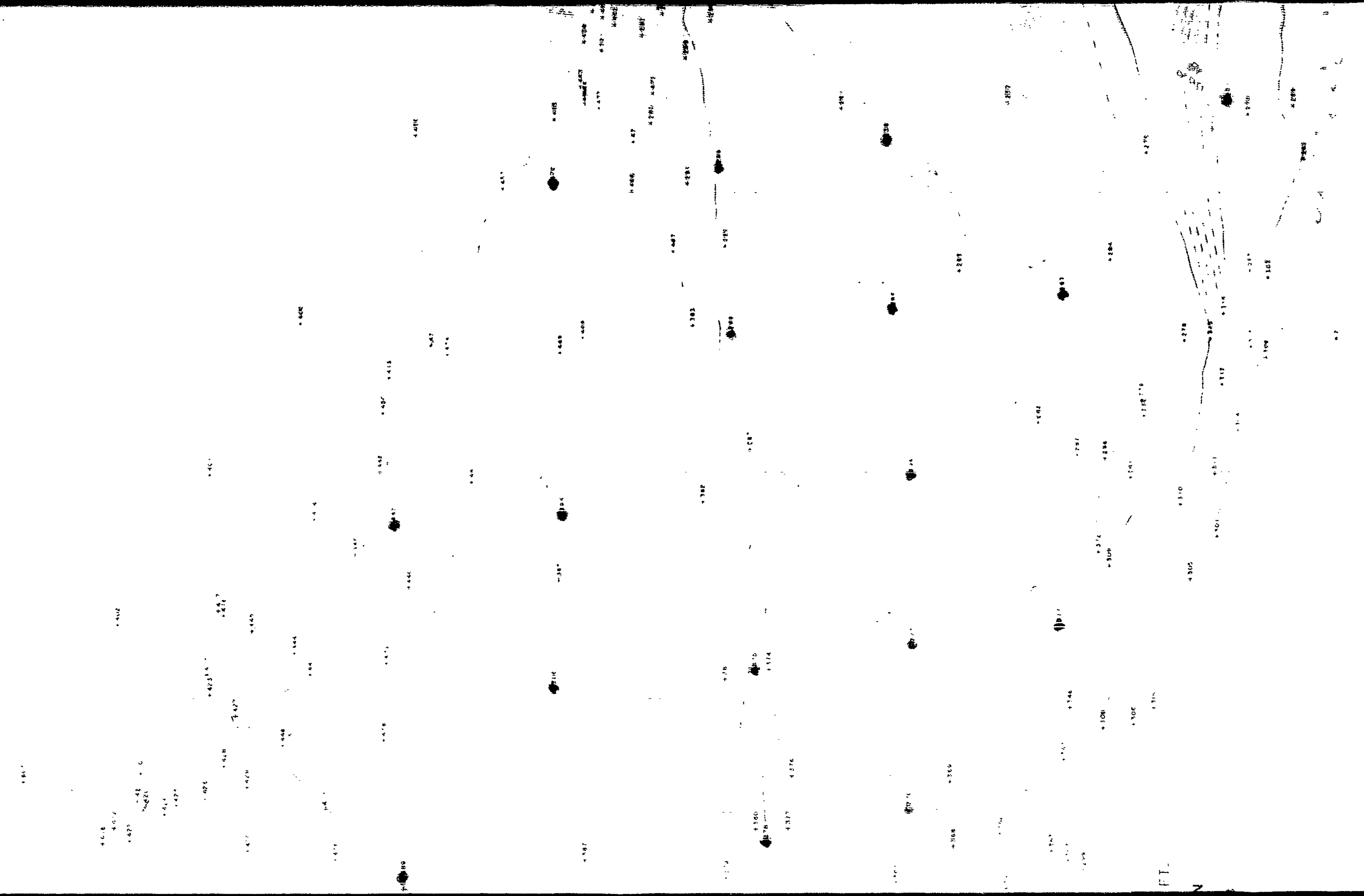
NYSDEC classification and investigation programs require that a site be listed as Class 2 before funding is available to conduct an RI/FS investigation. Both the Phase I and the Phase II provide the information to allow classification. The RI is the investigation in which the site is studied in detail so as to select and evaluate alternatives for remediation (FS). Since the enactment of SARA, the RI/FS investigations are conducted concurrently, under a phased approach. The first phase RI is conducted to provide detailed information about the site; the first phase FS is conducted to narrow the alternatives. The second phase RI is then conducted to evaluate these alternatives; the second and third phase FS are completed to select the final alternative.

The Tuxedo WD Site Phase II investigation was much more than a normal Phase II study, and in fact was comprehensive enough to be considered a first phase RI. Besides the additional studies recommended in Section 6.2, LMS recommends that if the site is classified 2, or if contaminant release is detected, then the RI/FS investigation should start with the first phase FS. Following are some remediation alternatives to be considered:

- Dewatering points could be installed to reduce the amount of leachate that might be produced from prior water seepage.
- Cut-off walls could be installed in strategic areas to prevent groundwater flow into the fill from lower elevations.
- A gas collection system could be installed to collect all gases from the landfill and treat or render them harmless through a scrubbing system.
- Removal of the contaminated material would solve the problem for the local community, but would be extremely costly and create another problem elsewhere.

Even if a full RI/FS investigation is not conducted at this site, we recommend that some type of RI/FS be performed to determine the best remedial actions to prevent the leachate from entering the groundwater and then the Ramapo River.


MW-2
MW-3
MW-4
POINT 316 440.87
RAMAPO RIVER
WATER ELEVATIO
AS OF
26 AUGUST 198



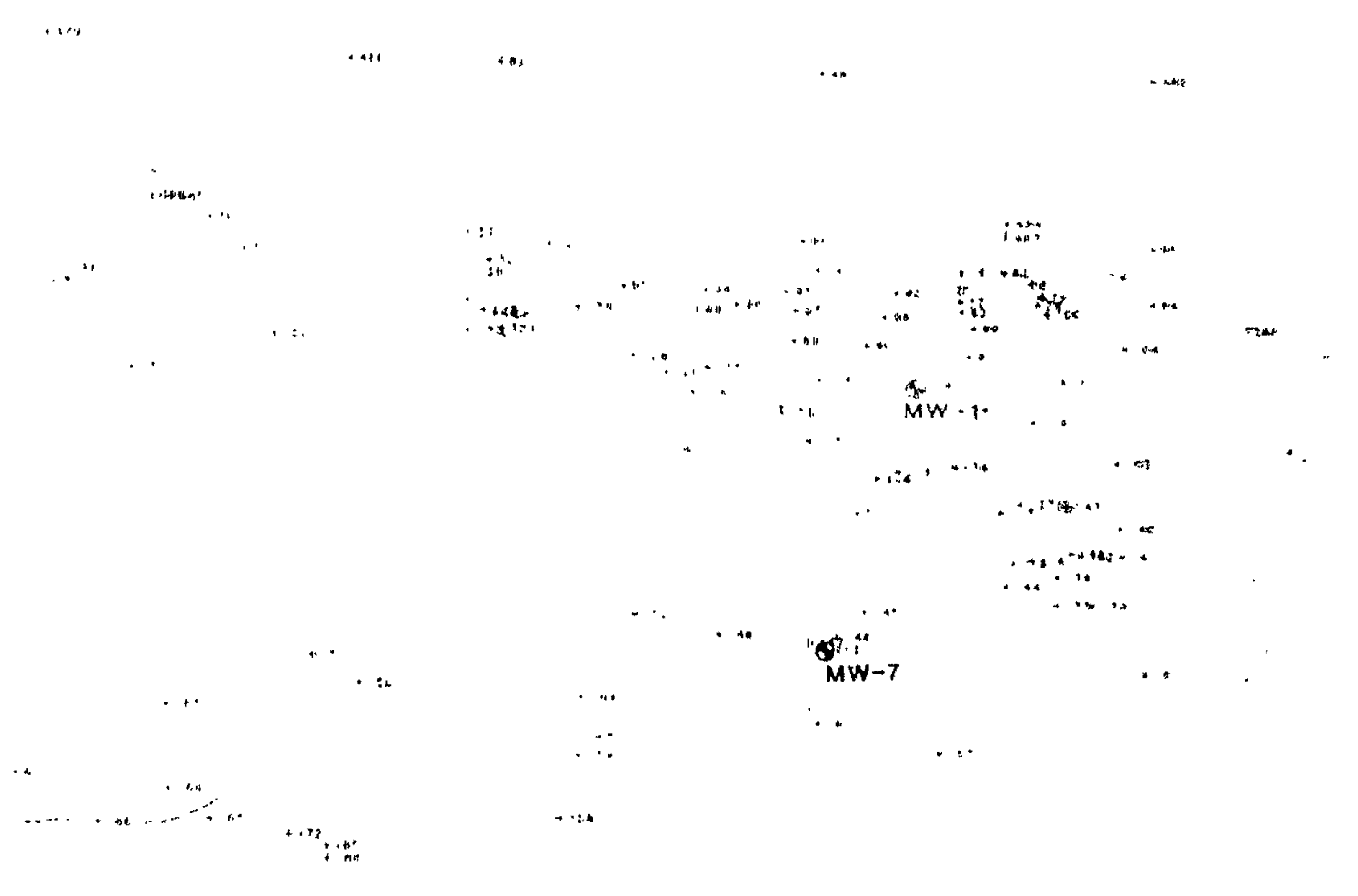

TUXED
1988 NYS
JOSEPH
LAWLER, MA
MW-5
MW-6

O WASTE DISPOSAL SITE
YSDEC ID. No 336035
DEC PHASE II INVESTIGATION

SITE SURVEYED:
26,29,30 AUGUST 1988
21 SEPTEMBER 1988

MAP PREPARED BY :
T CARUSO & ASSOCIATES
04 EAST ROUTE 59
UET, NEW YORK 10954

MAP PREPARED FOR:
ATUSKY & SKELLY ENGINEERS
BLUE HILL PLAZA
RIVER, N.Y. 10965



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